



GENERAL MECHANICAL INSTALLATION SPECIFICATION

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SECTION 1 – GENERAL

1.1 SCOPE

This specification covers the supply, delivery, erection, installation, testing and commissioning, including repairs and maintenance, to all mechanical services in new and existing buildings. Where any of the work is to be carried out as a sub-contract, 'Contractor' shall mean 'Sub-Contractor'.

All work shall be carried out in accordance with the relevant standards and guidance with particular reference to documents and standards from the following issuing authorities.

British Standards Authority (BS)
Euronorm Standards (BS EN)
Health & Safety Commission (HSC)
Chartered Institute of Building Services Engineers (CIBSE)
Heating and Ventilation Contractors Association (HVCA)
Building Regulations
Institute of Gas Engineers (IGE)

1.2 WORKING DRAWINGS

All Working Drawings when indicated as being required necessary for accurately and properly carrying out the works shall be prepared by the Contractor and submitted to the Contract Administrator for acceptance in principle, the installation shall not commence until this has been given. Acceptance of drawings submitted by the Contractor shall not in any way relieve the Contractor from his responsibility to provide equipment suitable in dimensions, construction and finish for the location in which it is to be installed.

The Contractor shall produce upon request drawings indicating all builders work in connection with his works.

It shall be the responsibility of the Contractor to check from site, the accuracy of all dimensions taken from the University's or others drawings for use in the preparation of his working drawings.

The Contractor, by agreement with the Contract Administrator, may choose to issue the Authority's tender drawings as working drawings. This will be acceptable providing the Contractor has checked the information and is satisfied that the drawings issued meet his contractual requirements.

1.3 DEFECTS LIABILITY PERIOD

The conditions of contract call for the Defects Liability period to be 12 months unless otherwise noted elsewhere however the Contractor shall after a period of 3 months from the works having been put into use, return to site to make the necessary adjustments to plant, i.e. lubrication and tightening up of all valve glands, checking and tightening all unions and flange bolts, adjustments of pumps, etc and shall include for these works in his Tender.

Allowance should be made to extend the defects for specific parts of the system period where operating conditions have not been met due to seasonal constraints. The period should be extended to ensure a full range of external design conditions have been met.

1.4 BUILDIERS WORK

- (a) Any necessary Builder's work associated with the contract shall be included for by the Contractor within his Tender and carried out by specialist Building Contractors. Unless otherwise agreed
- (b) Holes, chases and any damage to building structure shall be made good and suitably finished by the Contractor. The site of the works shall be at all times left in a clean and tidy condition.
- (c) All fire ratings to be re-established from any breaches.

1.5 ASBESTOS

- (a) Thermal insulation within the boiler rooms, ducts and roof spaces, in many instances may, depending on age, contain 'asbestos', also asbestos based products were used in the construction of buildings, e.g. ceiling tiles, fire stops inside heaters etc.
- (b) The Contractor's attention is also drawn to the Asbestos Register which is available on site and must be consulted in conjunction with university supervising officer before any work that may disturb the fabric of the building or the services installed in it are undertaken. If during the contract or any other maintenance or emergency work the Contractor suspects that additional unidentified asbestos may be present, he shall stop work immediately and inform the Project Supervisor in order that the appropriate action can be taken for its removal.
- (c) Removal of any asbestos insulation/materials or drilling of asbestos panels shall only be carried out in accordance with current legislation by a licensed Asbestos Removal Contractor as agreed by the university or arranged by the university.

1.6 ISOLATION AND CONECTION OF EXISTING SERVICES

The contractor shall not isolate existing services without first seeking approval from the University's Supervising Officer.

No connections shall be made to any service withjout prior authorisation from the university supervising officer.

Refer also to main contract conditions where applicable.

1.7 REDUNDANT EQUIPMENT

Existing equipment shall be offered to the client prior to removal from site.

Allowance should be made in the tender or quotation to remove any equipment or services made redundant as a direct result of the work in hand unless otherwise agreed by the university supervising officer. This includes dead legs in pipe work.

1.8 SAFETY AND WELFARE MEASURES

The contractor shall comply with the provisions of the Health and Safety at Work, etc Act 1974, relevant CDM requirements and all other Safety, Welfare and Statutory measures where applicable to the works. and The University Contractors Health and Safety Book.

1.9 FIRE PRECAUTIONS

Hot works permits shall be completed prior to commencing hot works. The contractor shall observe all fire precautions particular to the site.

1.10 INSTALLATION OF EQUIPMENT

All equipment shall be installed in accordance with manufactures guidelines, applicable regulations and current accepted good practice.

1.11 OPERATION AND MAINTENANCE INSTRUCTIONS

The contractor shall provide two sets of operating and maintenance instructions for all installations included within the contract. Each set shall incorporate descriptions of such installations of its operation and of the regular maintenance operating routine to be adopted. Each set shall contain copies of internal and external wiring diagrams for control equipment updated to include all modifications carried out during commissioning, manufacturer's data, maintenance leaflets for all items of plant and equipment, manufacturer's commissioning certificates, and the detailed drawings showing the construction of such plant and equipment.

A separate document must be produced which indicates any planned and scheduled maintenance that is required to preserve the cover of the warranty

The contractors shall be responsible for instructing the occupier's staff in the operation of the completed works.

1.12 AS INSTALLED DRAWINGS

After completion of the works, but before the release of any retention money, the Contractor shall supply two sets of paper drawings and an electronic copy of the same drawings in Autocad format, accurately indicating the works of the contract, as actually installed, together with diagrammatic charts, valve charts, damper charts, and services connected to etc, as may be required by the University. The scales of these drawings shall be appropriate to the level of detail required. The Contractor shall supply a diagrammatic drawing together with valve/damper chart of the installed plant, and shall fix within the Boiler House or Plant Room protected inside a plasticized covering and permanently fixed to the wall.

Valve and damper charts to show regulating valves commissioning sets, damper positions/volumes and valve settings unless otherwise agreed

These drawings and charts etc, are to be prepared in a first class manner to the satisfaction of the University.

On all gas installations, a line diagram meeting the requirements of the Gas Safety (installation and Use) Regulations must be placed as close to the primary meter as possible, indicating the position of all installation pipes, meters, meter controls, valves or cocks, pressures test points, condensate receivers and electrical bonding. This diagram must be updated after any modification to the gas installation.

1.13 LABELS AND NAME PLATES

The Contractor shall supply and fix with nuts and bolts or screws, ivorine, Traffolite or other approved labels to all items of equipment, valves, switches, fuses etc, as may have formed part of his works and these labels shall bear such information as is considered necessary by the University. The Contractor shall leave in position on all equipment the manufacturer's nameplate or marking normally attached thereto, and no equipment shall be installed without ready means of identifying the manufacturer and pattern or type number, together with the date of manufacture, the output and/or duty as applicable. On pressure sets, the actual commissioning values are to be indicated on the labels.

1.14 HEAT METERS

As detailed in the Heat Network (Metering and Billing) Regulations 2014, for any district heating connection to a newly constructed building or where a major renovation of building on a district heating network, heat meters must be fitted. If the building owners/ occupiers are planning to rent space to a third party organisations then a heat meter should be fitted to monitor the heat into the individual space being rented out.

