Performance Specification
& Contractors Proportion List

Client:
Beccles Fenland Charity Trust
Project Address:
Beccles Quay Toilets
Fen Lane
Beccles
Suffolk
NR34 9BB
Proposals:
Refurbishment of toilet accommodation

Ian Garrett Building Design Ltd.
The Store
Oakwood Mews
Lowestoft
Suffolk
NR32 2LS

T: 01502-511821
W: www.garrettdesign.co.uk

Dated: October 2021
Ref: 2625

Performance Specification & Contractors Proportion List

Contract: **Refurbishment of toilet accommodation**
Site: **Beccles Quay Toilets, Fen Lane, Beccles, Suffolk, NR34 9BB.**
Client: **Beccles Fenland Charity Trust**

1. Introduction:

A. The contractors tendering shall visit the site and make them self familiar with the site conditions, and on site facilities available. The contractor shall also note all services available to the site which are described in the specifications, although any cost for connection shall be at the contractors own expense, including making good of surfaces on completion of the works.
The contractor shall satisfy himself that he is able to carry out these works in accordance with the drawings and specifications, and to the complete satisfaction of the Employer.
Any questions related to the drawings and specifications shall be raised with the Employer, who shall clarify these, with any anomalies being confirmed to all contractors tendering in writing for inclusion in the tender price.
No extra will be given for items omitted from the contractors price, and necessary to complete the works in a satisfactory manner and to the complete satisfaction of the Employer.
B. The contractors tendering shall supply with their form of tender a brief and itemized programme of works. This programme will be adjusted by the successful contractor prior to starting works on site.
C. The contractor shall allow for the removal and disposal of all materials, equipment not specified for retention or re-use, and/or require removal/disposal to complete the works to the satisfaction of the Employer.
D. The contractor shall clear the site on completion of the building works, and all to the satisfaction of the Employer.
E. The contractor shall inform the Employer of any sub-contractors that he may wish to use for the completion of the works described, and for the final approval of the Employer. Application to use sub-contractors shall be made in writing by the contractors tendering, and prior to any start on site.
F. The contractors tendering shall comply with the Health & Safety at Work Act 1974 (amended), at all times throughout the contract period, and relevant to the specific trades employed on site. Hard hats shall be worn on site at all times by site operative, and a sign erected to inform visitors to the site that the building site is a hard hat area.
G. The contractor shall provide evidence of insurance prior to any start on the site.
H. Any changes to material specified shall only be made after consultation with the Employer, and approval verbal or written is received.
J. All dimensions, levels, and general setting out shown on the plans shall be agreed on site and prior to commencement of any excavations, and be approved by the Employer. Figured dimensions shall be followed in preference to scaled dimensions, or checked on site where possible. If in doubt always ask the Employer to avoid on site delays.
K. The contractor shall inform the Local Authority Building Control Inspector of the required statutory inspection visits/stages, and liase fully where applicable. Any alteration suggested by the Inspector must be agreed with the Contract Administrator prior to implementing this alteration. No extra payment will be given if alterations are not agreed with the Employer. Please note the application is a partnership with

Waveney DC, who are the plan inspecting authority, with Great Yarmouth BC are the site inspecting authority.
L. Specialist contractors drawings and specifications must be submitted to the Employer for approval (roof truss, floor, heating, electrical, etc). It is imperative that these details are received and approved prior to the manufacture takes place, and so that any problems may be resolved.
M. The contractor shall use at all times an electrician who is NICEE approved or similar, and provide completion certificates for all works, once commissioned.
N. The contractor shall use at all times a plumbing/heating contractor who is approved by the employers/agents, and shall be able to provide completion certificates for all works, once commissioned.
P. All timber used shall be preservative treated, including all cuts made after treatment. The contractor shall provide certificates to show treatments have been completed to timber supplied to the site.
All structural timber shall be stress graded, and C16/C24 graded unless specified.
Q. This brief specification and drawings accompanying it and as specified, in no way form part of a formal 'Bill of Quantities' The contractors tendering shall formulate their own opinion, quantities and methods of working, all in accordance with excepted and approved working practice. The drawings and specifications are only an indication of the works required and are not fully detailed in their description.
R. This brief specification shall be read in conjunction with the following documentation at all times:-
1. Drawings within this specifications.
2. This itemized specification, brief specification, appendix, preliminary items, structural engineers designs and recommendations, etc..
3. Manufacturers details and specifications and recommendations.
4. Any other sources recommended or specified.
5. Structural Engineers where appropriate.

2. Contract Requirements:

A. Project Management and Responsibilities:

The Contractor is requested to submit with his tender document the management arrangements which would apply to this contract. In particular the employer would expect the contract manager to be named and would particularly require to meet & discuss the project with your permanent on-site representative and be happy with the arrangements that would apply, before the contract can be confirmed. The Employer expects that there would be a main monthly meeting on a fixed day at which the Employer would be represented with the intention that this meeting discussed broad policy and programme. Not building details and minutiae. The format for these meetings would be agreed but would include a record of progress and a record of key issues and outstanding action required with an action column.
The Contractor will be required to provide on-site accommodation with the full range of welfare facilities, toilets etc. as the regulations applying to the operation of care homes make it inappropriate to offer any of these facilities to the Contractor.
The Contractors have been approached on the basis that they are experienced in this field of work and that their acknowledged expertise enables them to comply with current regulations, particularly Building Regulations
.
Also the Health and Safety Executive requirements for a building of this type – and submission of the form F10

We all recognise that a good building results from good team work and in his tender document the Contractor is invited to express any comment he may have on these arrangements, and that any concerns

he may have about the Employer representation, to ensure that the whole project proceeds smoothly after award of the contract.

B. Contractors Programme:
The Employer will supply a draft programme of the initial areas to be refurbished and in what order in order to ensure that the building remains in a useable state for residents during the entire period of the programme.
At the time of submitting the tender the Contractor shall present a draft programme. Within one week of appointment the Contractor shall firm up this programme which will then become a positive statement of intention and will be used to evaluate programme. It will also be used by the Employer as a tool to monitor delay.

C. Financial Arrangements:
Please let us have at the earliest possible date any information you require on financial status, banking arrangements etc. in order that these may be supplied to you without delay.

D. Workmanship:
The Contractor is asked to state in his tender offer which trades would be carried out by his own directly employed staff and which trades would be sub-contracted.
The Employer would not expect to communicate directly with subcontractors and is entitled to assume the same quality from those subcontractors that is expected from the main Contractor.

F. Materials:
Materials used throughout the job must be approved certified materials wherever these are available. Materials and systems should therefore be to British Standard specification and should be supported by Agreement certificate or equal documentation. Prior agreement must be obtained before using materials not covered by these quality descriptions.

G. Compliance:
In general terms the Contractors familiar with this work will appreciate that it is not domestic housing construction. The Employer is entitled to accept nothing other than clean, tidy, and accurate workmanship, smoothly finished in good quality durable surfaces with an absence of cracks and crevices and other defects which might lead to a multiplication of infection. The Employer cannot accept inferior materials which will wear badly and rapidly, become unsafe, or lead to cross-infection. If in doubt about the acceptability of any surface or material then PLEASE ASK.

H. Section M Building Regulations:
However the Employer draws attention to the fact that this is not entirely a building for the disabled as described in Section M of the Building Regulations. The Employer accepts responsibility for agreement of the layout of showers, toilets, basins and their enclosing rooms as shown on the tender documents which are based on good practice and experience in the operation of care homes and are deemed to be acceptable for their purpose but may not comply with Building Regulations, Section M

I. The Site and Working Area:
The areas must be screened to prevent access to the general public and measures taken to reduce to a minimum any disruption caused by noise, vibration or dust. These areas must be secure at all times against the fact that the general public, could attempt to enter the area of work. Externally a designated area should be defined and access restricted for security. Means of egress in case of fire is important and must be considered and agreed prior to any blocking off of current fire escape points/egress locations, and agreement be provided.

J. Defects Period and Making Good:

The Employer will expect a Form of Contract offering defects protection on building work for twelve months from handover of the premises and on plant and equipment for twelve months. During the defects period the Contractor must be prepared to attend at short notice to deal with any item which might adversely affect the safe running of the premises or compliance with the regulations affecting Residential Homes (for instance sticking doors, rucked carpets/floors etc.) at the end of the defects period the Employer expects a contract under which the Contractor will return and make good defects arising from defective workmanship or material. In addition and for the avoidance of misunderstanding and notwithstanding normal terms of contract the Employer requires that the Contractor shall price within his tender and allow to return if necessary and attend to the following specific defects should they have occurred at the end of the defects period.

1. Plaster cracks wherever occurring including the ends of lintels, around door linings etc. A crack is defined as a stress opening in material plainly visible and capable of admitting a 0.5 mm feeler gauge
2. Making good includes complete redecoration of a wall, not just touching in a crack. Stressed timber showing drying out cracks etc.
3. Any door or window which does not work easily and smoothly and on which the ironmongery requires unusual exertion to operate.
4. Again for the avoidance of misunderstanding the Contractor is reminded that this is a Residential Home and the equipment and all ironmongery, taps, fastenings etc. must work smoothly.

K. Making Good on Completion:

On completion it is inevitable that the Contractor will have affected the environment and may have affected adjacent buildings. Before commencing the work the Contractor shall produce a photographic survey of the site to normal en-print size and the Employer shall be given the opportunity to agree these prints. At the end of the contract the Contractor will be responsible for making good any damage which has occurred to adjacent surfaces up to and including the adjacent road and shall be responsible for making good any damage which can be identified in the adjacent premises.

The Contractor may supply and erect at his discretion one single site noticeboard to incorporate his name together with consultants and employed subcontractors with the board design and detail carefully controlled in view of the fact that the Care Home continues in operation. The Employer/agents may welcome the opportunity of being involved in this noticeboard as an advertisement and this would be a matter for negotiation and the Employer would be expected to make a reasonable contribution towards the costs incurred on his part of the board.

3. Additional Preliminary Items:

A. Quality of the Work -

This is always difficult to define. It may be helpful to schedule a concept of standards commencing with warehouse at the lower end and concluding with bank and prestige and bank and public building standard at the upper end in eight groups as follows.

01 Warehouse
02 Factory
03 Subsidized Housing
04 Housing for Sale
05 **Hospitals and Offices**
06 Individual Executive Housing
07 Bank and Prestige Public Building/Office Standard

It is considered that the public toilet standard must fall at level 05 or better.

4. Heating, Hot and Cold Water, and Sanitary Installations:

A. General Scope of Work:

The Contractor may well appoint a subcontractor for this work in which case the precise division of the works will be agreed between the parties. However, it is the Contractors liability to complete the total scope of works from the introduction of fuel, water, and power to the site to the delivery of hot and cold water and heating to all outlets and locations performing in accordance with all current & applicable regulations and leave in full & proper working order on the day of occupation.

Thereafter, as with all mechanical installations, the Contractor must be prepared to attend whenever problems occur during the defects period. The defects period for this work is 12 months from the date of occupation and 12 months from the date of occupation of any second phase and during this period emergency attendance may be necessary if elements of heating or sanitation fail.

B. Quality:

The premises are subject to heavy use and at all times quality of product and durability must be of the highest standard. In the pre-appointment discussions the Contractor will be asked to name the make of equipment used which it is anticipated will come from well-known national manufacturers. To take a simple example in the case of sanitary ware flimsy toilet seats and lids cannot be accepted. The same standards apply to basins, showers, etc.

C. Maintenance:

Thought must also be given to the problems of maintaining all equipment and the detailed design must take account of this requirement. For example, where pipes are run in ducts, these ducts should be accessible, neatly jointed, with catch systems or cup and screw fastenings enabling access for the greatest possible section of the installation. Individual fittings should be isolation valved at the fitting both on hot and cold so that simple repairs such as tap washer replacement etc., can be carried out without immobilising a larger part of the installation.

Where supplies, wastes or mains are run in concealed spaces such as ceilings it is doubly imperative that they shall be supported exactly in accordance with the manufacturers recommendations avoiding unnecessary bends, pipe droops, air locks, and other installation defects.

D. Record Drawings:

At completion the Contractor will provide a record drawing of all foul and surface water drainage systems with manhole, invert and cover levels properly identified to enable the proper maintenance of the system. This shall also include room layouts and electrical heating, under floor installations, manifolds and plumbing drawings.

E. Conclusion:

This specification is intended to enable the Contractor to fairly assess the content of the work, the quality required and the programme obligations and accordingly to submit a genuine and competitive tender. The Contractor must allow for all works, ancillary works, plant, labour, and materials necessary for the proper execution and total completion of the contract to good standards of workmanship and working satisfactorily in every respect upon completion.

On completion the building should be left clean and fit for occupation and the Contractors responsibilities must therefore include cleaning floors and windows. All working equipment will have been tested and certified. Locks and hinges will be eased and working freely. Gutters, down pipes and drainage should be free from building debris. The site shall be left in a tidy condition and whether or not the surfaces have been made the subject of new surface specification or Contractors work, the Contractor shall nevertheless totally remove from the building and its surrounds all building debris and pollution. Within one week of hand over the building is to be occupied.

Performance Specification & Contractors Proportion List

Contract: **Refurbishment of toilet accommodation**
Site: **Beccles Quay Toilets, Fen Lane, Beccles, Suffolk, NR34 9BB.**
Client: **Beccles Fenland Charity Trust**

5. Performance Items:

A. Heating Design:

1 Heat Source:

The hot water will be via 1no: natural gas boiler pressurized system within the plant room. The method of providing this, shall be agreed, along with the design options. The boiler will have roof terminating gas balanced flue outlets, complete with all water tight construction methods, along with any specialist methods of securing a water tight roof construction.

The contractor must consider ventilation to the boiler and space provided. The contractor shall discuss the means of air intake and extraction to the boiler with the boiler manufacturers, and agree a solution to allow the boilers to run at an optimum temperature. Boiler shall provide pressurised water to the showers and hot water taps, all with suitable hot water outlets to suit.

NOTE: If a pump would help meet demands then this must be included in the design with no extra cost being passed to the client later on in the contract.

The hot water heating shall be complete with a 300 litre mega flow insulated storage tank – minimum – Contractor to calculate the peak usage and allow for this in his design

The contractor must offer his full design before commencement of these works.

NOTE: The existing boiler may be suitable for the loading, but if this is the case then the contractor shall offer a warranty on the existing boiler to the client

2 Space Heating:

5.6.1 Shower & Changing Area (only)
The contractor shall allow for InfraRed Heater ThermoGlass Panels to suit the overall area of the room – manufacturer to provide full installation costs and requirements for room volume/size
Provide hard-wired thermostat (surface mounted) with manual control
https://www.infraredcompany.com/search?type=product&q=701*

5.6. Male & Female Toilets:
The contractor shall note that no active heating system is proposed to this area

3 Heating Layout & Controls:

Manifolds and relays shall be accommodated within plant room and cupboards around the building and each floor levels that exist on the plans

The new Gas boiler to be positioned within the new Plant Room, which shall be wall mounted unit. Position and location to be agreed on site, as other fittings and units are required in the plant room location. Flues to be wall mounted, with all water tight construction and protective cages and sleves to protect the residents from anything harmful or hot, etc.

Contractors shall allow for & install, cold water feeds, electrical supplies, boiler & flue unit/s, controls, venting, and supplies to the boiler/s units require for all hot water domestic to all taps and shower outlets.

Horizontal & vertical pipe work shall be minimised, and located at skirting level, where it must be boxed in melamine faced MDF boarding of at least 12.5 mm thickness, with removable panels (CP screw & Cup) as agreed on site. It is important to note that we must supply easy wipe down surfaces, as this is a medical facility with care and minimising of surfaces that can harbour dust, etc. *Minimise the need for ducting in the contractors design would be preferable, and should be discussed on site, so as to avoid a messy installation that may compromise the facilities that are intended.*

Note the controls for the hot water heating shall be digital, and allow complete temperature and time control. They shall provide a security code entry, so that the individual controls cannot be tampered with.

4 Design Temperatures:

The mandatory design temperatures for this accommodation are:

A. 21^{o}c in all other areas of the building including the all other areas.

It must be possible to achieve these temperatures when an adjacent room is not heated for any reason and it must be capable of achieving this performance whatever the external temperature. The Contractor is solely responsible for design to achieve the stated temperatures, design of controls, to achieve the stated control, and the planning of circuits

B. Design:

Within not more than four weeks of the commencement of the contract, the Contractor shall supply a layout of the scheme proposed, for approval by the Employer showing individual heating point/water layout positions. The Contractor must be prepared to respond to criticism of locations and to adjust the same without extra cost. Heating system & heat loss calculations must be indicated and approved before ordering. We repeat the earlier note that the thermostatic elements shall be capable of being fixed by the Employer in an internal location limiting the maximum temperature setting.

The detailed design of this system remains the Contractor's responsibility.

The contractors tendering shall note the need to supply a design layout and heat loss calculations based upon his chosen boiler/s design. This must take into account the current building requirements and layout, together with the requirements for an efficient system and boiler, so as to reduce the running costs of this establishment.

6. Specification for the Mechanical Engineering Services:

Mechanical Services Specification

Table of Contents

Section Description

Section 2

Mechanical Services Specification - Materials and Workmanship

Index

Clause Description Page

Section 2

Mechanical Services Specification - Materials and Workmanship

Section 2 of this Specification establishes the standards of materials and workmanship that the Mechanical Contractor shall be required to adhere to during the progression of works on site.

Where specific manufactures/suppliers are named, the Mechanical Contractor may propose alternatives for consideration, providing that the products are Aequal and approved@. However, the use of alternative manufactures/suppliers shall only be permitted providing that the Mechanical Contractor follows the procedures identified in Section 1, Clause 1.18 of this Specification.

2.01 Pipework - General

The Mechanical Contractor shall be responsible for the supply, delivery and erection of all pipework. The arrangement and sizes of all pipework shall be as generally detailed on the drawings.

2.02 Pipework - Setting Out

The Mechanical Contractor shall be responsible for the co-ordination of all pipework installations on site, predominantly with other trades and their respective services. All pipework shall be neatly run in careful alignment with the building and each other to ensure natural venting and draining and adequate provision for expansion. All pipework shall be carefully set out to ensure that ample access is left for operation and maintenance of the installation.

A clearance of at least 25mm shall be maintained between the outside diameters of any pipe and the face of any wall or ceiling. A clearance of at least 90mm shall be maintained between the outside diameters of any pipe and any floor finish. Where pipes are to be lagged these clearances shall apply to the outside diameter of the finished insulation.

All pipe ends shall be cut square with any burr carefully reamed out and the bore shall be truly circular.

Pulled bends and sets shall be used in preference to fittings and where formed in pipe lengths by machine bending or forging shall have a centre line radius equal to not less than three times the pipe bore. Alteration of the cross sectional area of the pipe or rippling of the throat of a bend shall make such a pipe section unacceptable.

The Mechanical Contractor shall allow for cutting out and replacing six number sample pieces of installed pipe for the Engineer=s inspection. If defective pipework is found, further samples and replacements will be required. All costs incurred shall be borne by the Mechanical Contractor.

Tees and other branches shall be swept except where draining or venting necessitates square branches.

Each high point in every heating pipe shall be fitted with an air bottle. Air bottles shall comprise 54mm square branch or a branch of equal diameter to the pipe being vented, whichever is the smaller, nipple or small extension piece, a minimum of 50mm long or a length the diameter of the pipe being vented, whichever is the larger and reduced to the size of the aircock. The material for all air bottles shall be copper as specified in Clause 2.11. Extended small bore vent lines shall be run from concealed or inaccessible air bottles and terminate with an aircock 1500mm above FFL.

Each low point on every pipe shall be fitted with a means of draining and as required by the Water Supply (Water Fittings) Regulations 1999.

During the progress of the works, open ends on all pipework shall be capped or plugged with appropriate screwed fittings, or by using red plastic caps or equal, to prevent ingress of foreign matter into the system.

If pipes in screeds are found to be blocked, the Mechanical Contractor shall locate and remedy the fault at his own expense and shall bear the cost of any additional work by other trades arising as a result in replacing the whole of the pipe run.

2.03 Pipework B Thermal Expansion and Contraction

The installation of the pipe work services shall be such that wherever possible the thermal expansion/contraction of pipe work shall be accommodated by means of

natural offsets and changes of direction of pipe runs.
Where the installation of pipe work does not facilitate the above, the Mechanical Contractor shall be responsible for the supply, delivery and installation of all pipe anchor and guides, in accordance with the following:-
Anchor Points - The Mechanical Contractor shall liase with a specialist manufacturer to establish the extent of expansion to any given pipe length and shall subsequently provide and install bellows or loops as deemed appropriate to ensure that a satisfactory installation results.
Anchor points for expansion shall be of adequate strength to resist the maximum stresses and shall be supplied and fixed by the Mechanical Contractor; the attachment of the anchor points to the building structure shall be in a manner approved by the Architect/Engineer.
Anchors shall be formed using welded flanges for steel pipe work, and brazing bronze flanges for copper pipe work, on each side of suitable angle or channel steel section, securely fixed to the building structure.
The flanges shall be bolted to the angle or channel steel sections.
In cases where the pipe work cannot run close to the structural surface, the Mechanical Contractor shall provide and fix a purpose-made stand off frame to carry the anchor. The frame shall be bolted to the structure as specified and shall be fully capable of resisting the offset anchor thrust.
Guides B The Mechanical Contractor shall provide and install guides to operate in conjunction with the bellows and anchors. Details of the guides to be used shall be submitted by the Mechanical Contractor to the Engineer for information, at least 14 days before the required manufacturing date. Those parts of the guide, which are in contact with the pipe, shall be of the same material as the pipe.
On all heating and hot water services pipe work where loops or natural bends occur suitable guides shall be supplied and fixed in strict accordance with the requirements of the manufacturer of the bellows or loop.
Guides for pipe work shall generally be attached direct to the structure of the building or to guide supports provided by the Mechanical Contractor
In cases where the pipe work cannot run close to the structural surface, the Mechanical Contractor shall provide and fix a purpose-made stand off frame to carry the guide. The frame shall be suitably bolted to the structure and shall be fully capable of resisting the offset guide thrust.
Services Buried Underground - Where pipe work services are to be buried underground in trenches (as opposed to properly constructed ducts or subways) then the Mechanical Contractor shall observe the following conditions:-
a) Trenches
All digging of trenches and back filling will be carried out under the building contract. However, the Mechanical Contractor shall be responsible for giving details of the required trench B dimensions and construction method, etc to the Main Contractor on commencement of the Contract.
The bottom of the trench shall be levelled to give an even bed for the pipe.
On no account shall the pipe be laid on an uneven hard bed. In the case of buried PVC pipe work, particular care shall be taken to ensure that the pipe is properly supported to avoid distortion after back filling.
b) Anchors Thrust Blocks
Anchor thrust blocks shall be formed in concrete and will be carried out under the building contract. The Mechanical Contractor will however, be responsible for detailing the position required, requirements with respect to the holding power of the soil and the operating pressure of the service in the pipe work, these details shall be submitted to the Engineer for approval, before the anchors are formed. The Mechanical Contractor shall be responsible for the

supervision of this work.
Where the pipe work comes into contact with the anchor thrust block, the pipe shall have three layers of Adenso tape applied. When back filling around the pipe work, all joints shall be left exposed until pressure testing is completed and passed.

2.04 Pipework - Supports

All steel and copper pipes shall be adequately supported in all positions, the centre of pipe the supports shall not exceed the following distances unless specifically shown to the contrary on drawings:-

Pipe Dia. (Nominal) Vertical Runs Horizontal Runs

Steel - 15mm Cu - 15mm 2.4m 1.8m
20mm 22mm 3.0m 2.4m
25mm 28mm 3.0m 2.4m
32mm 35 mm 3.0m 2.7m
40mm 42mm 3.6m 3.0m
50mm 54mm 3.6m 3.0m
65mm 67mm 3.6m 3.0m
80mm 75mm 4.5m 3.6m
100mm and
over
110mm
and over
4.5m 3.9m

All multi-layer composite Pe/Al/Pe pipes shall be adequately supported in all positions, the centre of pipe the supports shall not exceed the following distances unless specifically shown to the contrary on drawings:-

Pipe Dia. (External) Vertical Runs Horizontal Runs

16mm 1.55m 1.2m
20mm 1.7m 1.3m
25mm 1.85m 1.5m
32mm 2.1m 1.6m
40mm 2.2m 1.7m
50mm 2.6m 2.0m
63mm 2.85m 2.2m
75mm 3.1m 2.4m
110mm 3.1m 2.4m

All pipes shall be supported independently of other pipes and so fixed that they may be replaced or removed without disturbing other pipe runs unless expressly requested and approved by the Engineer.
Where it is not possible or practicable to support pipes at the above centres, supports shall be provided at closer rather than greater centres.
All steel pipe work shall be supported using 'Schoolboard' type brackets as Crane Ltd, Fig. 501 or 529, complete with M515 backplate - or equal and approved.
Where walls are of suitable material built-in brackets shall be used, but on framed or lightweight walls, screw-on brackets shall be used.
All concealed copper tubes shall be supported using gunmetal single pipe rings similar to Yorkshire Imperial Metals Ltd, Fig. 107 or equal and approved, together with either built-in or screw-on back plates 116 or 117S.
Where copper tubes are exposed, they shall be supported using Yorkshire Fig. 110 Hospital brackets or as approved by the Engineer.
In Boiler Rooms, Plant Rooms, Tank Rooms, in the main internal service ducts and ceiling voids, pipe supports may be as above, but generally pipe hangers

shall be employed. A pipe hanger shall comprise a single pipe ring or a fabricated back clip suspended by a drop tube or rod and back-plate or by an eyebolt attached to a suitable mild steel angle bearer where eyebolts are employed.
The drop tube or rod shall pass through a generous clearance hole in the bearer and rest upon a hemispherical washer with locknut.
All fabricated parts of supports shall be wire brushed and adequately painted with one coat of primer before fixing.
Types of fabricated supports shall be approved by the Engineer **before** manufacture.
All multi-layer composite Pe/Al/Pe pipes shall be supported utilising proprietary brackets as manufactured by Uponor Ltd. The Mechanical Contractor shall ensure that centre of pipe the supports does not exceed the manufactures recommended distances; in particular it shall be noted that the distance between supports on floors shall not exceed 0.8m, and that before/after each bend, a support must be provided at a maximum distance of 0.3m.
The Mechanical Contractor shall fix all surface fixing supports. For fixing to brickwork or masonry, wood screws shall be not less than 40mm long x 10 gauge and for fixing to timber, wood screws shall be not less than 30mm long x No. 8 gauge. Expanding metal plugs or explosive fixing devices shall only be used where approved by the Engineer.

2.05 Pipe Sleeves

Where pipes pass through walls, floors and ceilings, pipe sleeves shall be fitted. The sleeves shall be fabricated from mild steel tube in the case of m. s. pipe work, copper tube in the case of cu pipe work and from uPVC tube in the case of plastic pipe work.
Pipe sleeves shall have 1.5mm clearance from the pipes and the ends shall project 1.5mm proud of the finished structural surface.
All burrs shall be removed from the inside of the sleeves before fixing.
Pipes shall not rest on sleeves. The latter shall be supported off the pipes by wedges until the sleeves are built in. Except for cases otherwise stated, all pipes passing through sleeves shall be perfectly central within the sleeve.
Where a change in direction means that provision has to be made for the expansion movement of pipe work passing through walls, floors and ceilings, the sleeves shall be oval in shape and constructed from 20g m. steel, cu sheet, etc to suit the pipe work material.
The amount of clearance in oval sleeves shall be:-
12mm for up to 7m of approach run of pipe
20mm for 7m to 15m of approach run of pipe
25mm for 15m to 20m of approach run of pipe
30mm for 22m to 30m of approach run of pipe.
When the mains are cold, the sleeves shall be fixed close to the pipe with the clearance allowed on the side in which expansion will take place.

2.06 Wall, Floor and Ceiling Plates

All service penetrations through the building, which prejudice the integrity of fire barriers/zones, shall incorporate an approved method of fire protection B fire seals shall comply in all respects with the current regulations up to completion of the project.
Except where otherwise stated - where pipes pass through walls, floors and ceilings and are exposed to view, the holes are to be closed with off-white plastic wall/ceiling plates fitted around the pipe as Flamco type or other equal and approved. Plates shall be fixed after final decoration has been completed.
Where possible pipes shall be spaced to allow standard split plates to be fixed without cutting, but where necessary they shall be shaped to suit the building.