To register a heat network and for more information please visit the following website:

www.gov.uk/guidance/heat-networks

All heat meters must meet the standards set by the National Measurement and Regulations Office (NMRO) so that the meter has been approved for potential recharging purposes.

All meters will also need to be linked up to the University automatic metering system. Please contact Elcomponent to arrange commissioning of any heat meters onto our system on 01279503173 or see www.elcomponent.co.uk/ for further contact details.

SECTION 2 - PUMPING EQUIPMENT

2.1 CIRCULATING PUMPS

Circulating pumps and their equipment shall be as detailed in the Schedule, Specification of materials, or drawings.

2.2 OIL CIRCULATING PUMPS

Where oil circulating pumps are to be fitted, they shall be suitable for the viscosity and temperatures of the grade of oil to be pumped. Each pump shall be fitted with an integral pressure relief valve and isolating valves shall be provided on the suction and discharge side of the pump. Pressure indicating gauges and air release valves to be fitted.

2.3 BY-PASS PUMPS

By-pass/shunt pumps shall be indicated on the specification or drawings.

A by-pass/shunt pump, sized in accordance with the boiler manufacturer's recommendations, must be provided in all cases when a mixing valve is fitted to the system, to ensure a positive circulation of water through the boiler, unless specifically not required in accordance with the boiler manufacturer's instructions. On multiple boiler installations one common pump, or individual pumps for each boiler can be provided.

In the specific case of large calorifiers and domestic hot water heaters, there may be a requirement for an ant-stratification pump. Such pumps shall be suitable for HWS and connected between HWS flow and cold feed or drain.

Unless otherwise agreed

2.4 PRESSURE BOOSTER SETS

Pressure booster sets unless specified otherwise shall be intermittent operation, and shall be fitted with an expansion vessel and the necessary pressure switches.

The Contractor is to ensure that the whole of the systems connected to the set are suitable for the maximum delivered pressure, and that the set is located away from any external louvers so as to minimise the likelihood of freezing up.

All pressure sets are to be installed in accordance with the manufacturers' instructions, and the set is to be commissioned by him on completion. The expansion vessel and pressure switches are to be provided with a label indicating the pressure setting required, established after commissioning. Label to be permanently secured to pressure set with fixing screws or bolts. A full commissioning report must be included in the operation and maintenance and instructions (Clause 1-6).

When a pressure set is used as a make-up supply to a closed heating system, the system shall be fitted with a fast connection, incorporating a stopcock, pressure reducing valve and suitable hose connection. The heating system shall not be filled using the make-up set. An isolating lock

shield valve and drain cock is required between the expansion vessel and the system, so that the vessel can be drained, and the air pressure checked for maintenance purposes.

Where the pressure set incorporates a make-up tank, a suitable overflow arranged to discharge in a suitable location, shall be provided.

Pressure sets are generally not recommended for closed heating systems. The favoured systems are (a) a conventional feed and expansion tank, or (b) a proprietary, WRC-listed mains-connected ressurisation system as Mikrofill or equal and approved. Unless otherwise agreed

2.5 CIRCULATING PUMPS GENERALLY

All circulating pumps shall be fitted with a metal identification plate giving the manufacturer's name and address, pattern, serial number, duty in litres/second, frictional head in kN/m² and RPM. The plate shall be securely fixed to the pump, or base plate.

The Contractor shall make sure that any pump fitted is operating with a desired static head to the manufacturers recommendations, that the position of the motor shaft is as recommended by the manufacturer, and that the pump is rotating, and is installed to pump, in the correct directions.

Pumps are to be capable of operating continuously under the maximum static head of the system the water temperature of the system.

Where canned rotor pumps are installed the Contractor must ensure that they are fitted such that at no time can the pump air lock i.e. the top pump on asset fitted horizontally shall be installed on a drop loop from the flow main.

Where recommended by the manufacturer, the Contractor shall fit an automatic air release valve to the pump.

Where pumps are mounted one above another and there is the possibility of water from the upper glands or seals dripping onto the lower pump, then a suitable shield must be installed to deflect the water.

SECTION 3 - DISTRIBUTION, INSTALLATION, TUBES AND PIPES

3.1 L.T.H.W. SYSTEMS AND PRIMARY H.W.S. SYSTEMS

Black Mild steel to BS EN 10255 Heavy weight.

Galvanised tubes shall be used for foam inlets, drains, open ends from safety valves, etc.

3.2 COLD FEEDS AND VENTS (all piped systems)

Light gauge Copper to BS EN1057 Grade R250

Galvanised MS to BS EN 10255 shall only be used where alteration or repair work to existing systems where galvanised steel is already installed. Where replacement feed and vents are specified these shall be installed in copper pipework.

3.3 DOMESTIC H.W.S. (SECONDARIES) AND COLD WATER SYSTEMS

Light gauge Copper to BS EN 1057 Grade R250

Pipe work within showers and other areas:-

Light gauge copper to BS EN 1057 Grade R250 chromium plated with chromium plates fittings or stainless throughout. Compression fittings shall be used.

Tubes in external trenches:

Medium Density polyethylene blue pipe for potable water supplies to BS EN 12201.

All works shall comply with BS 6700:1997 'Design, installation, testing and maintenance of services supplying water for domestic use within buildings and their curtilage' and the HSC Approved Code of Practice L8 'the control of Legionella bacteria in water systems' and conform to the Water Supply (Water Fittings) Regulations 1999. Work to domestic hot and cold water services shall only be undertaken by a Contractor, Sub-Contractor or operative who is registered under the "Watermark" Approved Plumbers Scheme operated for the time being by Severn Trent Water, or other equal and approved Quality Assurance scheme.

Cold water storage cistern shall only be provided where specifically called for by the detailed specification and shall comply with the Water supply (Water Fittings) Regulations 1999.

3.4 GAS SERVICES (NATURAL GAS & LPG)

All locations internally:

Mild Steel to BS EN 10255 (Heavy) – pipe size up to 40mm

Mild Steel to BS EN 10255 (Medium) – pipe size 50mm and above

All joints to be screwed and jointing compounds shall be suitable for the type of gas in use unless otherwise agreed.

Mild Steel to BS EN 10255 (Heavy) – all pipe sizes welded throughout.

In certain approved locations where detailed by the Supervising Officer.

Light gauge copper tube to BS EN 1057 GRADE R250, with capillary fittings may be used.

Buried pipe work:-

MDPE yellow tubes to BS 7281 with integral magnetic marker strip

The Contractor shall allow for the final 1.0 m length prior to the pipe/tube rising from trench to be run in MS BS EN 10255 Heavy (welded), and wrapped in two layers of denso tape. Alternatively a purpose made close fitting sleeve can be used to cover the whole of the internally exposed tube and providing complete heat and fire protection to the MDPE pipe within, as required by the current Gas Safety (Installation and Use) Regulations.

The Contractor shall lay and joint gas pipework in polyethylene using the service tools and fusion machine specified and required by the manufacturer. All Operatives employed to carry out this work, shall be formally trained in the process and hold an approved ACOPS certificate.