2.07 Taper Pieces B Reducers/Enlargers

All pumps and apparatus requiring smaller/larger connections than their respective mains shall be connected by means of flanged taper pieces or reducing/enlarging sockets giving unrestricted flow and to ensure that they are fitted so as not to cause air locking.

Isolating valves and check valves etc, shall be provided to the match the bore of the pipeline.

2.08 Below Ground Pipework B Gas and Cold Water Supplies

Below ground gas pipework - the secondary gas distribution shall be routed in yellow medium/high density polyethylene PE80-MDPE / PE100-HDPE - SDR11 pipe (subject to pipe size) to GBE/PL2 parts 1,4,6 & 8 suitable for low pressure connection to discharge side of gas meter.

All pipework shall be installed in strict accordance with Gas Board Regulations and the manufacturer's recommendations, with all joints fusion welded.

Pipelines shall be laid so as to have a minimum ground cover of 650mm above the crown of the pipe.

Below ground mains cold water pipework B the pipework shall be run in blue medium/high density polyethylene PE800-MDPE / PE100HDPE - SDR11 pipe (subject to pipe size) to B.S. 6572, with fittings to B.S. 864 Part 3 as Glynwed Plastics Ltd. All joints shall be made in strict accordance with the Water Supply (Water Fittings) Regulations 1999 and the manufacturer's recommendations.

Pipelines shall be laid so as to have a minimum ground cover of 900mm above the crown of the pipe.

Note - All below ground gas and mains cold water supply pipework shall be protected from direct sunlight during the storage period. The pipelines shall be fitted with plastic to copper adapters for connection to the respective Supply Authority's main and internal mains water service pipework as appropriate.

2.09 External Pipework B Heating & Gas Services

All externally located heating and natural gas service pipework and fittings shall be as Clause 2.10 but for added corrosion resistance they shall all be galvanised to the requirements of B.S. 729:1971. It should be noted that all pipe joints should be made using either screwed or flanged joints, no welding being permitted on galvanised pipe.

Note - In the event that the heating system has been installed utilising copper pipework, this Clause shall be waived.

2.10 Internal Pipework B Black Heavy Weight Mild Steel

With reference to Section 4 of this Specification and in accordance with the project particulars, where pipework is to be run in black heavy weight mild steel, the tube shall comply in all respects with B.S. 1387:1967.

Screwed fittings shall be adopted for joining pipework up to and including 2@ dia., these shall be black malleable iron fittings to B.S. EN 1042 & ISO 49 as manufactured by Crane Fluid Systems. Threads on pipework and fittings shall be tapered to B.S. 21 and ISO 7.

Piping of 22@ dia. and above, in Plant Rooms and closed service ducts shall generally be welded B refer to relevant sub-section of this Clause.

Screwed joints - where screwed joints are used the use of bushings or long screw connections and back-nuts will not be acceptable.

On heating pipework, screwed joints shall be made with hemp and paste, the amount used in making the joint shall be kept to a minimum and all excess shall be removed.

Where excessive use of hemp is observed the Mechanical Contractor will be required to remove the length of pipe and fittings involved and replace same withnew.

On gas pipework, the Mechanical Contractor shall particularly note that all joints on

screwed gas pipework shall be made using Hawk Superseal P.T.F.E. tape or Hawk White paste or equal and approved conforming to the requirements of the Gas Regulations.

Unions and flanges - these shall be fitted as appropriate adjacent to all items of plant and on the downstream of all valves for the purpose of disconnection.

Unions shall be black malleable iron with bronze-to-bronze seats as Crane Fig. 289 or equal.

Flanges shall be fully faced black mild steel to B.S. 10 or B.S. 4504:PN 10 or 16.

Bolt lengths shall be chosen to project 1.5mm through the nuts. Short bolts or sawnoff bolts will not be accepted.

Flanged joints or unions as described above shall be provided in the positions shown on the drawings and at a maximum of 6m intervals and at other points considered necessary to facilitate the easy dismantling of pipework.

All pipe flanges shall be machined right across the jointing face and on the edge, and when in position flanges forming a pair shall be flush with one another all round.

All flanged joints shall be made with 2mm thick Klingerite ready-made joints to the full-face dimensions of the appropriate B.S. Table. They shall be of the type appropriate to the service on which they are being used and as manufactured by Messrs Richard Klinger or other equal and approved.

Joint rings shall be fixed concentric with the pipe bore and the Mechanical Contractor shall ensure that they do not obscure any of the pipe bore.

Mild steel flanges that are welded to the pipework shall be drilled with a slight taper in their bore and a shaped boss to facilitate welding. Flanges shall be welded neck and bore.

Pipework Welding - Welding shall be adopted for joining black steel pipework on sizes 22 dia. and larger in preference to screwing. All pipes in ducts shall be welded.

All pipes prepared for welding shall be free from rust, paint or oil or other foreign matter, both on the surface to be welded and on the surrounding material. Where pipes are cut to length by use of a flame cutter, all oxide and foreign matter shall be cleansed by a hammer and chisel, file and wire brush, from the internal surfaces.

All welded butt joints shall be aligned with bore of pipes symmetrical and shall have butt weld inserts as British Steam Specialities Ltd, beaded pattern on sizes down to and including 1" dia. Breaks or kinks in alignment will not be accepted.

In the case of butt welds on pipes of 2" dia. and above, the pipes shall be bevelled at an angle of 25o B 30o to the vertical with a space between each pipe to be welded of not less than 1.5mm and not greater than 3mm according to the size of the pipe to be welded.

Welded branch joints, bends, twin elbows, etc, shall be made with shaped fittings unless written consent is received from the Engineer to do otherwise. Square branches and/or tees **will not be acceptable** except for air venting or draining.

All welded joints shall be wire brushed to remove iron oxides and scale immediately after the weld has been completed and the weld painted with zinc chromate to the extent of 150mm on either side, or more as necessary, to prevent corrosion.

All welding shall be carried out only by tradesmen competent in this work and in accordance with the recommended Code of Practice of the Heating and Ventilating Contractors Association and the appropriate specification issued by the Institute of Welding. Such tradesmen carry out any welding should produce their certificates of competency on demand by the Engineer.

The Mechanical Contractor may be called upon to submit his welding operatives to a test called for by an Insurance Company Inspector on behalf of the Client. Each operative will be required to pass all tests and the Insurance Company Inspector's decision shall be accepted by all as final. The Mechanical Contractor shall include

for any and all fees chargeable in this event. In the event of a dispute as to the quality of any welds, the welds in question will be sent to the British Oxygen Company for testing - their report shall be accepted by all as final.

No welding shall be carried out on galvanised tube.

2.11 Internal Pipework B Copper

With reference to Section 4 of this Specification and in accordance with the project particulars, where pipework is to be run in copper, the tube shall be as manufactured by Yorkshire Copper Tube Ltd - their type >Yorkex= complying with EN1057-R250.

The pipework shall be manufactured from half hard, light gauge copper tube; all tubing shall be scoured to remove oxides formed during the manufacturing process.

All tubes shall be 'Kite' marked and be produced free of all harmful films or scales as recommended by the British Non Ferrous Metal Research Association.

Pipework fittings shall be as Yorkshire Fittings Ltd., Apotable@ type stamped with YP identification.

All joints on copper pipework being 54mm dia. and under shall be made by means of Yorkshire capillary type fittings with internal solder ring or equal and approved.

Capillary joints shall be correctly prepared and heated in accordance with the manufacturer's instructions. Incomplete solder rings and surplus solder at the mouth of the fitting will not be accepted.

On copper pipework above 54mm dia., all fittings shall be from the Yorkshire Endex Endbraze range and silver soldered using silver brazing alloy to BS 1845 AG14.

Excess flux shall be removed by wire brushing and washing the joint.

Note - In those instances where there is a potential fire hazard caused by soldering/hot works, particularly where the Mechanical Contractor is operating in confined spaces adjacent to combustible materials, consideration shall be given to using an alternative method of pipework jointing.

Such alternative methods of pipework jointing shall include conventional Yorkshire compression fittings, Yorkshire Press Fit or Yorkshire Tectite Pro push-fit fittings B the latter systems must be used in conjunction with the manufacturer’s approved tube. The Mechanical Contractor shall seek written approval from the Engineer before proceeding with any alternative methods of pipework jointing.

Flanged or union joints shall be provided in the positions shown on the drawings and at all other points where considered necessary to facilitate the easy dismantling of pipework and equipment.

Before commencement of installation a sample joint for each size of copper tube shall be fabricated for the approval of the Engineer and/or the Insurance Company's representative, and shall be held on site as typical standard to be used throughout.

2.12 Internal Pipework - AUNIPIPE@ Multi-Layer Composite Pe/Al/Pe

With reference to Section 4 of this Specification and in accordance with the project particulars, where pipework is to be run in multi-layer composite Pe/Al/Pe, the tube shall be as manufactured by Uponor Ltd.

The tube shall comprise of a longitudinally welded aluminium pipe with an inner and outer polyethylene layer, all sections shall be permanently bonded together by means of intermediate adhesive layers. The tube shall be tested and approved for use up to 95oC @ 10 bar operation B all tube and fittings shall carry both DIN 4726 and WRAS 004036 approval.

Pipe sizes as indicated on the drawings or as defined within Section 4 of this Specification, are given with reference to the external diameter of the pipe. It shall be noted that under no circumstances will pipe of less than 16mm external diameter (equivalent to 12mm internal diameter) be installed.

The method of pipework jointing, shall only be made utilising the proprietary Unipipe fittings as manufactured by Uponor Ltd. The fittings shall be either APress Fit@ (permanently connected to the pipe) or compression fitting (designed to allow ease

of removal for future maintenance) B refer to Section 4 of this Specification for clarification on the project particulars.
Unless specified to the contrary, the Press Fit method of jointing shall be used throughout the majority of installations, generally in preference to compression fittings. However, connections to final appliances shall be made with compression fittings, thus facilitating ease of removal for future maintenance.
The Mechanical Contractor shall note that where a number of piped services are required to connect to a header arrangement, these shall be made using the UNIWELL modular manifold system, complete with protective cabinet + cover.
Where the Pe/Al/Pe tube traverses from a concealed location to a surface mounted aspect, the transition shall be made with a proprietary Asingle bend guide@ B i.e. where domestic hot and cold water services traverse from the floor void / behind vanity units, with final connections to sanitary appliances.
Where the Pe/Al/Pe tube traverses from a concealed location to an exposed aspect, the transition shall be made with a proprietary Aterminal box set B i.e. where heating services traverse from the floor void to serve copper stalks to conventional radiators.
With reference to Section 4 of this Specification and in accordance with the project particulars, where the multi-layer composite Pe/Al/Pe pipework is to be sleeved, the sleeve arrangement shall comprise the manufacturers proprietary conduit system - UNIWELL corrugated protective tube.
For the purposes of future identification, the pipework services shall be sleeved with coloured protective tubes as follows:-
LPHW Heating B black tube
Domestic hot water B red tube
Domestic cold water B blue tube.
Note - The installation, testing and commissioning of the AUNIPIPE multi-layer composite Pe/Al/Pe system shall be undertaken in strict accordance with the manufacturers recommendations, in particular their Installation Guide, details of which are available from Uponor Ltd.

2.13 Valves and Cocks, etc.

The Mechanical Contractor shall supply and install in positions shown on drawings or otherwise specified, all necessary valves, stopcocks and draincocks etc., as described below, or as detailed in Section 4 of this Specification.
All valves and cocks, etc shall be comply with the requirements of the Water Supply (Water Fittings) Regulations 1999, shall be WRAS listed and stamped appropriately.

LPHW, MPHW Heating Installations and Chilled Water Installations

Isolation 15mm to 50mm
65mm and above
Crane D171A - DZR bodied ball valve. Quarter turn, lever operated. PTFE seats and stem seal. Female threaded ends to BS21 (taper). Rated PN25.
Crane D171AEXS **-** As D171A with extension spindle. (This valve type to be used to maintain integrity of the thermal insulation as deemed appropriate).
Crane D171ALS **-** As D171A with lockshield operator.
Crane F624 - Fully lugged butterfly valve to EN593, suitable for mounting between BS. 4504. PN16 flanges. Stainless steel

disc. Maximum temperature 100oC. Lever operated incorporating locking facility. EPDM liner. Rated PN16.

Flow Measurement 15mm to 50mm

15mm Low Flow
(0.061 to 0.15 l/s)

65mm and above

Crane D901 - DZR bodied flow measurement device having square edged entrance orifice plate with tapings for P84 test points. Rated PN25.

Crane D902 **-** As D901 but designed for low flow rates.

Crane DM900 - Stainless steel flow measurement device with corner tapings terminating in with Crane P84 test points.

Double Regulating 15mm to 50mm Crane D921 - Bronze bodied Y pattern double regulating valve to BS.7350. Having characterised throttling disk and authority sufficient to regulate flow in circuits incorporating flow measurement devices. Ends threaded to BS21 parallel (2@ and :@ threaded to BS.2779 and have disposable compression adapters for copper tube to BS. 2871). Double regulating feature set by Allen Key and valve operation by Microset handwheel. Rated PN25.

Circuit Balancing

15mm Low Flow
(0.061 to 0.15 l/s)

65mm and above

15mm to 50mm

15mm Low Flow
(0.03 to 0.07 l/s)

Crane D923 - As D921 but with characterised throttling disk and authority sufficient to regulate ultra low flows incorporating flow measurement devices.

Crane DM920 - Cast iron Y pattern double regulating valve to BS.7350. Having characterised throttling disk and authority sufficient to regulate flow in circuits incorporating flow measurement devices. Ends flanged to BS. 45045 PN16. Double regulating feature set by Allen Key and valve operation by Vernier type handwheel. Rated PN16.

Crane D931 - Bronze bodied fixed orifice double regulating valve to BS. 7350, incorporating integral fixed orifice with corner tapings terminating in Crane P84

test points. Ends threaded to BS.21 parallel (2@ and :@ threaded to BS. 2779 and have disposable compression adapters for copper tube to BS. 2871). The double regulating feature shall be Y pattern globe type with characterised throttling disk set by Allen Key and valve operation by Microset handwheel. The whole providing accuracy of +/- 5%. Rated PN25.
Crane D933 - As D931 but designed for low flow rates.
15mm Ultra Low Flow (0.016 to 0.04 l/s)
65mm and above
Crane D934 - As D931 but designed for ultra low flow rates.
Crane DM940 **-** Cast Iron fixed orifice double regulating valve to BS. 7350. Consisting of DM900 stainless steel measurement device with corner tapings terminating in stainless steel extension tubes mounted with Crane P84 test points. The double regulating feature shall be DM920 cast iron Y pattern, having characterised throttling disk and authority sufficient to regulate flow in circuits incorporating flow measurement devices. Ends flanged to BS. 4504 PN16. Double regulating feature set by Allen Key and valve operation by Vernier type handwheel. The whole providing a measurement accuracy of +/- 5%. Rated PN16.
Note - Flow measurement and regulating valves shall be installed on all main pipe branches/sub-branches, whether or not specifically indicated on the tender drawings, to facilitate the hydraulic commissioning of the heating installation in accordance with the CIBSE=s recommendations.
Non Return Valves 15mm to 50mm
65mm and above
Crane D138 - Bronze bodied swing check valve. Metal disc, screwed cap. Female threaded ends to BS21 (taper).
Kitemarked to BS5154.
Crane FM451 - Cast iron wafer check valve with resilient face. Bronze trim. Fits between BS4504 PN10/16 flanges. Rated PN16.
Strainers 15mm to 50mm
65mm and above
Crane D297 - Bronze bodied Y type

strainer. Stainless steel perforated screen 0.75mm. Female threaded to BS.21. Rated PN25.
Crane FM276 - Cast iron Y type strainer. Stainless steel perforated screen 0.75mm. Drilled bosses and cap. Flanged ends to BS.4504. PN16.
Draw Off Cocks 15mm to 25mm Crane D171MHU - Bronze bodied draw off ball valve. Lever operated. Threaded male BS21 (taper) Fitted with hose union outlet. Rated PN25.
Crane D171MHULS - As D171MHU but fitted with Allen Key operated lockshield.
Draining Taps 15mm to 25mm Crane D340 - Bronze bodied drain tap. Lockshield type. Threaded male BS21 (taper) Kitemarked to BS2879. Rated PN10
Crane D341 - As D340 but without lockshield.

Radiator & UnderfloorValves Generally, thermostatic radiator valves (fitted on the heating flow) B shall be Danfoss Randall body type RA-N15 (2@) angle or straight pattern, with RA2000 built in sensor head (temperature range 5 to 26oC.)
The TRVs shall be complete with integrated pre-setting device to enable commissioning of the flow rate to match the required heat output of the radiator.
Generally, radiator lockshield valves (fitted on the heating return) B shall be Danfoss Randall body type RLV-15 (2@) angle or straight pattern.
1No. Danfoss Adrain-cock adapter@ used for draining/filling the radiator/radiator circuits shall be supplied with every 10No. LSVs installed.
Under floor manifolds to suppliers, designers, installers designs for agreement by the clients agents. Position and location of each to be agreed, and should be within cupboards provided on the plans, and not re1quire further cupboards, which would restrict the access, and accessibility to the building by residents, staff and visitors.

b) Domestic Hot and Cold Water Installations

Isolation

Non Return Valves
15mm to 50mm
65mm and above
15mm to 50mm
Crane D171A - DZR bodied ball valve.

Quarter turn, lever operated. PTFE seats and stem seal. Female threaded ends to BS21 (taper). Rated PN25.
Crane D171AEXS - As D171A with extension spindle. (This valve type to be used to maintain integrity of the thermal insulation as deemed appropriate.
Crane D171ALS - As D171A with lockshield operator.
Crane F624 - Fully lugged butterfly valve to EN593, suitable for mounting between BS. 4504. PN16 flanges. Stainless steel disc. Maximum temperature 100oC. Lever operated incorporating locking facility. EPDM liner. Rated PN16.
Crane D140 - Bronze bodied swing check valve. Renewable nitrile rubber disc, screwed cap. Female threaded ends to BS21 (taper). Maximum temperature 100C. Rated PN25.
65mm and above Crane FM451 - Cast iron wafer check valve. Bronze trim. Body seat facing EPDM. Fits between BS4504 PN10/16 flanges. Rated PN16

Strainers 15mm to 50mm
65mm and above
Crane D297 - Bronze bodied Y type strainer. Stainless steel perforated screen 0.75mm. Female threaded to BS.21. Rated PN25.
Crane FM276 - Cast iron Y type strainer. Stainless steel perforated screen 0.75mm. Drilled bosses and cap. Flanged ends to BS.4504. PN16.

Draw Off Cocks 15mm to 25mm Crane D171MHU - Bronze bodied draw off ball valve. Lever operated. Threaded male BS21 (taper) Fitted with hose union outlet. Rated PN25.
Crane D171MHULS - As D171MHU but fitted with Allen Key operated lockshield.

Draining Taps 15mm to 25mm Crane D340 - Bronze bodied drain tap. Lockshield type. Threaded male BS21 (taper) Kitemarked to BS2879. Rated PN10
Crane D341 - As D340 but without lockshield.

Final connections to all hot or cold water outlet shall be fitted with a Service/Automatic Flow Limiting Valve type AFL as manufactured by Arrow Valves Ltd. The quarter turn service valve shall be complete with optional operating lever.
After chlorination on **mains or pressurised** hot or cold systems, automatic flow limiting cartridges shall be fitted to these valves to control the maximum flow of hot and cold water in accordance with the following:-

Service/Flow Limiting Valves	
Washbasin	0.15 l/s
Sink (2@)	0.20 l/s
Sink (:@)	0.30 l/s
Shower	0.20 l/s
WC cistern	0.13 l/s
Urinal cistern (per stall)	0.004l/s
Bath	0.30 l/s
Dishwasher	0.15 l/s
Washing machine	0.20 l/s

Note - The incoming mains cold water supply to the building shall be complete with stopcock/draincock arrangement, fitted at low level in accordance with the Water Regulations.

All HWS secondary circulation loops shall be fitted with lockshield valves for flow regulation purposes, Crane type D171ALS.

c) Final Connections to Domestic Water Services

The Mechanical Contractor shall include for making final connections to domestic hot and cold water draw-off's, the Mechanical Contractor shall supply and install copper to BSP adapters as neces

d) Urinal Cisterns

The Mechanical Contractor shall provide and fix approved flushing devices to all waste-water-preventers as Cistermiser STD 6073/A/HF, LP 6074/A/HF or HSLP 6075 manufactured by Cistermiser Limited.

e) Aircocks/AAV's

To facilitate natural venting of each circuit, the Mechanical Contractor shall supply and install aircocks on all high points of the systems, these shall be Crane type E56.

The Mechanical Contractor shall supply and install automatic air vents in all positions shown on the drawings, these shall be Spirax Sarco type AE30C with matching check valve and lockshield valve on the inlet - the lockshield valve shall be complete with manufacturers proprietary key (sold separately).

f) Draincocks

To facilitate natural draining of each circuit, the Mechanical Contractor shall supply and install drain cocks on all low points of the systems, these shall generally be Crane type D341.

The Mechanical Contractor shall supply and fit draw off cocks on the Adead@ side of all circuit valves and on plant as specified. 15mm to 25mm bore with hose union outlet Crane, type D171 MHULS conforming to BS. 2879:1980 type 2 to meet system temperature.

g) Three Way Vent Cocks

All three-way valves shall be Nabic 175, ball type, complete with iron operating lever as manufactured by Nabic Valve Safety Products Ltd. The three-way valve shall be fitted with union/flange connections on all ports, to facilitate ease of future maintenance.

h) Backflow Protection B Double Check Valves, RPZ Valves and Anti-Vac Valves

Backflow Prevention@ devices shall be installed in strict accordance with the Water Regulations; the type to be installed shall provide absolute protection relative to the given fluid category.

Where mechanical backflow prevention devices are installed and the fluid category permits the use of double check valves, reduced pressure zone valve (RPZ) and anti-vac valves, the following shall be used:-

15-22 DCV Arrow Valves Ltd, ED132 DZR low head loss type

15-150 RPZ Arrow Valves Ltd, RPZ (BA) option F or G as required

15-50 AVV Nabic Fig 568 SS stainless steel construction

i) Gas Service

15-50 Crane D191 AT lever operated ball valve

65 and above Donkin Valves Ltd series 555 softseal cast iron, double faced, resilient seat, internal screw, full bore wedge gate valve flanged B.S.10 or 4504; PN16 and c/w optional cast iron handwheel.

j) Pressure/Temperature Relief Valves

These shall be Nabic Valve Safety Products Ltd., and sized for compliance with B.S. 1123 with pressure setting as appropriate to the system being protected and to AOTC approval - model Fig. 542 for pressure relief only or Fig. 500 T for combined pressure and temperature relief.

The safety discharge lines shall terminate at a safe location, either routed to local floor gully in the Plant Room or taken to an external drain point B final location to be agreed with the Engineer.

k) Float Valves

These shall be equilibrium ball float valves, fabricated and tested to ensure buoyancy to specification, in accordance with BS 1968 and W.R.C. requirements. The float valves shall be complete with type 'AA' or 'AB' air gap as required by the Water Regulations and shall provide absolute protection relative to the given fluid category.

2.14 Gauges

All temperature and pressure gauges shall include quarter turn isolating valves fitted on the syphon tube to facilitate dial replacement.

a) Temperature

These shall be as Messrs. Brannan Ltd., Beta heavy duty, bourdon movement, 100 dia. dial with black bezel all to B.S. 5235:1975, DIN 16203 and 16205 - calibrated for working temperature at mid scale with range in accordance with the site operating conditions.

b) Pressure

These shall be as Messrs. Brannan Ltd., Beta heavy duty pattern, 100 dia. dial with black bezel c/w gauge cock all to B.S. EN 837:1998, IP 66 and DIN 16064 calibrated for working pressure at mid scale complete with red pre-set pointer with range in accordance with the site operating conditions.

2.15 Chromium Plating

Throughout this specification where the terms 'Chromium plated' or 'C.P' finish are stated, this shall mean that the article shall be plated with deposits of nickel and chromium, all in accordance with the requirements of B.S. 1224:1959 for severe service conditions.

The Engineer may require certificates from the manufacturers that this standard has been complied with.

2.16 Painting

All steel pipework, joints, fittings, etc. shall be cleaned, wire brushed and prepared as necessary and painted one coat red oxide primer prior to installation. A further coat of red oxide primer shall be applied when the pipework is fully erected and all pressure testing completed to the satisfaction of the Engineer.

All ironwork brackets, supports, etc. and exposed ironwork of new or replacement plant shall be cleaned, wire brushed and prepared as necessary and painted one coat of zinc chromate or similar primer and one dark grey heat resistance finishing coat.

2.17 Labels

The Mechanical Contractor shall provide and fix identification labels to all main plant and equipment which shall be affixed with lengths of brass chain - where plant/equipment labels are required, these shall be 'Traffolyte' laminated whiteblack-white with 6mm or 12mm lettering, the precise wording to be decided by the Engineer as works progress on site.

Valve number discs shall be affixed to each valve complete with identification number corresponding to those indicated on the glazed valve chart, discs shall be 35mm dia. as above with 20mm high numerals.

Labels shall also be fixed adjacent to all drinking water points.

2.18 Ductwork

a) The Mechanical Contractor shall supply and install the complete ranges of ductwork as shown on the drawings; he shall be responsible for the coordination of all ductwork installations on site, predominantly with other trades and their respective services. Before commencement of manufacture he shall take all site dimensions necessary to ensure that all ductwork and equipment can be obtained and fitted in its appropriate positions, he shall then prepare a set of detailed manufacturing drawings for the Engineer=s comment and approval before manufacture commences. He shall be responsible for coordinating with all other Contractors as to the order and time of installation, and that no interference is caused to other trades.

b) All sheet metal ductwork shall be of best quality galvanised steel manufactured and erected to the latest standards laid down in the HVCA DW 144 and TM8 B Design Notes for Ductwork. All plastic ductwork shall be in PVC, GRP or Polypropylene to HVCA DW 154 as particularly called for in this Specification.

c) The Mechanical Contractor shall supply and fix duct supports generally by means of trapeze type hangers for horizontal ducts comprising steel angle stretcher below the duct, supported by screwed drop rods. Vertical ductwork shall be generally supported by means of angle brackets with cantilever. External ductwork on roof areas shall be provided with angle iron cradle supports with square steel footplates. All burrs and sharp ends and edges shall be removed and made safe to touch, especially so in plant spaces. Provide and fix 6mm thick felt between ducts and supports to prevent sound transmission. All supports shall be degreased and painted one coat of chromate at works and one further coat after installation.

d) Balancing dampers shall be fitted on all main duct branches/sub-branches, whether specifically indicated on the drawings or not (due regard being given to their external accessibility), to facilitate the commissioning of the mechanical ventilation systems in accordance with the CIBSE=s recommendations.

Dampers shall be Air/Shield stainless steel aerofoil opposed blade pattern having low profile aerofoil stainless steel blades with facility for removal of the complete damper regardless of blade position. The blades shall be enclosed

in a galvanised steel casing of double skin construction 1.6mm outside, 1.0mm inside with fixing flanges having pre-punched holes.
The blade position shall be controlled via precision moulded gears and bearings in molybendum disulphide filled nylon, located outside the air stream and operated by an external locking wheel with coloured visual blade position indicator. All as manufactured by Actionair Equipment Ltd or other equal and approved.
Where balancing dampers are to be fitted in external ductwork, the Mechanical Contractor shall provide external access through an insulated weather proof access cover. Where dampers are required to be mounted in circular ductwork, 1.6mm galvanised steel adapter plates shall be employed complete with spigot connections.
e) Fire dampers shall be located in all positions where ductwork passes through a firestop barrier and shall comply with Fire Regulations and DW/TM3 B the Guide to Good Practice for the Design and Installation of Fire and Smoke Dampers.
Fire dampers shall be provided and installed to the types, sizes and manufacture as described in the Technical Section of this Specification. Unless stated to the contrary, they shall be as Actionair "Smokeshield", to the details given.
f) Access panels shall be provided at all terminal batteries, fire dampers, balancing dampers and motorised dampers, airflow switches, duct detector positions and all other locations necessary to ensure that the ductwork and ancillary equipment/plant can be cleaned and maintained efficiently.
These shall be 'Actionair' double seal access doors comprising a pair of 0.8mm galvanised steel doors, with continuous double seal fire retardant expanded neoprene gasket, 1.6mm galvanised steel saddle hinges and internal fibreglass insulation. The whole held in place with a retaining spring catch and nylon locking knob. All as manufactured by Actionair Equipment Ltd or other equal and approved.
g) Test holes with easily removable grommets shall be fitted after all items of equipment and at all main branches.
h) Ductwork shall be installed in strict accordance with TR/17 B the Guide to Good Practice for the Cleanliness of Ventilation Systems, and DW/TM2 B Internal Cleanliness of New Ductwork Installations
Irrespective of the specific requirements of TR/17 and DW/TM2, the ductwork installations shall be thoroughly cleaned out as the work progresses, all open ends shall be covered using polythene sheet or similar when work is halted/stopped for any extended period of time, i.e. - at the close of each working day.
i) All ductwork exposed externally, uninsulated, shall be suitably prepared and painted 2 coats chromate and one coat best quality bitumastic paint. All ductwork exposed internally, uninsulated, shall be suitably prepared and painted with one coat primer and two coats gloss, the colour shall be agreed with the Engineer before commencing.