All gas works shall comply with the Gas Safety (Installation and Use) Regulations 1994 (SI 1994 No. 1886), all current procedures as issued by the institute of Gas Engineers. (IGE/UP/1 to 8), and all operatives used on such work shall be competent and hold the appropriate ACOPS certificate for the elements of work undertaken all as required and defined by Gas Safe Register. All engineers must have their registration card available for inspection at all times and this must have been presented during induction.

3.5 BURIED GAS INSTALLATION PIPES (GENERAL)

All steel pipe work buried in the ground shall be rubbed down free from rust and painted with red oxide and further protected against external corrosion by the use of double DENSO Tape wrapping with overlap as required by the manufacturer.

The Contractor shall mark out the position for trenches. Pipes/tubes shall have a minimum earth cover of 750mm. In special locations where excessive loads/vibrations may occur, i.e. under roads/car parks, the Contractor shall agree with the Contract Administrator the extra depth/protection necessary.

Where a common excavation is made for gas pipes/tubes and electric cable a minimum horizontal clearance of 300mm shall be made between the two services within the common trench.

The trench bottom shall be of constant depth and free from sharp stones, bricks etc. All backfilling shall be carried out using granular pea gravel, 10mm single size aggregate to BS 882, with 150mm layers below and above the pipe. Final backfill shall be selected earth, compacted level with the surrounding area.

The Contractor shall lay 150mm wide yellow marker tape with metal insert for tracing pipe location and labelled "CAUTION BURIED GAS MAIN". This tape shall be laid during backfilling; 450mm below finished ground level for the whole length of the trench. Tape to be as Campbell type 053 or 054 other equal and approved.

The Contractor shall provide "as installed" layout drawings of all gas pipework. The drawing shall be encapsulated in plastic laminate and fixed at the meter position(s), (Natural Gas) or second stage governor position (LPG).

3.6 PIPEWORK, JOINTS AND FITTINGS

LT.H.W. Systems

Joints on all pipe work, 65mm diameter and above, and all pipe work concealed in voids, chases, ducts, lofts and ceiling space shall be welded. Unless otherwise agreed. All other pipe work shall be screwed or welded joints. Where the Contractor elects to use screwed joints at least one of two engaging components shall be taper threaded and the jointing between them shall be made with approved jointing material. The use of linseed oil-based jointing compounds shall be limited to heating systems only.

At dismantling points, or where the pipe work is connected to an appliance, ground-in spherical seated Navy-pattern unions shall be used for pipe work up to 50mm size, and flanges shall be flat faced BS 10 Table "D" and "E" if required to connect to equipment having flanges of imperial size, otherwise flanges shall be raised face BS 4504 Tables 6/2 or 6/5 where the joints are welded and Table 6/4 where the joints are screwed. Flanged joints shall be made with a flat or corrugated ring gasket suitable for the pressure and the temperature and extending to the inside of the bolt circles. Full joints shall not be made with raised faced flanges.

Screwed fittings other than sockets shall be malleable cast iron banded or beaded pattern, screwed BSP thread. Standard butt welding fittings shall be used on welded pipe work.

Flanges for mild steel pipe work shall be forged steel machined over the raised or flat faces. Headers shall be of flanged mild steel tube with flanged outlets welded on and spare outlets shall be blanked with bolted flanges. Unless otherwise agreed

3.7 D.H.W. SECONDARIES AND COLD WATER SERVICES

All installation shall comply with BS6700, the HSC Approved Code of Practice L8 and the Water Supply (Water Fittings) Regulations 1999. All fittings and materials shall be listed in the Water Fittings and Materials Directory published by the Water Research Centre. All jointing shall be suitable for potable water supplies and Contractors notice is particularly drawn to the fact that linseed oil-based jointing compounds ("Boss White" or similar) are expressly prohibited from use on potable and HWS/CWS systems.

All copper pipe work to be best quality, kite marked and protected from any contamination as cement dust. Joints shall be made using lead-free solder and the minimum amount of water-soluble flux of a type approved and WRC-listed for domestic water services, all residues to be removed by thorough flushing with clean water prior to commissioning.

Repairs to existing domestic hot or cold water pipe work in galvanised mild steel shall have tapered screwed joints, with jointing compound approved for potable water, and fittings shall be galvanised. Alternatively compression fittings of the Viking-Johnson type may be used. Galvanised pipe work is not to be welded, and not used on new installations.

Fittings for copper pipe work up to and including 65mm size shall be of the capillary or the compression type BS 864 Part 2. All capillary fittings shall have lead-free solder ring and be suitable for potable water duty, as Yorkshire Potable or other equal and approved.

Fittings for copper pipe work of 80mm and 108mm size shall be of the flanged compression or capillary type. Fittings for pipe work above 108mm size shall be flanged brazed.

Pipe work shall be arranged with adequate connections points to allow easy dismantling. Connection points in copper pipe work up to and including 65mm shall be union or demountable

compression joints and for pipe work of 80mm size and above shall be flanged. New Hot water dead legs are not to exceed the following lengths: at 60°C, 5.0 metres; at 43°C downstream of blending valve, 2.0 metres, with an overall maximum of 5.0 metres in any case.

A dead leg is a section of pipe that has a tap or appliance connected to it. The length of dead-leg is to be measured from the centre of the running main to the point of discharge, including any flexible shower hose.

When pipe work is stripped out dead ends shall be no longer than 5 pipe diameters in length. Where practical redundant tees should be removed and replaced with straight length of pipe. For all sanitary equipment The Contractor is to include for all final connections to taps, cisterns, etc with isolation valves to individual items or ranges of basin as specified. The use of flexible braided connections to taps and appliances is not recommended and can only be used by agreement

Where the incoming cold water main is run underground other than in ducts, it shall be laid with a minimum cover of 750mm below finished ground level from the connecting point 1m outside the building until it is within the building. The Contractor shall lay 150mm wide blue magnetic marker tape with metal insert for tracing pipe location and labelled "CAUTION BURIED WATER MAIN". This tape shall be laid during backfilling, 450mm above pipe, and 300mm below finished ground level for the whole length of the trench. Tape to be as Campbell type 051 or other equal and approved.

The Supervising Officer and/or Regulations inspector from Severn Trent Water to witness the installation at all points prior to the completion of backfilling.

The trench bottom shall be of a constant depth and free from sharp stones, bricks etc. All backfilling shall be carried out using granular pea gravel, 10mm single size aggregate to BS 882, with 150mm layers below and above the pipe. Final backfills shall be selected earth, compacted level with the surrounding area.

Pre-cleaning and disinfection shall be carried out to all water installations for both hot and cold water generally in accordance with BS 6700.

3.8 GAS SERVICE (NATURAL & L.P.G)

All gas installations shall be generally carried out in accordance with the 'Utilisation Procedures' IGE/UP/2 published by the institute of Gas Engineers.

- (a) Joints on polyethylene underground pipework shall be carried out using the fusion welding method and process specified by the manufacturer of the tube and welding equipment. All operatives shall be suitable trained as detailed in Clause 4-4.
- (b) Where polythene is being connected to steel pipes the Contractor shall carry out the jointing using a mechanical jointing method.

Pipes up to 63mm dia. - ADAPTORS – PE/BSP female for service pipe.

Pipes above 63mm dia. – FLANGE ADAPTORS – PE/BS4504 – PN 16 or BS 10 Table D/E.

Both forms of transition fittings are fusion welded to the polythene pipe and provided for screwed or bolted flange connection to metal pipes, valves or other ancillary equipment.

The Contractor shall ensure that a liner or insert is installed to support the bore of the pipe to give long term performance of the compression seal as recommended by the manufactures.

The Supervising Officer is to witness the installation at all joints and pressure testing prior to the completion of backfilling.

Under no circumstances should steel grips or wrenches be used on plastic pipe or plastic compression fittings.

- (c) L.P.G. gas pipe work in galvanised mild steel, shall have tapered screwed joints, fittings shall be malleable beaded. All jointing materials are to be suitable for L.P.G. PTFE tape, or Calorite, to provide gas tight seal. Boss white/hemp joints shall NOT be used on L.P.G. pipe work. All pipe threads shall be carefully cut.

Final connections on all L.P.G. pipe work shall be in copper tube see Clause 4-4, jointing shall be compression fittings by WADE, SIMPLEX or other equal and approved with plain parallel soft copper olives (often known as Ferrules/rings). The manufacturers' recommendations on tightening shall be carefully followed.

NOTE: There is **NO** acceptable level of leakages with L.P.G. installations shall be totally gas tight.

- (d) Joints for external steel pipe work shall be butt welded and fittings shall be BS 1965 (Heavy) seamless.
- (e) For natural gas fittings for mild steel pipe work inside the buildings shall be malleable with taper screwed joints as specified in Clause 4-6. Jointing material shall comply with BS 6956 Part 5 and 6, no hemp is to be used on pipe work up to 40mm dia. and only limited quantities used on larger pipe work which shall be suitably trimmed. Fittings for copper pipe work shall be as detailed above for LPG, and joints made only in exposed locations, i.e. in laboratories above floor level and below the benches.
- (f) Internal pipe work shall be arranged for easy dismantling. For this purpose the Contractor shall provide unions at intervals not more than 24m on pipe work up to and including 50mm size where these are to be connected to equipment having flanges of imperial size, otherwise they shall be to BS 4504 Tables 6/2 and 6/5. Flange joints shall be made with flat or corrugated ring gasket suitable for the pressure and extending to the inside bolt circles.
- (g) A clearance of 150mm shall be maintained between gas pipes and electric cables, conduitsetc, on internal pipe work installations and above ground external installations.

Unless otherwise agreed

3.9 OIL FUEL LINES

- (a) Steel pipe work shall have all welded joints with standard butt welded fittings. Joints and fittings for copper pipe work shall comply with Clause 4-8 except that soft soldered fittings shall not be used and compression fittings shall be used only where required to facilitate dismantling.
- (b) External buried steel pipe work shall be protected against corrosion with Denso Tape.

3.10 GENERAL

- (a) All fittings shall, as far as practicable, be the same size as the tubes and pipes connected to them. Reduced socket outlets will only be accepted if the required outlet size of a fitting is not of standard manufacture. Eccentric reducers and square tees shall be used where concentric reducers and pitcher tees might cause air to be trapped in the system. Elsewhere square tees shall be confined to dead-leg branches of DHWS systems and on cold water branches to fittings or ranges of fittings.
- (b) Bends shall be used where practicable, in preference to elbows: square elbows will NOT be permitted.
- (c) Pipe work shall follow the contours of walls and shall be graded to ensure positive venting and draining. The clearance between pipe work (or the lagging) and the wall, and any other fixtures shall be not less than 25mm.
- (d) Purpose made sets of springs may be used where necessary to deviate from straight run in ungalvanised pipe work.
- (e) Sets or springs in tubes of 50mm size and above shall be fire-made and the tubes shall remain circular after setting. In galvanised pipe work deviation shall be formed from standard fittings.
- (f) Eccentric reducing sockets shall be used where changes of bore are made in runs of nominally horizontal pipe work to facilitate air venting and drainage.
- (g) Metal-arc welding shall comply with BS 2971. The execution of welding and the competence of the welder shall be in accordance with "Recommended Practice and Tests for Certificates of Competency of Oxy-acetylene and Metal-arc Welds in Mild Steel Pipe work" issued by the Heating and Ventilation Contractors Association.
- (h) The Project Supervisor shall have power at any time to ask the Contractor to demonstrate the quality of the welder's work in accordance with BS 4872 Part 1, at no additional cost.
- (i) When visual tests on completed work indicate that the quality of welding could be below standard, the Project Supervisor shall be entitled to have the welds examined by radiography as a test of acceptability. Such test to be chargeable to the Contractor If work is found to be substandard.
- (j) Tubes shall be reamed after cutting and shall be free from burrs, rust, scale and other defects, and shall be thoroughly cleaned before erection. Open ends left during the progress of work shall be temporarily closed with purpose-made metal or plastic plugs or caps, or blank metal flanges.
- (k) Joints shall not be made in the thickness of any wall, floor or ceiling, and pipe work shall not be embedded in the structure of floors unless otherwise instructed by the Project Supervisor. Where pipe work passes through walls, floors or ceilings, sleeves shall be provided and fire compartmentation maintained. Spaces between pipe wall and sleeve shall be packed with mineral wool or other approved vermin-resistant and fire-retardant material.

Pipe work passing through floors, ceilings and walls where visible shall be provided with approved floor, ceiling or wall plates. Plates are to be fixed to the sleeves or structure, not to the pipe.

- (l) Entry and exit holes to or from buildings for pipe work services shall be sealed and plugged. For services conditions below 60°C the sealant shall be mastic compound, above this temperature it shall be silicone rubber.
- (m) Where the pipe work enters the building through a large hole or duct a mild steel blanking plate not less than 6mm thick shall be built into the walls of the hole or the duct; the service pipes shall pass through clearance sockets welded to plate, and the space between the pipe exterior and the socket interior shall be sealed and plugged, and as far as possible made water-tight. The plate to be suitable painted to match the existing décor.
- (n) Flow headers, Return headers and low-velocity headers, where indicated, shall be welded with flanged connections. Each circuit isolating valve shall be connected direct to vertical flanged outlet on top of the headers. On the circuit side of the isolating valve, the Contractor shall fit a drain cock and a 100mm diameter thermometer. Each circuit returns shall be valved as required, the header shall be horizontal, and the thermometers drain cocks and circuit isolating valves shall be arranged at common horizontal levels. A non-return valve shall be supplied and installed in each heating circuit connection to the header, to prevent unwanted circulation under part-load and timed operation of individual zones.
- (o) Internal pipe work shall be arranged for easy dismantling. For this purpose the Contractor shall provide unions at intervals not more than 24m on pipe work up to and including 50mm size where these are to be connected to equipment having flanges of imperial size, otherwise they shall be to BS 4504 Tables 6/2 and 6/5. Flange joints shall be made with flat or corrugated ring gaskets for the pressure extending to the inside bolt circles.
- (p) Unfixed pipe work stored on sites, shall be raised off the ground on racks, and the open ends protected, to prevent the ingress of any foreign matter.