2.19 Pressure Testing

On completion of the works, but before the application of any insulation the Mechanical Contractor shall be required to pressure test the services. Prior to the testing of any service, all pipework and equipment shall be cleansed of accumulated dirt or debris by washing or blowing through twice.
Pipework shall subsequently tested in accordance with the following quoted hydraulic pressures, which shall be held for 30 minutes without fall in pressure:-
a) Low pressure hot water heating pipework and chilled water pipework shall be tested to 6.0 bar gauge.

b) Steam and condense pipework shall be tested to 12.0 bar gauge.
c) Domestic hot and cold water down service pipework shall be tested to 10.0 bar gauge.
d) Gas pipework shall be tested to 2.0 bar gauge.
e) Laboratory gas pipework shall be tested in accordance with HTM 2022 and C11.
f) The ventilation installations shall generally be tested for air leakage as required under HVCA DW 144 and 154, and in particular HVCA DW/143 B the Practical Guide to Ductwork Leakage Testing.
The Mechanical Contractor may be called upon to test sections of the installed pipework, ductwork, etc. at various times during the course of this contract to facilitate progress, and shall make due allowance for this in his tender price.
In the event of the plant or any section or sections of the installation not passing the prescribed test, the Mechanical Contractor shall remedy all faults and the plant, section or sections shall be re-tested to the entire satisfaction of the Engineer.
The Mechanical Contractor shall allow for disconnecting all items of plant not suitable for the prescribed test pressures and reconnection work.
The Mechanical Contractor shall include for the provision of all necessary instruments, plant, labour and materials for carrying out the required tests.
The Mechanical Contractor shall provide a full compliment of all Test Certificates in duplicate to the Engineer; further sets of Test Certificates shall be included in the Operating and Maintenance Manuals.
Note - Where welding of pipes is carried out, the Mechanical Contractor shall allow for blanking off that section of the pipework with flanges and hydraulically testing as specified above. In the event that the weld shall fail the pressure test, then the weld shall be completely remade and retested until sound (caulking of welds will not be allowed on any apparent leak), the total cost being borne by the Mechanical Contractor.

2.20 Dynamic Flushing/Chemical Cleaning, Disinfection and Water Treatment

a) Dynamic Flushing (all pipework service installations) - immediately prior to commissioning/ handover of the installations, the Mechanical Contractor shall dynamically flush and chemically clean all pipework service installations in accordance with Clause 3.1.10.1 of B.S. 6700:1997, the Water Supply (Water Fittings) Regulations 1999 and BSRIA Application Guide 1/2001.
In this respect, it is essential that the system be flushed through until all debris, **including excess flux,** which may have collected in the pipework during installation, is thoroughly removed.
The Mechanical Contractor shall dynamically flush the pipework service installations to remove all solid matter; during this procedure all items of equipment which could be damaged by large elements of debris moving at high velocity should be byMechanical passed or removed B i.e. flow measuring devices, diverting/mixing valves and strainers. The dynamic flushing procedure shall continue until water samples drawn from the system are visibly clear, only at this stage will the flushing procedure be deemed complete.
Chemical Cleaning (all pipework service installations) - on completion of the flushing procedure, the Mechanical Contractor shall employ a Specialist Water Treatment Contractor to chemically clean all pipework service installations.
The Water Treatment Contractor shall dose the pipework service installations with an approved (system compatible) chemical cleaning agent for a minimum period as recommended by the manufactures; full system circulation shall be achieved during this process to ensure that all sections are adequately cleansed.
On completion of the chemical cleaning procedure, and once the chemicals have been dynamically flushed from the pipework service installations, the Water

Treatment Contractor shall flush the system with an approved neutralising agent.
b) Disinfection (domestic hot and cold water installations) - on completion of the above procedures, the Water Treatment Contractor shall disinfect/chlorinate the entire domestic hot and cold water installations (including all pipework services, CWS tanks, calorifiers, etc) in accordance with Clauses 3.1.10.2 to 3.1.10.5 of B.S. 6700:1997, Clauses G/R 13.2 and G/R 13.3 of the Water Supply (Water Fittings) Regulations 1999, BSRIA Application Guide 1/2001 and CP310.
During the disinfection/chlorination procedure, it is essential that any elements of the system that may be adversely affected by the chemicals B i.e. the water flow limiting restrictors, as Clause 2.14, shall be removed until such time that the system is proven to be clear of chemicals.
Subsequently, tests shall be carried out on random samples taken from the system to indicate that the water quality is acceptable within the following concentrations:-
Total dissolved solids B equivalent to the incoming raw water.
pH B equivalent to the incoming raw water.
Iron in solution B below 5ppm or equivalent to the incoming raw water, whichever is the greater.
Water quality, to be visually clear, bright and free from suspended solids
c) Water Treatment (heating and chilled water installations) B on completion of the flushing and chemical cleaning procedures, the Water Treatment Contractor shall dose the heating and chilled installations with an approved agent to ensure protection against microbiological growth/Agassing@ of the system, internal corrosion and limescale formation.
Refer to Section 4 of this Specification, for details of materials used in the project particular heating and chilled water installations; thus enabling the Water Treatment Contractor to ensure that the dosage chemicals are compatible with base metals used in boilers, chillers, pumps, etc.
Note - on completion of the flushing, chemical cleaning, disinfection and water treatment procedures, to the entire satisfaction of the Engineer, the Water Treatment Contractor shall issue certificates clearly indicating the procedures undertaken for each type of installation.
The certificates shall include a schedule of all chemicals used, and their applied dosage rates, and an analysis of the final water quality.

2.21 Commissioning

a) After completion of the installation or sections of the installation and tests as specified about, the installation shall be set in operation with all plant and automatic controls commissioned; pipework valves and ventilation air dampers, adjusted/regulated to the entire satisfaction of the Engineer.
b) The Mechanical Contractor shall be provided at commissioning stage with details of flow rates for all regulating valves and shall allow for adjusting these valves within the limits -0%/+10%. The reference number, identifying the position of the commissioned valve setting, shall be clearly identified in the Operating & Maintenance Manuals.
c) The Mechanical Contractor shall check the operation of air conditioning and ventilation systems. The Mechanical Contractor shall be provided at commissioning stage with details of air volume flow rates and shall allow for adjusting fan speed controllers, ductwork and grille air dampers within the limits -0%/+5%. The reference number, identifying the position of the commissioned damper setting, shall be clearly identified in the Operating & Maintenance Manuals.

d) The Mechanical Contractor shall allow for commissioning of all main items of equipment by the various manufacturers. Any such commissioned data, reference points and settings shall be clearly identified in the Operating & Maintenance Manuals.
Commissioning of the automatic controls will be carried out in conjunction with the Electrical Contractor and the Controls Engineer. All control settings - timed functions, set points, dead bands, etc shall be identified in the Operating & Maintenance Manuals.
e) The Mechanical Contractor shall provide all necessary supervision of plant and equipment for the carrying out of commissioning.
Fuel, power and water will be available to the Mechanical Contractor for commissioning purposes.
f) The Mechanical Contractor shall allow for demonstrating all balancing / commissioning results with the Engineer in attendance.
A schedule of all balancing/commissioning results shall be provided in duplicate to the Engineer, further schedules shall be included in the Operating and Maintenance Manuals.
g) Any leaks or defects that become apparent following commissioning shall be made good to the entire satisfaction of the Engineer.

2.22 Thermal Insulation

a) General

i) When all pressure testing and commissioning procedures have been completed to the entire satisfaction of the Engineer, then the Mechanical Contractor shall insulate all pipe work/duct work installations to minimise the loss of wasted energy (from standing system losses), to prevent the shedding of condensation and to protect the services from freezing.
The whole of the insulation work including the provision of valve boxes, covering and identification of services shall be carried out by a specialist Insulation Contractor who shall be a member of the Insulation Contractors Association, appropriate references must be provided prior to commencement of works on site.
ii) Any work which is carried out in an untidy fashion or where the application of insulation does not accord with recognised practice/the manufacturers recommendations, then the insulation will be condemned and shall be replaced at the Mechanical Contractors own expense.
Where exposed ends of sectional insulation occur, such as at small bore valves etc., the ends of the sections shall be neatly sealed/finished-off.
iii) Each service, whether insulated or otherwise, shall be identified by means of self-adhesive colour bands, which shall indicate direction of flow and coded to BS 1710 or the Client's particular requirements. The identification shall be affixed at all bends and junctions, and in any case at distances not exceeding 3 metres of pipe length.
iv) All mineral fibre insulation, where specified, shall be manufactured from stranded silk intermeshed to a uniform density of not less than 80 kg/m3, and the thermal conductivity of the finished sections shall not be greater than 0.035W/mK - complying with the provisions of BS.3958:Part 4:1982/Part 5:1986 and BS.5422:1990. The mineral fibre sections shall be finished with Class AO@ foil face, providing a continuous vapour barrier to prevent the shedding of condensation and to maintain the integrity of the insulation.
v) All Phenolic insulation, where specified, shall comprise 25mm rigid insulation panels, having a density of not less than 16 kg/m3; and a thermal conductivity of not greater than 0.02W/mK. The Phenolic sections shall be CFC free and coated as Kingspan Koolphen or equal and approved.

b) General Insulation Types

LPHW heating pipe work - to be insulated with mineral fibre rigid sections as iv) above.

Steam and condensate - to be insulated with mineral fibre rigid sections as iv) above.

Chilled water pipe work - to be insulated with mineral fibre rigid sections as iv) above. To prevent the shedding of condensation at support points, wooden block/Acrocodile inserts@ shall installed to match the full thickness of the insulation.

Domestic hot and cold water pipe work - to be insulated with mineral fibre rigid sections as iv) above.

Rectangular ductwork B to be insulated with Phenolic insulation as v) above.

Circular ductwork - be insulated with mineral fibre mattress, generally complying with iv) above.

c) Insulation within the Plant Room

All fluid conveying pipe work installed within the Plant Room shall be insulated with mineral fibre rigid sections to the thickness detailed in the schedule. All joints shall be butted together and secured with metal bands, over this shall be fitted Stucco embossed aluminium pre-formed sections fitted in accordance with the manufacturers recommendations.

d) Insulation within Floor/Ceiling Voids and Service Ducts

All fluid conveying pipe work located within floor/ceiling voids and service ducts, other than minor service boxing/s, shall be insulated with mineral fibre rigid sections with a factory applied aluminium foil finish to the thickness/s detailed in the schedule. All joints shall be butted together, longitudinal overlaps shall be stuck down with suitable adhesive, and butt joints shall be taped. Bends shall be mitred and wrapped with self-adhesive tape.

e) Insulation within Minor Service Boxing/s and Floor Ducts

Where space is limited, pipe work located within minor services boxing/s and floor ducts shall be insulated with flexible Class AO@ nitrile rubber insulation with a thermal conductivity not greater than 0.035W/mK and a minimum thickness of 13mm. The insulation shall be neatly butted and stuck with the manufacturer's recommended adhesive B the tapping of joints will not be accepted.

f) Pipe Work Insulation Thickness

All pipe work installations in service ducts, floor/ceiling voids, roof spaces and Plant Rooms shall be insulated in accordance with the following thickness schedule or to B.S. 5422:1990, whichever is the greater:-

Insulation Thickness (mm)

Pipe Dia. (mm) Steam/ Condensate	**Chilled Water**	**HTG. & HWS.**	**CWS.**
15 (2@)	30	25	25 25
20 (:@)	30	25	25 25
25 (1@)	40	38	25 25
32 (13@)	40	38	38 25
40 12@)	40	38	38 25
50 (2@)	40	38	38 25

65 (22@) 40 38 38 25
80 (3@) 50 50 38 25
100 (4@) 50 50 50 25
125 (5@) and over 50 50 50 25

g) Valve Insulation Boxes

Valves and flanges within service ducts, floor/ceiling voids and roof spaces shall be insulated with 'Topo' polyurethane boxes as manufactured by Falcon Insulation Products Ltd.

Valves and flanges within the Boiler House/Plant Rooms shall be fitted with insulation jackets, in each instance the valve/flange to be insulated shall be measured and jacket ordered to give a close fit.

The insulation jacket shall be type "Flex-Wrap", available from Carr Marketing Ltd., or equal and approved. The jacket and liner shall be Teflon coated glass fibre cloth, suitable for use over a temperature range of -55oC to 260oC, the insulation mat shall be 100% fibrous glass to a minimum thickness of 1".

h) Supply/Recirculation Air Ductwork

All rectangular supply and recirculation air ductwork shall be insulated with Phenolic insulation as vi) above, to a minimum thickness of 25mm. The insulation shall be secured with adhesive and piercing fasteners and securely wired into positions.

Ductwork insulation within the Plant Room shall be finished with Stucco embossed aluminium pre-formed sections fitted in accordance with the manufacturers recommendations, all joints must be sealed and edges strengthened.