3.11 PIPEWORK SUPPORTS AND ANCHOR POINTS

Pipe work shall be supported in such a manner as to permit free movement due to expansion and contraction. Pipe work supports shall be arranged as near as possible to joints and changes in direction. The spacing of the support shall not exceed the centres given in table 1 and 2. where there are two or more sizes of pipes, the common support spacing shall be based on the centres required for the smallest bore pipe work.

Vertical rising shall be supported at the base; branches from the riser shall not be used as a means of support for the riser.

Where pipe work up to 50mm size fixed to solid walls, brackets may be of the screw-on or long shank built-in type, except where the walls are plastered, when only the long shank built-in type shall be used. For fixing to woodwork and lightweight partitions or walls shall be screw on pattern and may be adjustable two piece type. For mild steel pipe work, brackets shall be mild steel or malleable iron, brackets for copper pipe work shall be brass or gunmetal. The upper part of the clip shall be detachable without disturbing the fixing.

Brackets screwed to walls shall be secured by expanding plugs or other purpose designed fixing devices. Soft wood plugs shall not be permitted.

Pipe work in ducts and voids subjected to expansion and contraction and hung from supports shall be suspended on swivel hangers unless otherwise agreed with the Project Supervisor. It is expressly forbidden for mains potable cold water pipe work to be installed in a common trench or

duct alongside hot water or heating pipe work, no matter what standard of thermal insulation is fitted. Unless otherwise agreed

Hangers from horizontal pipeline at high level shall be supported from angles or channel irons, suitable for building in or otherwise securing to the structure. Adjustable mild steel hangers shall be used. Pipe rings shall be of malleable cast iron or fabricated steel, made in halves and secured by bolts and screws. Alternatively, malleable iron hinged pipe rings may be used, but calliper hooks will not be permitted.

Where pipe work is fitted in ducts or trenches, and it is of 65mm size or greater and supported from the walls, the design of the pipe support, guides and anchors shall be as indicated, and of an approved type. The performed insulation shall be kept free of the rolling surface and when in external ducts or trenches insulation shall comply with clause 9-8. Load bearing insulation at supports, where required, shall be fitted by the contractor at the time of erecting the pipe work.

On mild steel pipe work, mild steel anchors capable of resisting the maximum stresses shall be provided, and shall be welded to the pipe work. Where it is impracticable to weld the anchors to the pipe work, cast iron chairs with at least 2 wrought iron stirrup bolts shall be used. The bolts shall be provided with sufficient thread to ensure an effective grip on the pipe. For copper pipe work the anchors shall be provided by wide upper straps secured to the pipe work in such a manner that the pipe is not damaged. The contractor shall supply and fix in position ready for building in all cleats (and steelwork) required to anchor points. Anchor steelwork secured to the bottom of ducts or trenches shall be coated with hot poured bitumen.

Provision for movement due to expansion and contraction shall be made by changes in direction of the pipe work by loops or by special expansion joints approved by the Contract Administrator. Supports, steadiers and guides shall be arranged to ensure that all movement is taken up by the change in direction by pipe work loop or joint. Where pipe work is required to be pre-stressed for the purpose of reducing expansion stress under working conditions, the extent of the cold pull shall be as indicated. No anchoring is to be carried out in buildings, neither is any structural steelwork to be cut or welded to, unless clearance is obtained from the Project Supervisor. Pipe work fixing bracket must not reduce the effective insulations properties of the pipe insulation

3.12 AIR VENTING

Devices for air venting shall be provided at all high points in the pipe work. They shall be installed at the highest point of the sections which they are intended to vent.

Air bottles for L.T.H.W. Systems shall be made from 50mm size tube. Each approximately 230mm long fitted with a cap and 8mm size air cock, they shall be fitted to equal tees or have 50mm size connections if the main is 50mm or above. Where an air bottle is fixed out of reach, an 8mm size extension tube shall be run to a suitable visible position, terminating with an 8mm size needle seated key operated air cock.

Automatic air vents shall be used where necessary, and shall be of Charles Winn manufactures or other equal and approved, with drip pipe taken to discharge in an approved visible location. Spirax Sarco AAVs shall be allowed only where designated by the Project Supervisor. All AVVs shall be fitted with separate isolation i.e. valve fitted between AVV and pipe being vented.

Air venting devices and any air release pipes installed in exposed positions shall be insulated to prevent freezing.

Air eliminators/separators as specified shall be installed on both heating and hot water circulations where called for by the Project Supervisor.

3.13 EMPTYING DOWN AND DRAINING.

- (a) Cylinders, calorifiers and L.T.H.W. boilers shall be provided at their lowest points with key operated glands cocks having hose unions. Alternatively, the emptying cocks shall be connected into a common drain run visibly to waste.
- (b) Key operated cocks with hose unions shall be fitted at all low points of L.T.H.W., D.H.W.S. and cold water systems to ensure drainage, and sized to permit drainage in a reasonable time (not to exceed one hour for calorifiers).
- (c) Where a pipe dips under a door into a floor chase, the pipe shall be formed/pulled in a single length and shall contain no joints or fittings.

3.14 PAINTING PIPEWORK AND FITTINGS

The Contractor shall wire brush free from rust all black steel pipe work, and all fittings and supports and paint with one coat of red oxide paint. When pipe work is not to be insulated, an additional coat of gloss paint shall be applied, in APPROPRIATE BS colour unless other agreed.

3.15 TABLE 1 - SUPPORTS FOR STEEL PIPEWORK

Size:- mm	Horizontal runs		vertical runs	
	Bare metres	lagged metres	Bare or lagged metres	
15	1.8	1.8	2.4	
20	2.4	2.4	3.0	
25	2.4	2.4	3.0	
32	2.7	2.4	3.0	
40	3.0	2.4	3.7	
50	3.0	2.4	3.7	
65	3.7	3.0	4.6	
80	3.7	3.0	4.6	
100	4.0	3.0	4.6	
125	4.5	3.7	5.5	
150	5.5	4.5	5.5	

3.16 TABLE 2 - SUPPORTS FOR COPPER PIPEWORK

Size:- mm	Horizontal runs		vertical runs
	Bare metres	lagged metres	Bare or lagged metres
15	1.2	1.2	1.8
22	1.2	1.2	1.8
28	1.8	1.5	2.4
35	2.4	1.8	3.0
42	2.4	1.8	3.0
54	2.7	1.8	3.0
76	3.0	2.4	3.7
108	3.0	2.4	3.7

3.16 PIPE WORK INSULATION

- (a) All L.T.H.W. pipes and fittings to be insulated with foil backed preformed insulation.
- (b) Removable covers or muffs must be fitted when access to equipment is required.

SECTION 4 - CALORIFIERS, CYLINDERS, CISTERNS AND WATER TANKS

4.1 CALORIFIERS

Storage and non-storage calorifiers shall be installed where indicated on the Schedule of Materials.

Each calorifier shall be provided with:-

- (a) A relief/safety valve
- (b) An altitude valve
- (c) A thermometer
- (d) An open vent pipe on system open to atmosphere (except on pressurised systems)
- (e) Bolted head or manhole for internal inspection and cleaning purposes with gaskets with gasket of WRC- listed approved material such as EDPM rubber (NOT natural rubber)
- (f) Thermostatic control or provision for control by BEMS
- (g) A drain cock with hose union
- (h) Non return valves on both cold feed and return connections on HWS storage calorifiers
- (i) In the specific case of large calorifiers and domestic hot water heaters, where specified, there may be a requirement for anti-stratification pump. Such pumps shall be bronze, suitable for HWS duty connected between HWS flow and cold feed or drain. Pumps shall be controlled to run for one hour per day only during a period of no HWS demand but while the heat source is available.
- (j) Insulated casing, as detailed under Clause 10-3
- (k) Flanges or unions on all connections for easy disconnection

Horizontal calorifiers shall be supported on brick concrete piers, and/or mild steel cradles. Sheet lead pads shall be fitted on the bearing surfaces of copper calorifiers. Vertical calorifiers shall have convex bottom and shall be fitted with feet and a purpose-made steel support frame.

Where calorifiers are to be reused the Contractor shall provide all items as Clause 4-1(a-k) where not already fitted.

4.2 CYLINDERS

The Contractor shall supply cylinders where indicated on the specification.

Each cylinder shall be provided with all items as specified for calorifiers under Clause 5-1 (a-k).

Horizontal cylinders shall be supported as recommended by the manufacturer.

Vertical cylinders shall be supported with frame supplied by the manufacturers or from a raised plinth, as instructed by the Contract Administrator.

Manhole covers shall be secured with studs and nuts or with one or more external bridge.

Joints for manhole covers shall be made with approved jointing material.

Where existing cylinders are to be re-used the Contractor shall provide all items as Clause 5-1 (a-k) where not already fitted.

4.3 CISTERNS AND COLD WATER TANKS

Cisterns and tanks shall be as indicated on the specification.

Each cistern or tank shall be fitted with a float operated valve in accordance with the relevant Regulation to BS 1212 Part 2 (Diaphragm Type with Brass body of Aylesbury type), capable of withstanding back siphonage when the water level is at the centre line of the valve.

Connections to float operated valves to be installed in accordance with Water Supply (Water Fittings) Regulations 1999. Float operated valves should be of the size indicated, and suitable for the pressure available on the particular site.

All cistern, cold water storage, hot water feed, and feed expansion, shall be constructed from one piece top quality polyester resin/glass fibre, with all but the smallest tanks having integral welded steel frames encapsulated with the laminate.

All tanks used for heating feed and expansion shall be fitted with loose lightweight covers which are to be slotted for the passage of vent pipes. It is essential on feed and expansion tanks that the ball valve and overflow are fitted such that there is sufficient capacity in the tank to accept the expansion of the system.

All tanks and cisterns shall be suitable for storing water up to temperatures of 90°C., and all connections made with unions or flanges for easy disconnection.

All tanks used for potable water supply, i.e. to both hot and cold water systems shall comply with Water Supply (Water Fittings) Regulations 1999, complete with sealed cover with inspection manhole, and fully insulated to a minimum thickness of 25mm encapsulated within the tank structure.

Overflow pipes shall be twice the bore of the ball valve fitted or 32mm size whichever is the greater. Overflow and warning pipes shall be run to discharge visibly outside the building (not over flat roofs), and shall be fitted with a screen protect from ingress of birds, insect and rodents. Open vents for domestic hot and cold water service tanks shall not be terminated over the tank but discharge visibly outside the building via a tundish or similar air break device.

Cisterns and tanks shall be supported over their whole base area.

All cisterns and tanks shall be installed ensuring suitable access for maintenance purposes. A minimum of 350mm on tanks below 1000 litres, and 500mm on tanks above 1000 litres is to be maintained for access to the ball valve. Walkways constructed from 600mm wide flooring grade chipboard shall also be provided from the tank room access position to the float valve side of the tank. The location of tanks should ensure that covers and/or manholes can be easily removed for access for maintenance.

Cistern cold water tanks and pipe work shall be thoroughly cleaned and then disinfected by the application of chlorine in accordance with BS6700 1999 Clause 10.1 (page 55), and as

detailed in this specification (Part 12) to the satisfaction of the Project Supervisor, before being brought into use for domestic purposes.

F&E Cisterns

Boiler Rating	Float Valve	Safety Valve	Cold Feed	Open Vent	Over-Flow	Nominal Cistern Capacity
KW (BTU/Hr)	mm	mm	mm	mm	mm	litres
Over 44 (150,000)						
Up to 58 (200,000)	15	20	20	25	32	90
Over 58 (200,000)						
Up to 146 (500,000)	15	20	25	32	32	170
Over 146 (500,000)						
Up to 293 (1,000,000)	20	25	32	40	40	260
Over 293 (1,000,000)						
Up to 586 (2,000,000)	20	32	40	50	50	350
Over 586 (2,000,000)						
Up to 1470 (5,000,000)	25	50	50	65	80	880

SECTION 5 - SPACE HEATING EQUIPMENT

5.1 RADIATORS

All radiators shall be supplied by the Contractor as indicated on the Specification, and shall be installed in positions as shown on the drawings where provided.

Radiator specification – Sensotherm Concept 2000. S712C (Unless otherwise specified)

The positions and heights above the floor of all radiators shall be confirmed with Project Supervisor. A minimum clearance of 75mm shall be provided between the floor and the underside of any pipe serving a radiator. The minimum clearance between the floor and the underside of the radiator shall be 150mm. Radiators shall be kept 40mm clear from walls when supporting brackets and stays are built in, otherwise clearance shall be in accordance with manufacturers Standard Details. All radiators shall be provided with valves as indicated in Valve Clause 7-5. An air cock or vent plug shall be fitted to each radiator and be arranged so that the water-ways can be completely evacuated of air when operated. A drain cock shall be provided to enable all of the radiators to be drained. Radiators shall be supported on bottom brackets and top stays or purpose designed brackets to suit the type of radiator, the supports may be of the two piece adjustable pattern. Unless otherwise agreed.

Where used on masonry walls they may be either built-in or plugged and screwed to the wall face. Where the masonry walls have an internal light-weight structural surface, the radiator support shall pass through the facing and be built into the load bearing wall.

Supports for all radiators may be fixed direct to light-weight partitions but only where these extend from floor to ceiling. Supports for radiators against light-weight partitions shall be designed to transmit the weight to the floor and shall be screwed to or built into the floor, top stays may be screwed to the partition. Where radiators are fed by a straight section of pipe work which is beneath the radiators and is more than 10m long, the radiator brackets shall be of the suspended pattern or other approved type designed to permit free movement due to expansion and contraction of the pipe work. (Pipe sets of under 225mm shall be deemed straight pipe work). When supporting radiators fixed to light-weight partitions, each brackets shall be screwed to a vertical strut of not less than 50mm x 6mm thick mild steel flat, arranged to transmit the weight to the floor, the bottom of the strut shall be fixed to the floor.

The number of brackets and/or wall stays per radiator shall be as specified by the manufacturer. Where radiators with feet are specified and the floor finish is of a material likely to be damaged, the radiator shall stand on 12mm thick hard wood boards supplied by the Contractor. The Contractor shall include for taking down radiators as required for painting, and re-fixing.

Where existing radiators are to be re-used, they are to be disconnected and re-fixed in the same or new positions and be thoroughly washed out, wire brushed and repainted as necessary using a propriety radiator paint.