All circular supply and recirculation ductwork shall be insulated with mineral fibre mattress, generally complying with iv) above.

i) Exhaust Air Ductwork

Where exhaust air ductwork has the potential to shed condensation, i.e. B bathroom extract ventilation routed through cold roof space, then the ductwork shall be insulated as v) above, complete a with continuous vapour barrier as an integral part of the thermal insulation.

j) External Pipe Work and Ductwork

All external pipe work and ductwork shall be insulated with mineral fibre rigid sections as v) above, thickness to BS 5422:2001. The insulation shall be complete with a factory applied aluminium foil finish and covered with two layers of PIB sheeting not less than 0.8mm thick and sealed by solvent or cold welding.

At pipe work/ductwork supports both insulation and outer covering shall be continuous and shall not be punctured by the supports. The insulation inserts at the supports shall be a material of sufficient density to take the loads transmitted.

2.23 Electrical Requirements

The electrical supply available shall be as stated in Section 4 of this Specification, electrical equipment shall be ordered as appropriate. All electrical wiring for permanent power, lighting and control circuits will be provided under separate contract. All wiring diagrams necessary to make clear the connections between various items of control gear associated with equipment supplied under this contract will be submitted in duplicate by the Mechanical Contractor for the Engineer=s comments, 4No. copies thereafter issued for distribution

Section 3
Mechanical Services Specification - Extent of Work and Conditions of Tender
Index
Clause Description

Section 3

Mechanical Services Specification - Extent of Work and Conditions of Tender

Section 3 of this Specification establishes the location of the site, the extent of the Mechanical service installations and any specific tender allowances particularly relevant to this Contract.

The Specification shall be read in conjunction with the Employer=s Requirements/ Works Information packages, which shall be obtained from the Lead Consultant (Architect/Project Manager) B should there be any discrepancies arising between the respective documents, then the Employer=s Requirements/Works Information packages shall take precedence.

3.01 Site Location

The site is located at**:** Allonsfield House, Campsea Ashe, Woodbridge.

3.02 Visiting Site B See Preliminaries

3.03 Tender Drawings B See Preliminaries

3.04 Brief Description of Works

The project involves the re-modelling, extension and refurbishment of an existing school building, as shown on the drawings.

The works will be phased in accordance with the Main Contractors programme, with the school remaining operational at all time.

It is essential that the Mechanical Contractor considers such phasing and make due allowance as deemed appropriate in his tender submission.

Architectural and Structural drawings covering all aspects of the building construction for this project may be obtained from the tendering Main Contractor. No additional costs shall be agreed or certified through the apparent lack of knowledge caused through not inspecting the said drawings.

3.05 Mechanical Services Scope of Works

The Mechanical services scope of works associated with this project shall require the Mechanical Contractor to provide a fully functioning system/s conforming to this Specification, the design/tender drawings - including commissioning/testing of all services to the satisfaction of the Engineer and the provision of "As Fitted" drawings,

Operating & Maintenance Manuals.
Mechanical services works shall generally but not exclusively, comprise:-

Site Services

The Mechanical Contractor shall cut back the existing incoming MCWS supply to avoid the new extension. A new water supply shall be routed from the main to serve the building. The Mechanical Contractor shall ensure these works are carried out in a timely manner and in accordance with an agreed programme so as to cause the minimum of disruption to homes operation.
The Mechanical Contractor shall be responsible for obtaining a quotation, ordering and programming the supply and installation of a dedicated 90mm supply from Cambridge Water Company to supply the sprinkler storage tank feed.
AWA Water Company=s costs are to be claculated and allowed for in the tender price The Mechanical Contractor shall include in
his tender for this profit and attendance on these works

Heating

With the exception of the alterations within the reception areas and adjacent vedroom which shall be heated by
radiators, the heating to the building shall generally be provided by means of under floor heating. There shall be a number of manifolds grouped into zones as follows:-
Each zone group shall be independently time controlled. An out of hours overrun button shall be provided within the Reception Area. Each individual zone shall be independently temperature controlled.
The air source heat pumps installation shall consist of

Domestic Hot & Cold Water

In accordance with the Water Regulations all hot water points (except where specifically noted otherwise) shall be fitted with thermostatic blending valves (TMV3) to limit outlet temperatures to 43□C.

Gas

Calor gas services shall be altered to suit the new layout and heating/laundry configurations, with ne under ground tanks as specified. All works on the gas installation shall be carried out by qualified and Gas Safe registered personnel.

Automated Controls and Mechanical Services Wiring

The provision of automated controls and the wiring of mechanical services equipment shall form part of this package.

3.06 Extent of Works

a) The Mechanical Contractor shall supply, deliver, erect, commission and set to work the whole of the works as described in this Specification and in accordance with the project drawings as applicable.
b) The works shall be carried out in accordance with the programme dates as specified by the Lead Consultant (Architect/Project Manager).
c) Throughout the Contract, the Mechanical Contractor shall give due consideration to other trades when installing mechanical services within shared service ducts, floor/ceiling voids, etc.
d) The Mechanical Contractor shall take particular note that the Lead Consultant (Architect/Project Manager) will not accept the installation upon completion of the building until the following items have been completed and approved by the Lead Consultant (Architect/Project Manager)/Engineer:-
Issue of Operating and Maintenance Manuals.
Issue of 'As Installed' drawings.
All Mechanical Services have been satisfactorily operated continuously for

two weeks without any defect arising.

3.07 Alteration to/Removal of Existing Services

The existing Mechanical services within the areas associated with this Contract are to be regarded as redundant, except where indicated otherwise and shall be removed.

The Mechanical Contractor shall include for isolating or local freezing of existing services where necessary to allow total draining down of the systems to facilitate removal of the redundant services. The Mechanical Contractor shall note that the integrity of the existing valves is suspect, a degree of leakage should be expected and as such due allowance should be made for local freezing of the services.

Those parts of the existing installation which are to be re-used are to be treated with care and intelligence during the works and any damage caused due to lack of compliance with the above shall be paid for by the Mechanical Contractor at no cost to the Employer.

Any existing items to be re-used are to be cleaned, overhauled and deemed to be in suitable working order.

Modifications to the existing services shall be made to maintain the continuity of services within the building. Particular consideration is required in respect of the installation programme relating to the alteration of existing piped services and the continued operation of other areas common to the system.

The Mechanical Contractor will be required to provide a detailed Method Statement relative to any such works identifying the duration of the works and particularly any periods which unavoidably result in disruption to the continuity of operation of services. **All such disruptions must be kept to an absolute minimum and shall be arranged in full co-operation with the Employer.**

The Mechanical Contractor shall note that due to the restrictive nature of site survey works, it has not been possible to fully ascertain the full extent of the existing services installation. The Mechanical Contractor shall therefore undertake a comprehensive survey of the existing services installation, to identify any variances with the perceived arrangement, such that due consideration can be given to adapting the proposed installation to suit.

3.08 Builders work

The expression Builders work shall mean that work which shall be carried out by the Main Contractor in connection with, or consequent upon, the electrical services works and will embrace such work given below. The Mechanical Contractor shall be responsible for marking out on site and providing drawings giving all necessary information for the execution of the works described.

The Mechanical Contractors attention is drawn to the high degree of accuracy and care required in the marking out of builders work requirements and the preparation of detailed drawings which shall be prepared only after careful liaison and co-ordination with other trades.

The cutting and forming of holes for conduit, pipe or ducts through walls, floors, ceiling, partitions and roofs and making good after the work is sufficiently advanced.

The construction of concrete and/or brick ducts in floors, walls, etc.

The formation of concrete bases and plinths for plant and equipment.

The building of manholes, pits, sumps, etc.

The excavation and forming of trenches for services, etc., and the filling in of same after the services are laid.

Excavation and forming of ducts and trenches for underground services

The cutting or forming of chases, recesses, in floors, walls and ceilings for pipes, ducts, conduits and fittings and making good.

Excavation for and laying of pipes or sleeves for carrying cables or other

services. The building in of brackets and holder bats or other form of conduit or pipe suspension.
The painting of all pipes, tubes and conduits, etc., other than that of a protective nature, after fixing, unless specified to the contrary.
The construction of plant room chambers, housings and builders work ducts.
The forming of access ways via doors, ceiling tiles, wall panels or manholes in floors.
In general all holes through walls, floors and beams for pipes and ducts will be formed by the Main Contractor during the process of the building works.
Where holes or other builders work of a significant nature have already been agreed by the Lead Consultant (Architect/Project Manager)/Engineer, the Mechanical Contractor shall check such builders work provision and satisfy themselves that the allowances are sufficient.

3.09 Supervisor in Charge

The Mechanical Contractor shall employ on site a working, full time Supervisor in Charge to oversee the Mechanical service installations on site B refer to Section 1, Clause 1.31 of this Specification.

3.10 Working Drawings/Builders work Drawings

Mechanical Contractor will be required to provide detailed working drawings of the Pipe work and ductwork installations, generally in accordance with Section 1, Clause 1.30 of this Specification; including site measured ductwork layout/manufacturing drawings prepared with due consideration to the interrelation with other services and principal building structural elements.
Builders work drawings shall also be provided, detailing service penetrations through the fabric of the building, equipment/plant supports and bases, etc.
The working/builders work drawings shall be provided by way of plans, elevations and sections as necessary, at an appropriate scale for clarity.
All drawings will require to be provided in good time prior to the works requiring to commence on site, such that the Lead Consultant (Architect/Project Manager)/Engineer can review the drawings provided, including requesting such changes that may be necessary, in an adequate time scale.

3.11 Procurement of Materials

It shall be the responsibility of the Mechanical Contractor to ensure all materials and labour is made available to enable the contract to be completed to programme requirements.
All materials are to be placed on order immediately upon the Mechanical Contractor having been appointed.
In the event of any delay in material obtainment, the Lead Consultant (Architect/Project Manager) shall be informed immediately to enable due consideration to be given by the Lead Consultant (Architect/Project Manager)/Engineer to alternative manufacturers or suppliers.

3.12 Offloading of Main Plant

The Mechanical Contractor shall include for offloading as necessary for the temporary and permanent positioning of **all** plant items such as boilers, CWS tanks, HWS cylinders, pipe work, controls and ancillary items. All costs arising from these works **must** be included within the tender.

3.13 CDM Clause - Factories Act/Plant Access and Maintenance

It shall be the responsibility of the Mechanical Contractor to ensure that the design and construction of the plant, machinery, equipment and installation provided and/or installed by him under this Contract shall comply in all respects with the requirements of the Factories Acts and the regulations made therein.
The Mechanical Contractor shall make due allowances as necessary in the design

and layout of all plant and equipment so that full consideration is given to further maintenance to fully comply with the requirements of the Health and Safety Executive Statutory Instrument 1994 No. 3140 Health and Safety.
The Construction (Design and Management) Regulations 2007 are to be enforced on this Contract; therefore the Mechanical Contractor shall allow to provide all information, method statements, etc., as required during the course of the works and shall as necessary provide and maintain a site Health and Safety File.
Prior to completion of the works the Mechanical Contractor shall provide the Planning Supervisor with 3 No. copies of the Health & Safety File incorporating comprehensive operating and maintenance documentation, together with record drawings, distribution board charts etc.

3.14 Fire Prevention

Fire prevention measures on construction sites are to be entirely in accordance with the provisions incorporated with The Joint Code of Practice on the Protection from Fire of Construction Sites and Buildings Undergoing Renovation, as published by the Building Employers Confederation, the Loss Prevention Council and the National Contractors Group.
The Mechanical Contractor shall take particular and stringent precautions in respect of fire prevention, and shall in addition note the following:-
Blow lamps and similar hot work appliances are in no circumstances to be used in connection with any part of the works except with the specific prior written permission of the Lead Consultant (Architect/Project Manager), and will be sanctioned only where no alternative method can be employed.
In such cases, a hot work permit system is to be followed, viz. the Supervisor in Charge, who will be required to inspect the site proposed works with the operative(s) involved; to satisfy himself that the proposed method of work is essential and agree how it is to be most safely done; and subsequently to instruct precautions as required.
i.e. - clearing away of flammable materials and provision of anti-fire blanketing and extinguishers.
Once these conditions have been met, the Supervisor in Charge will issue a permit to the relevant operative(s) for the specific operation(s) only and ensure close supervision and a careful post-operation inspection, endorsing the permit on return to certify that this has been done.
Any use of hot work appliances must cease at least 60 minutes before the site closes and a check be undertaken at the work face after a period of 30/60 minutes to ensure that conditions are safe and free of any fire risk. The Supervisor in Charge is to tour the site each night and make a fire security inspection immediately work has finished and operatives have cleared the site.
Portable and appropriate fire extinguishers must be made available to each operative at the work face where any soldering, brazing or welding operations are undertaken. When undertaking such operation in-situ, heat masking gauzes or shields must be employed to protect flammable building elements. In addition to the aforementioned precautions, the Mechanical Contractor shall allow for the provision of 3 No. chemical extinguishers in good working order and maintained throughout the works in accessible and convenient positions as agreed by the Lead Consultant (Architect/Project Manager). Ensure that all operatives know the position of extinguishers and are instructed in their operation.
Smoking will not be permitted inside the building or in/or above the roof space.
No Smoking notices must be posted at all points of entry.

Operations will be suspended if the above precautions are not being adhered strictly to, and the Mechanical Contractor shall be instructed to remove the offending personnel from site.

3.15 Instruction to Contract Administrator
At handover, the Mechanical Contractor shall include for 3 No. full days of attendance by the Supervisor in Charge and necessary specialist sub-Contractors, to fully brief/familiarise the Contract Adminstrator with the correct, safe and efficient operation of the new systems.

Section 4
Mechanical Services Specification B Project Particulars/Technical Section
Index
Clause Description

Section 4 Mechanical Services Specification B Project Particulars/Technical Section

Section 4 of this Specification establishes the technical aspects of this project relevant to the Mechanical service installations B the operating duty/capacity of all equipment and plant is clearly defined.

4.01 Clarification of Materials

References to Section 2 of this Specification, the following materials are to be utilised throughout this particular project:-

Clause 2.10 B All Heating Pipework shall be Heavy Grade Mild Steel to B.S. 1387:1957.

Clause 2.11 B All internal domestic hot and cold water services pipe work shall be run in Copper tube as manufactured by Yorkshire Copper Tube Ltd B their type Yorkex complying with EN1057-R250..

Clause 2.13 B All valves to be as Clause 2.13.