5.2 NATURAL CONVECTORS

Natural convectors shall be of the types, rating and dimensions, as indicated either on the drawing, or in the Schedule of materials.

The positions and heights above the floor of convectors shall be agreed with the Contract Administrator. Where recessed or built-in convectors have been specified, the Contractor shall

supply details of the openings and of any fixings or framing required before commencement of work.

All wall mounted convectors shall be secured to the walls as recommended by the manufactures or as indicated on the Drawing where supplied.

Wall convectors shall be provided with air cocks accessible from the front or side without dismantling the casing. Flow and returns connections shall be provided, with valves, as indicated in Clause 7-4.

5.3 FAN CONVECTORS

All fan convectors shall be fitted with operating thermostats and hold off thermostats as detailed in the Specification, or as supplied with the fan convector.

Each fan convector shall be fitted with isolating gate valves as described in the Clause 7-4 and shall incorporate a manual air vent with loose key or drain cock, and applicable all to be easily accessible for maintenance.

All fan convectors shall be fitted with a suitable washable air filter, which shall be accessible for cleaning. Where existing fan convectors are to be re-used the Contractor shall include for cleaning and/or replacing the filters as found necessary, and for checking that existing thermostats are operational unless other wise agreed.

Where dual speed convectors are specified with room and speed changeover thermostats, the Contractor must ensure the sequence of operations is correct.

5.4 RADIANT PANELS, STRIPS AND CEILINGS

Radiant panels, strips and ceilings shall be of the ratings and dimensions as indicated on the drawings or in the Schedule of Materials. Radiant panels shall be pre-insulated by the manufacturer and the factory finished in a colour to the architects requirements.

All surface plates shall be smooth and free from distortion. Where connections pass through the side of a panel, they shall be sealed effectively. The spaces between the edge of the panel and the wall or ceiling surface to which the panel is to be attached, shall be completely sealed.

Each radiant strip shall be assembled in continuous unbroken length.

Radiant panels and strips shall be arranged horizontally, vertically or inclined as indicated on the drawings and suspend from purpose designed hangers, the point of support being in accordance with the marker's recommendations. All panels and strips shall be fitted with valves as described in part 7.

5.6 UNIT HEATERS

Each motor shall be supplied with a starter and isolator.

The type of method of the automatic control of the unit heaters shall be as indicated. Heaters shall be provided with two or more point of suspension and shall be so suspended that their direction of discharge can be altered. All unit heaters shall be fitted with isolating gate valves as described in Part7.

Hold off thermostats shall be supplied and installed where not supplied with the heater.

SECTION 6 - VALVES, TAPS AND COCKS

6.1 SUPPLY

The Contractor shall supply valves, taps and cocks of the following manufacture, size of which shall be as stated on the drawings or Schedule of Materials.

6.2 SAFETY VALVES OR RELIEF VALVES

Nabic spring safety valves (screwed), to be set to lift at the system static head + 0.5 bar/g minimum.

Each safety valve shall be fitted with a drip pipe or suitable size terminating within 300mm of the Boiler House floor.

Unless otherwise agreed

6.3 VALVES GENERAL

Isolating valves 50mm dia (PN20 Series B):

Crane Fig. No. D151 wheel heads to flows]
Crane Fig. No. D237 lockshield heads to returns.]Or ball valve equivalent
Hattersley Fig. No.D. 33X wheel to head flows.]
Hattersley Fig. No. D.33XLS lockshield to returns.]

Isolating valves 65mm dia. and above (PN6 flanged):

Crane Fig. No. F52.
Hattersley Fig. No.549.

Commissioning sets:

50mm and below: Crane Fig. No. D941 (PN20)
Hattersley Fig. No.CV2432 (PN20)
65mm and above: Crane Fig. No. DM940 (PN16 flanged)
Hattersley Fig. No. CVM 2733 (PN16 flanged)

Double Regulating Valves:

50mm and below: Crane Fig. D920 (PN20)
Hattersley Fig. DRV-1432 (PN20)
65mm and above: Crane Fig. DM920 (PN16 Flanged)
Hattersley Fig. M733DR (PN16 flanged)

Non Return/Check valves up to 50mm Dia:

Hattersley Fig. No 47. PN 25 series B bronze swing pattern.
Holden and Brooke 'senflux' pattern (horizontal only)
Gestra Fig. MB.16

Non Return/Check valves 65mm and above:

Hattersley Fig. No. M651 pn6 cast iron swing.

Holden and Brooke 'senflux' (Horizontal only)
Gestra Fig. RK.44.BZ

Double Check Valves:

Fitted where required by the Water Regulations for the prevention of backsiphonage.

Hattersley Fig No. 249 DZR

Other valve approved for this purpose by the Water Research Council will be accepted.

RPZ valves:

Fitted where specified.

Water Meters:

Kent PSM/T – PS30198 with pulsed output.

Other meters approved by the Water Council will be accepted with prior agreement of the contract Administrator.

Cisternisers: Shall be fitted to all wet urinal systems

Strainers:

50mm and below: Spirax Sarco Fig.12
BSS Fig. 49N
65mm and above Spirax Sarco Fig. 33
BSS Fig. 48XN

Strainers are to be fitted on the heating return connections to the main return header on all systems and are to be fitted with stainless steel screens of 3mm mesh. Strainers of other manufacture will be acceptable with the prior approval of the Contract Administrator. A spare basket is to be provided for each size fitted.

Float valves:

Feed and Expansion Tanks: Hattersley Fig 337 equilibrium with
Extended arm and copper float.

Cold Water Cisterns: Float Valve 'AYLESBURY K' type by
Keraflo Ltd.

Unless otherwise agreed

6.4 FAN CONVECTOR ISOLATING VALVES

Each fan convector shall be fitted with a wheel valve to flow and a lock shield valve to the return of the following:-

- > Crane Fig Nos. D.890 wheel and D.891 lock shield
- > Hattersley Fig No. 2406/2406LS wheel and lock shield valves or similar to be agreed.

Valves can be matt brass or matt chrome finish as available.

6.5 RADIATOR VALVES

Each radiator shall be fitted with valves as specified. Unless otherwise agreed

- > Drayton TRV4 and Lockshield valve or
- > Danfoss RA FN TRV
- > RLV Lockshield

6.6 DRAIN COCKS

Drain cocks shall be installed on all low points of the heating system and also following zone isolating valves.

Exposed locations:

Crane Fig No. D340
Hattersley Fig No. 371 and 81hu Boiler Rooms or similar to be agreed.

Boiler and Plant Rooms and Ducts etc:

Crane Fig No. D342HU
Hattersley Fig No. 81HU

Unless otherwise agreed

6.7 GAS COCKS

Gas Valves up to 80mm dia:

Newmann-millikan Fig. No. 200 M
Crane Fig. No. 181 Ball type
Hattersley Fig. No. 100 Ball type or similar to be agreed.

Unless otherwise agreed

Gas Valves 100mm Dia. and above:

Newman-Millikan Fig. No. 201 F
Crane Fig No. F611
Audco 'Slim seal' or similar to be agreed.

All valves shall be supplied with a hand lever, and Contractor to specify to supplier for USE ON GAS.