Clause 2.18 B All ductwork shall be manufactured from steel to DW144 in accordance with Pressure Classification A, Low Pressure.

Clause 2.22 B All LTHW and Domestic Hot and Cold water pipe work within ceiling voids shall be insulated using mineral fibre rigid section insulation with a foil face.

Where LTHW and Domestic Hot and Cold water pipe work is to be within walls or minor service risers, it will be acceptable to insulate using Class nitrile rubber

All pipe work within the plant room shall be insulated using mineral fibre insulation. The contractor shall finish the insulation using either Isogenopak or Stucco Aluminium.

All ductwork in roof voids and ceiling spaces shall be insulated using mineral fibre insulation with a Class AO@ foil face to the formation of condensation.

4.02 Incoming Mains Cold Water

The Mechanical Contractor shall cut back the existing incoming MCWS supply to avoid the new extension. A new water supply shall be routed from the main to serve the building. The Mechanical Contractor shall ensure these works are carried out in a timely manner and in accordance with an agreed programme so as to cause the minimum of disruption to the care homes operation.

4.03

4.04 Boiler/s to be located as plans, and with associated service, buffer tanks, tanks, expansion vessels in the Plant Room

Air Source Buffer Vessel

The Mechanical Contractor shall supply and install a buffer vessel to be used in conjunction with the air source heat pump system.

The Buffer vessel shall be manufactured by Dimplex and be supplied by Econic Ltd, or similar approved

The buffer Vessel shall generally be in accordance with the following schedule-

Capacity: To suit loading and requirements of the new and existing works

Design Pressure: 3.0bar

Dimensions: To be agreed

Connections: 2@ Primary Flow and Return

2@ Secondary Flow and Return

4.05 LPHW Calor Gas Fired Boiler/s

Service and leave in working order. This boiler/s shall be equipped with a valve and control centre to allow this to pick up any failure in one of the boiler/s, etc. The exact design and installations shall be agreed although a fixed costing is required in the tender package.

The Mechanical contractor shall supply and install the following fittings and accessories to the boiler or to pipe work immediately adjacent:-

25mm NABIC safety valve set 3.5bar with discharge to drain

Full bore isolation valves on flow, return and gas connections

32mm trapped condensate waste to drain

150mm Ø dial temperature gauges on flow and return

4.06 Circulating Pumps

The Mechanical Contractor shall supply and install the following circulating pumps.

The pumps shall be as manufactured by Grundfos Pumps Ltd (Their contact: Sean Blandford, Tel. 07917 605 770):-

The contractors shall assess, and allow for suitable pumps to provide an even and continuous flow to the systems an and allow flow and water temperature rates to be stable and consistent around the whole of the new building and extg. In the case of the radiators systems. It is important to allow for the temperatures specified throughout the buildings both new and existing, which the contractors shall be liable for supplying.

All twin head pump sets, when mounted in the horizontal positions shall be fitted with 1/8@ BSP tapping and automatic air vent. All twin head pumps shall be complete with blanking flange, to be hung on suitable wall bracket adjacent to the pump set.

The Mechanical Contractor shall provide a R100, infrared communication unit, which shall be wall mounted within the plant Room. Pumps shall be supplied with tapings for individual head d. p. switches and be fitted with Grundfos insulating kits.

All pumps shall be adequately supported on purpose made supports incorporating AV inserts and be installed in strict accordance with the Grundfos recommendations.

4.07 Rubber Flexible Connections

The Mechanical Contractor shall supply and install rubber flexible connections as manufactured by Stenflex and supplied by Engineering Appliances (Tel. 01525 876475), generally in accordance with the following:-

All Pumps P1 B 5

Type: Stenflex AS Tied EDPM Bellow

Model Ref: EA58-E (size to suit pump connection)

The flexible connection must be DIN 4809 compliant and a current DIN 4809:Part 1 Certificate should be submitted to the Engineer prior to installation. The flexible shall also have complied with DIN 86232 flames proof tested.

4.08 Heating System Pressurisation Unit

The Mechanical Contractor shall supply and install Pressurisation units and expansion vessels as designed by the heating sub-contractors.

Pressure Rating: 10.0bar

Commissioning The Mechanical Contractor shall allow for full on site commissioning by the manufacturer.

4.09 Deaerator and Dirt Separators

The Mechanical Contractor shall supply and install a line mounted integrated Dearator and Dirt Separator.
The unit shall comply with the following requirements-
The Dirt Separation side shall remove all particles of dirt heavier than water, down to 5 micron and less.
The unit shall have a mild steel housing and must be fitted with non-clogging helicoidal separation tubes manufactured from stainless steel.
The unit shall be flanged to PN16, and fitted with a quarter turn ball valve at the lowest point to allow dirt removal whilst the system is operational.
The unit shall have an air release system which shall comprise of a solid polypropylene float not rigidly coupled to the air release valve. The valve shall be spring-loaded so providing positive shut off. This AAV shall incorporate a three way valve positive shut-off to the AVV for servicing and protection from dirt during filling/flushing, an outlet for fast venting/skim and normal venting operation.
The unit shall have a standard maximum operating temperature and pressure of 110oC and 10 bar g respectively and must be CE marked in accordance to the PED regulations.
The pressure drop across the combined unit shall remain constant regardless of the amount of dirt trapped.

4.10 Water Treatment - Heating System

The exisitng system shall be drained and filled with 1.0% FERNOX COPAL **CENTRAL HEATING PROTECTOR**
After flushing and dosing of the system the Mechanical Contractor shall take water samples from the two furthest drain cocks and send them to Fernox for analysis. The Mechanical Contractor shall submit the test results of these samples to the Engineer for approval. Copies of the records shall also be included in the maintenance manuals/log book.

4.11 Radiators - <u>NONE</u>

The Mechanical Contractor shall supply and install Low Surface Temperature Radiators in areas of the exisitng building as altered and requiring new radiator location.
All outputs based on a mean water temperature of 45oC and 21oC room temperature.
All radiators shall be configured with 15mm BOE connections.
Radiators are to be complete with the following:-
1 No. aircock at high point
Blanking plugs for unused radiator tappings
Radiators shall have fitted on the flow connection a type VK5 external thermostatic radiator valve and a pre-commissioned lockshield valve on return connection all as manufactured by Oventrop

4.12 Under Floor Heating

The Mechanical Contractor shall install a plated under floor heating system as Manufactured.

The Mechanical Contractor shall be responsible for the installation of all heating distribution pipe work and equipment up to and including the heating.

The under floor approved specialist shall design and install all subsequent pipe work including the pump sets, mixing manifolds, flow meters and UF heating loops in a tray system along with the installation of all room thermostats, intermediate wiring and control panels.

Heating manifolds shall be installed to feed the new zones

The Mechanical Contractor shall ensure that their tender return includes for the following services, undertaken by the specialist under floor sub contractor and their specialist installer -

Full Design including fully detailed calculations indicating the water flow rates and pressure drops, predicted surface temperature of the screed during operation etc., and full working drawings indicating manifold locations, pipe work layout. The under floor heating layout shall be co-ordinated with other Mechanical and Electrical items.

The supply and installation of all under floor heating manifolds and heating loops

Commissioning of the under floor heating installation.

Provision of AAs Fitted documentation and ensure that all warranty certification shall be enclosed within the operating and maintenance manuals.

The specialist installer shall allow for the following additional items within their Quotations:

500 Gauge Polythene Membrane

Tamper proof room thermostats to every room

Design backed by their PI insurance

Supply, installation, testing and commissioning

Each manifold shall consist of separate flow and return sections manufactured from DZR brass. Drain and fill cocks to be fitted to both flow and return sections. Flow sections to be complete with manual valves, which may be replaced with thermo actuated valves on each loop allowing individual control of loops or zones.

Each under floor heating loop shall consist of continuous lengths of PEX pipe having a wall thickness of 2mm (minimum) and a nominal diameter of 16mm. Only personnel fully trained and qualified in the installation of Giacomini under floor heating systems shall install the under floor heating pipe work.

The under floor heating pipe work matrix shall conform to all current regulations and have Water Council approval. The pipe work shall be complete with integral oxygen diffusion barrier, to prevent the ingress of oxygen and so preventing corrosion to the heating system.

4.14 Thermostatic Mixing Valves

The Mechanical Contractor shall provide and install local mixing valves to all HWS draw-off points. The valves shall comply in all respects with TMV3 Certificate No. ETC/28/0997 and the requirements of NHS Model Engineering Specification B DO8.

The valves shall be pre-set at the manufacturers works to provide a maximum outlet temperature of 41oC, when served with hot/cold water at a maximum pressure loss ratio of 10:1 in favour of either supply.

The valves shall be complete with in-line isolating, double check valves and strainers on both the hot and cold water inlet ports - the valves shall be complete with tamperproof casing.

4.15 Chlorination

Once the systems are complete, chlorination of the domestic systems shall be carried out. The Mechanical Contractor shall allow for chlorination of the domestic services from the position of all mains cold water inlet connections, all hot water pipe work and all cold water distribution pipe work shall be thoroughly cleansed and then sterilised by the application of chlorine in accordance with BS Code of Practice CP310 to the satisfaction of the Engineer, including providing all test certificates.

4.16 Extract Fans

The Mechanical Contractor shall supply and install extract fans as specified items. This shall include costs for design, installation, builders works, supply, electrical installations, ducting, grills cowls, etc to completion and with all being left in working order and operation.

4.17 Mechanical Services Controls

4.17.1 Automatic Controls

The Mechanical Contractor shall be responsible for the ordering and programming of the automatic controls.

The Controls Engineer shall be directly responsible for the construction, supply, delivery, installation, connection and commissioning of the field control items, terminal actuators, sensors, the Mechanical Services control panel, etc.

The Controls Engineer shall appoint and place their order with an approved Electrical Services sub-Contractor who will provide and install all site wiring associated with the mechanical services plant and equipment (control and power), general lighting, small power, etc.

Note:- The Mechanical Contractor shall liase with the Controls Engineer immediately upon his successful appointment, to discuss/agree the integration of the electrical services and controls installation within the defined working programme.

The Mechanical Contractor shall place an early order for the Controls Engineers works - on receipt of which they will commence production of working drawings, software/graphic design, ordering of equipment, etc.

The Mechanical Contractor shall allow for attending commissioning of the control systems with the Controls Engineer. The Mechanical Contractor shall also allow for training periods of the Client in the proficient use of the controls within his programme, refer also to Specification Clause 3.16.

The Controls Engineer shall provide the following controls information with all documentation handed in duplicate to the Engineer with further sets to be included in the Operating and Maintenance Manuals to be prepared by the Mechanical Contractor

Layout drawings indicating the installed position of all loose field controls - and/or attend site with the Mechanical Contractor to identify locations on site during the installation period.

Wiring diagrams for control panels B copies to be issued to Client for approval prior to the commencement of any construction works.

Description of the automatic controls system and intended operation.

Final commissioning report.

Full parts list with reference to plant and As Fitted drawing.

Periodic visits are to be made by the Controls Engineer, as necessary during the Contract, to supervise the installation of the control equipment, associated power and control electrical wiring, etc and during the commissioning of the complete installation - the Mechanical Contractor shall co-ordinate such visits.

4.17.2 General System Description

The Mechanical Contractor/ Controls Engineer shall supply and install a packaged system to control the main plant located within the Plant Room

4.18.3 Selection of Controllers, Valves, etc.

Controllers and sensing elements shall be carefully selected and provided by the Controls Engineer, for accurate control and rapid restoration of desired values in each application, proportional bands being as narrow as possible consistent with the avoidance of hunting.

Three-way control valves shall present a constant resistance to the water circulating system and tenders shall state the type of characterised valve plugs offered.

Scale of ranges, proportional bands of measuring units and hydraulic resistance of correcting units shall be stated in the Operating and Maintenance Manuals.

4.19.4 Control Panel

a) General

The control panel shall mean the composite unit as a whole, comprising sections such as:

Incoming isolator, interconnecting busbar section and necessary fuseways.
Indication and control.
Motor starter panels
Auxiliary supplies section
Relay section
Entry and exit gland plates, terminals and labelling

The general arrangement of contactors, relays and other control equipment to be the subject of discussion and approval before manufacture commences.

The control panel shall include components by the following manufacturers

Isolators and or switch fuses A.B.B. STROMBERG AC23 DUTY
Miniature Circuit Breakers MERLIN GERIN
Moulded Case Breakers TELEMECANIQUE
Motor Starters/Contactors TELEMECANIQUE
Indicators TELEMECANIQUE
Selector Switches TELEMECANIQUE
H.R.C. Fuses (BS88) LAWSON
Terminals KLIPPON
Panel Cabling TRI-RATED 105oC(Coloured & Numbered)
Instrumentation NORTONIC=S
Cable Entry Mains Supply Bottom
Cable Entry Outgoing Top

The Mechanical Contractor shall supply and install 1 No single section wall mounted enclosure measuring approximately 1600mm wide X 1000mm high X 300mm deep finished to RAL 7302. A 63A TP & N door interlocked isolator shall be fitted in the incomer.

b) Indication and Control

The voltage of all contactor relays coils shall be 240V AC.

The extent of equipment/plant operation and warning indictors, mounted on the face of the control panel, shall be as scheduled within the Controls Engineers= quotation.

The precise wording of labels adhering to the operation and warning lamps shall be agreed with the Client/Engineer.

Indicating lamps shall be of the LED cluster type - red Aplant tripped@, - green Aplant running@. Lamps shall be mounted to the panel face plate.

Face panel mounted switches normally associated with boilers and pumps shall not

be installed, the BEMS control modules shall be complete with override switches/sliders
c) Motor Starter
Starters shall be of the DOL type for motors up to and including 5.5kW.
Overloads shall be thermal type with single phase protection - heater elements directly connected up to 22 amps.
MCB type shall be utilised for sub-circuit protection.
d) Panel Wiring
All control wiring of panels and junction boxes shall be carried out in LSF insulated single core cable of the appropriate size - each cable shall be fixed with slip on interlocking number ferrules at each end.
Terminal boards shall be provided for all external control circuit connections. These shall be positioned within the confines of the appropriate panels allowing for easy access for connections and disconnection.
e) Labelling
The method of labelling shall be in accordance with Specification Clause 1.44, the exact wording shall be agreed with the Client/Engineer.
Circuit title and device reference labels shall be provided -these to be positioned as close to the component as possible.
MCB bank assemblies shall be provided with a circuit chart to indicate the items served.