Gas valve on LPG services (propane or Butane) to be 'Saunders' diaphragm valves – special version with type 'C' neoprene diaphragm with 'out of doors' weather protection finish by manufacturer.

Unless otherwise agreed

6.8 D.H.W.S (SECONDARIES AND TANK COLD WATER SYSTEMS)

Exposed valves on 15mm and 22mm hot and tank cold water supplies to basin etc. to be full bore Ballofix CP. Valves by Cotham and Preedy. (no other manufacturer is acceptable)

Valves up to 50mm Dia.:

Crane Fig.No. D151 wheel or lock shield with adapters.
Hattersley Fig. No 33X wheel head with adapters
Yorkshire 610 or 610LS or similar to be agreed.

Valves 65mm Dia. and above:

Hattersley Fig. No.35. PN16 or similar to be agreed.

Thermostatic Mixing Valves and shower Fittings:

Shall be as specified. Where not specified wash basins shall be provided with Reliance water controls 4 in 1 TMV3 valves.

Unless otherwise agreed

6.9 MAINS COLD WATER

All stop cocks to be Yorkshire 501 GM or 501 GMLS or similar to be agreed.

All stop cocks on underground services to be EBCO to BS5433 or similar to be agreed

6.10 LABELLING OF VALVES

All boiler room valves and every circuit control valve shall be provided with an ivorine/traffolyte or approved plastic label 40mm in diameter and stamped or engraved with a reference number.

Wherever practicable the label shall be fixed up to the valve(s) in a prominent position to identify the valve concerned. Elsewhere, purpose-made light-weight steel brackets for carrying the labels shall be welded to the pipe work adjacent to the valves.

The Contractor shall provide and fix an encapsulated plastic drawing in a position to be indicated by the Supervising Officer on site, showing the diagrammatic arrangement of the Boiler Room indicating the location of valves, their numbers and functions, which should be approved by the Supervising Officer before fixing.

6.11 POWER SEAT AND CONTROL VALVES

All power seat valve, control valves etc, shall be as detailed Specification, and the following:

Gas safety 'shut off' valves shall be as detailed in Clause 2-15, and be one of the following 240 volt quick acting valves:

- > Blacks – 668 series
- > Johnson (Maclaren) –GS2000 screwed, GH5000 flanged.

- > Kromer Schroder – VG series.

Unless otherwise agreed

Three port mixing and diverting valves, and other control valves shall be installed in the pipe work in the correct configuration and in accordance with the manufactures recommendations. The preferred unit is a shoe type valve which can be ported on site:

Sauter Fig. No. MH32 R/F screwed or flanged as required with either AR30W13F001 (240 volt) or AR30W13F008 (24 volt) actuator having a 110 sec running time, or AR30W32SF001 for an analogue output of 0 to 10 volts as the specification. Unless otherwise agreed.

All motorised valves must be fixed such that the motor can be easily accessible and removable for maintenance purpose.

6.12 PAINTING VALVES

The Contractor shall allow for painting all new exposed valves, one coat of black gloss paint; existing valves being re-used to be wire brushed clean, painted one coat red oxide paint and one coat black gloss finish. The painting is to include the mating flange and 50mm of pipe either side which could still be exposed after the application of the insulation.

All valve handles to be painted one coat Red Gloss. The gland nuts and valves spindle are **NOT** to be painted.

SECTION 7 - AIR CONDITIONING EQUIPMENT

7.1 DX SYSTEMS

Where a split type DX system is proposed it should be either from the Mitsubishi, Daikin or Trane range of products and in any event the exact make and model must be ratified by the supervising officer. Normally these will be Heat Pumps, where this is not the case then the model should incorporate an integral inverter control.

The type and positions of the indoor units, the condensers, the fridge pipe work routes, methods of containment and local controls are to be agreed with the supervising Officer.

All units should be able to accept an external enable signal in the form of a volt free contact or provision for full BMS control. Unless otherwise agreed

The total cooling capacity of the units shall be calculated to take account of all known heat gains; principally these will be equipment, people, solar and air infiltration but may include others specific to the space being treated.

7.2 CHILLED WATER SYSTEMS

Specifications for chilled water systems would normally result from a specific study and design proposal.

7.3 OTHER SYTEMS

Specifications for other types of cooling systems would normally result from a specific study and design proposal.

SECTION 8 - VENTILATION SYSTEMS

8.1 LOCAL ROOM VENTILATION

Where local room ventilation is required Mitsubishi Lossnay Units or Daikin Vam units which both provide heat/cooling recovery will be specified and may require electric heater batteries to be added. However each of these ventilation requirements will be considered individually and a specification will be agreed with the Supervising Officer.

Local and or BMS control will be specified by the Supervising Officer

8.2 LARGE SCALE VENTILATION OR PACKAGED UNITS

Specifications for other large scale or packaged units would normally result from a specific study and design proposal.

SECTION 9 - COMMISSIONING AND TESTING

Heating System/Compressed Air System pipe work is to be pressure tested to twice the working pressure. The Supervising Officer shall be given at least a week's notice of such tests and may wish to witness these tests. The results of any test is to be recorded in a formal document

Commissioning should ensure that full functionality and design parameters are proved these results are to be recorded in a formal document.

Depending on the system, seasonal commissioning may be required to ensure that the design performance is met under all conditions.

The Supervising Officer may wish to witness part or all of this activity.

SECTION 10 - O&M MANUALS

The Supervising Officer will indicate at the beginning of each job when an O&M manual is deemed necessary. When an O&M Manual is to be provided then it must be compiled during the contract and be available for all commissioning works an electronic version must be supplied.

Unless otherwise agreed.

SECTION 11 - ISOLATION AND CONNECTION TO EXISTING SUPPLIES

Any Isolations and draining down and any connections to existing services must be agreed with the Engineering Officer or Maintenance Supervisor before any such actions takes place.

The source of the service should be agreed before any work that may prevent the free selection of service pipe routes takes place

All DHWS and CWS systems must be chlorinated by a proprietary Chlorination company. Certification must be provided. Dipping in Chlorine as an alternative must be agreed by the Supervising Officer and will only apply to small items that can be fully immersed in a bucket, These items must be immersed in a minimum 50 PPM solution of Chlorine for at least 1 hour.

All connections to Domestic Water Services must have a combination of a drain/injection point located between to isolating valves inserted between the source and the new connection

SECTION 12 - LEGIONELLA AND WATER SAMPLING

Water samples may be required prior to work commencing and before final connection is made to the University supply.

The exact details of when sampling will be required and what the samples are tested for will be at the discretion of the Head of Estates Engineering, no samples should be sent away for analysis without the consent of the Head of Estates Engineering.

Schematic drawings of the DHWS and DCWS must be provided in line with the recommendations in L8 guidance document. Sentinel taps for both hot and cold water must be identified and the location of these must be indicated on a schematic drawing

Where it is agreed water samples are to be taken the following procedure must be adopted

The process requires 2 samples to be taken
The first one following a after a 30 second flush
A second one after 10 minutes of flushing

Both samples are to be submitted immediately to a UKAS laboratory for the agreed tests only. If one of these agreed tests is for Legionella then this must be the 10,/14 day test carried out to **ISO 11731** and not a rapid test unless otherwise agreed by HOE Eng