4.20.5 Electrical Installation
The controls specialist shall supply and install all power and control wiring, from their control panel to feed all external controls and sensors. The incoming electrical supply for the panel shall be provided by the Electrical Contractor. These works shall include the wiring of all items.

The wiring installation shall include all local maintenance isolators.
Pipe work serving the respective sprinkler heads shall be sized in accordance with pre-calculated British Standard pipe schedules; the pipe work shall be prefabricated from medium weight black mild steel to BS EN 10255 and joined by means of malleable iron screwed, rolled grooved or weld type fittings as deemed appropriate. All prefabricated pipe work and materials shall be installed with one coat red oxide primer applied, suitable for additional decoration by others as required.
The sprinkler heads shall be quick response type, pendent spray pattern with standard white finish and matching rosette - all sprinklers shall be rated for activation at 68□C.

4.21 Sundries
The Mechanical Contractor shall leave on site the following sundries to be secured in a tool box fitted with padlock and key:-
2 keys for each make and size of lock sheild valve
2 aircock keys
2 adjustable spanners, covering the range of nuts used on site
2 keys for the mechanical services controls panel
A diagrammatic layout of the plant room in a glazed frame shall be mounted on the boiler room wall. All valves and plant shall have labels affixed which correspond to this chart.
Insulating rubber mat to be placed in front of control panel.

4.22 First Years Maintenance

Notwithstanding their obligations under the Defects Liability Period, the Mechanical Contractor shall include a cost to provide both routine and emergency maintenance for a period of one year (12 months) following Practical Completion.

The emergency cover shall include 24hour emergency call out B with same day response.

The extent of the maintenance works, for each individual item of equipment, plant or service B shall be in accordance with HVCA SMG2000 B A Standard Maintenance Specification for Services in Buildings

4.23 On Going Heating Maintenance

The contractor within his tender shall provide a ongoing maintenance contractor the first 24 months as soon as the practical completion certificate is released. This shall include the ongoing maintenance for the LPG gas boiler/s, and ancillary items, for the domestic and hot water system, heating, etc. Provide costs if required for the individual Items

C. Hot Water Storage & Supply:

The contractors tendering must allow for a hot storage system that is suitable for the buildings proposed consumption *(options are open for contractors to design)*, and must include all pipe work, etc., to allow delivery to each part of the building. The storage tank shall be positioned in the plant room, or within the loft space subject to truss designs, insulation, access and ease of ongoing maintenance, being accessible for servicing with ease. NOTE: Cold water storage tanks are positioned in the loft spaxce which appear disused- check and isolate if necessary or reuse if this is possible

The storage tank shall be complete with all isolation valves, insulation to suit the location, which must include pipe work to complete. The hot water storage system and cold water storage/supply tanks must be able to support 50% operation of showers and the basins/sink also in use at the same time.
It is critical that good supply levels are achieved, so the design must consider this fully.
Hot water storage and circulation must be strictly in accordance with the Code of Practice previously described which Code of Practice also represents normal, good practice. The Contractor is reminded of the need for segregation and separate valving of circuits and for the valving of individual outlets to permit simple repairs. Hot water is required to every location where a sink, basin, or shower head is nominated together with not less than one sinks & basin. Hot water is required in each individual location.
Hot water temperatures emerging from any tap that may be used by elderly or children shall not be higher than 48^{o}c. Hot water delivered to the plant room sink, etc. may be delivered at the higher temperatures consistent with the room use. This is achieved by individual key access mixing valves. Experience shows that it is not practical to meet the requirements of temperature control by controlling circuits. It is necessary to have individual mixers/taps local to individual outlet installations.

Valves to all basins, showers, etc. Noting showers and basins can be supplied by TMV compliant taps/controls.
A WRAS Approved, DN 20 thermostatic mixing valve (TMV)
certified as compliant with the performance requirements of the *NHS Model engineering specifications D08 Thermostatic mixing valves (Healthcare premises)* and BS 7942. Testing and approval to these standards is administered by Buildcert under the TMV3 Scheme.
Please note that the use of purpose made TMV3 tap is specified in most locations.
The same conditions of proper installation, maximum concealment, neat penetrations, etc. together with the separation of systems apply to hot water as have previously been described for other services.

Heating of these premises is a major cost. Pipes should be lagged for maximum heat conservation using proprietary lagging sections fixed with proper clips, not simply located with tape or similar material.

Motorised valves introduce a further maintenance liability and failure of a motorised valve can cause problems. The care home operators have a legal liability to maintain heating to the stated standards at all times and any detail should be avoided which increases this liability.
Testing cannot proceed with rooms in occupation and all preliminary testing and balancing must be complete before handover. The Employer is aware that both the mode of operation and the occupancy affect heat input but any balancing left until after occupation must be relatively minor.
The contractors tendering shall note the need to supply a design layout and heat loss calculations based upon his chosen radiator design. This must take into account the current building requirements and layout, together with the requirements for an efficient system, air source heat pumps & boiler, so as to reduce the running costs of this establishment.
In conjunction with the hot water installation the contractor shall allow for the cold water storage tank if required (agree along with location) which shall be complete with all isolation valves, insulation to suit the location, which must include pipe works (insulated) and tank its self insulation, tank lids insulated, etc., a suitable sized and designed tank stand.

D. Plumbing:

Provide all cold and hot water supply pipe work to complete the installation and to all sanitary, kitchen and boiler installations. The pipe work shall be copper to BS 864, with all fittings and fixings to compete the works to the satisfaction of the Surveyor.

All sanitary, kitchen and boiler equipment shall have isolation valves fitted. Provide a drain off tap adjacent the incoming stop valve. All pipe work shall have bends at changes in direction, and elbows are to be avoided where ever possible.

All pipe work except where exposed shall be insulated in accordance with BS5422. Exposed pipe work shall be clipped back in all instances, and with approved clips and fixings.

WC cisterns shall have external overflows with frost guards as approved by the local water authority.

Provide loft storage tanks for cold water and expansion as necessary, and complete with approved stands, supports, and insulation to the tanks and pipe work. Overflow required with insulation also.

E. Water Services:

1 Mains Supply:

Allow for the extension of the existing cold water supply from the current location/meter to room, all in strict accordance with the Water Safety regulations, recommendations, etc. The contractor will on acceptance of his tender provide design solutions to facilitate the cold water supply to be located within the new plant room.

2 Cold Water Service:

The Contractor design will be responsible for the complete cold water supply from the main to delivery at individual fittings via a suitable storage facility all housed in the loft of the new roof void/s. This shall be designed to allow adequate cold water supply to each cold water outlet and the hot water storage to be installed as looped hot water distribution system to all hot water outlets . We draw your attention to the Code of Practice -The Control of Legionellae in Health Care Premises. The Contractor is referred to the Good Practice documents giving a maximum of 24 hours storage for tanks (or more correctly a 24 hour turnover). The Contractor is then referred to the supplementary diagrams regarding the connection and details of these tanks with all of which provisions we wish to comply. It should be noted that these stipulate the ability to withdraw tanks separately for the purposes of maintenance as in the case of the boilers and this requires a valving system and pipe connections easily accessible from the roof access ways to facilitate this work.

3 Hot Water Service:

The contractor shall allow for suitable storage capacity for the building and the various outlets to be supplied and operated within the new works. The final capacity being agreed, but design based upon the operation and capacity requirements of each –WC 5.0 litres; basins 5.0 litres; showers 10 litres, etc. The final design proposals shall be agreed at the contractors design stage.

The same conditions of proper installation, maximum concealment, neat penetrations, etc. together with the separation of systems apply to hot water as have previously been described for other services. The hot water looped distribution shall be in the main via gravity feed, but to gain the head of water and storage will we consider require the use of a pumped water service. The type and size to be agreed. The layout and position of pipe work, pumps (looped system), storage vessels shall be noted on a plan for client approval and updated in the normal manner for the CDM file.

F. Mechanical Ventilation:

1. Provide a mechanical extractor fan to each of the following areas, which shall be ceiling mounted with insulated ducting and external roof tile outlet, where possible, or through the wall with external grill, ducting, and cavity tray as is appropriate. The outlet shall be fully water tight in construction and match the main roof tile colouring. Extract fans manufacture/type to be agreed with the client. Provide moisture traps to all extractor fans that have a vertical lift.
2. Toilets (male & female) & Shower & changing area: Provide a mechanical extract fan capable of extracting at a rate of not less than 15 litres per second, with this being linked to the light switch and an overrun of 15 minutes provided with humidistate control. A whole building solution is not possible due to the sound transmission and fire protection issues.
3. Provide a design with air flow calculations in support of Part F 2006 revision of the approved documents.
   Background shall be as the approved document Table 1.2a sq mm equivalent ventilator area shall be in strict accordance with the table. Obviously for extensions this is not achievable, but see windows/doors.

   Note that the final location of ducts for the fans shall be agreed, along with the terminating grill system to be employed by the contractor. Inline fan systems are permissible

J. Electrical Installation:

The whole of the works shall be carried out in accordance with the latest edition of the Regulations for the Electrical Equipment of Buildings. The installations and commissioning shall be carried out by an electrical engineer who is a member of the NICEE or similar accredited system, and shall issue test/completion certificates at the completion of the works. These certificates must be handed to the Contract Administrator. The installations shall be carried out in accordance with any stipulations or requirements of Eastern Electricity. The layout of outlets and fittings shall as near as possible match the plans and include all necessary making good of the wall, ceiling and floor surfaces to the satisfaction of the Contract Administrator on completion. All chasing shall be completed by a mechanical method Finally agree the position of each outlet, etc, so as to avoid costly alterations later.
The electricity supply shall be as noted previously to the property and positioned. The contractor shall, provide all cable sheathed and protected as applicable. It is preferred that cabling is exposed in roof spaces, floor voids or in accessible ducts, exposed dado rails or within the rooms themselves. The minimum quantity of cabling should be embedded.
The contractor shall allow for protection against indirect contact with the supply by providing main earth bonding to conductive parts of the building and installations including the following:- main water supply, main gas supply other service pipes/ducts, central heating system and exposed metallic parts of the building structure (bath, sink)etc..
Provide Protective multiple earthing. All earth clamp shall be in accordance with BS951.
Provide automatic disconnection of supply and earth fault loop impedances, with disconnection designed not to exceed 0.4 seconds. The contractor shall confirm if this is possible with the current system in place.
The contractor shall include typed circuit schedule to be within a suitable log book within the meter room.
The whole of the wiring shall be of PVC insulated and sheathed cables and conform to BS6004. The wiring shall have copper conductors, and earthing facilities as required, circuit protective conductors, separate protective conductors. The wiring shall be loop-in system and with no junction boxes.
All connections shall be made in terminals of switches, sockets and ceiling roses.
Cables shall be secured via wiring clips to walls, and ceiling joist and in an approved manner.
The wiring shall be all enclosed in a plastic conduit should the cable not be able to be drawn through the existing conduits.. The plastic conduit shall extend at least 25 mm into roof void.
Wiring in the roof void shall be to the trusses and on the upper face (not below or in insulation).
Cables shall not be installed in the ground floor structure.
All boxes, switches and sockets, etc, shall be fixed to the walls with no less than 2 no: screws, with cable protected at these boxes with rubber grommets.
The lighting points shall be wired to a sub-circuit and connected to a 5amp circuit breaker.

Socket and wiring shall be carried using a ring circuit with conductor size cable, and connected back to a 30 amp circuit breaker. No spurs off this loop shall be permitted.
Provide all switched spur outlets, for fans, timer and thermostatic control unit, with all cables in suitable surface conduit as applicable, and back to an individual circuit breaker. These positions are not shown on the plans, but must be included in the contractor tender.

Mounting heights: None necessary as the building will only have fused isolators to the hand driers @ 2.2 m above finish floor levels

Note that all fittings shall be in accordance with Part M of the current Building Regulations.

The contractor shall allow for an adequate amount of light switching points throughout the building, to allow operation and isolation of any light fitting within the building. This may cover a whole area between say fire doors, to stair enclosures, etc. The final details will be agreed with the client. Noting that most lights are retained in an ON position during the day & night through the use of PIR controls as lighting specifications.

At completion of the contract and following the labelling and notation exercise the Contractor will supply to the Employer detailed circuit and control drawings enabling attention in emergency by any qualified electrician without the need for circuit tracing.

A. A system is preferred whereby there are localised sub-distribution positions (in locations approved with the Employer). All main and sub-controls must be securely installed and with the added security of a locking system to avoid interference by staff or residents. Only authorised staff should be able to access these controls save for the operation of emergency switching.
Certain electrical work is obviously involved with other installations and in those particular cases we do not wish the margins to be blurred or for there to be an over-provision or shortfall in the work and it may be helpful to make the following suggestions for the division of costing on particular items.
B. Loft Space: Remove all redundant wiring.
C. Cabling and Conduit
All cabling and conduit shall be concealed and where embedded in wall surfaces shall be run regularly and in compliance with current recommendations. If embedded in wet plaster surfaces the chasing shall be sufficient to permit proper depths of plaster over.
D. Chasing Generally
All chasing shall be mechanical not hand and the size shall be to the minimum for the use required without removal of excess material. The degree of chasing in any structural walls shall be within the limits approved by the Contractors engineer. Note that back to back chasing and socket boxes is not allowable due to the reduced sound qualities of walls created by such operations.
E. Accessible Cabling
The Employer prefers the maximum volume of cabling to be accessible in ceiling spaces, in roof spaces and in accessible ducts, or in exposed skirting or dado ducts within the room spaces themselves. The minimum quantity of cabling should be embedded.
F. Switching and Socket Outlets
Socket outlets should all be 2-gang switched 2-socket outlets to not less standard than MK white plastic and fitted in accordance with the current recommendations for safety and accessibility. Socket outlets should not be fitted close to baths, basins, showers or toilets where dangerous situations might occur.
G. Lighting
The whole of the premises as altered & extended will be lit to good modern standards through a variety of light fittings. – As appendix items
H. External Lighting – As appendix items
External lighting will be required at escape doors, on prominent escape routes, at the points noted on the plans, with manual override internally placed in a room adjacent etc. External lighting shall be provided to ensure that all areas around the building can be lit by night staff and the presence of unwanted persons determined. *The contractor shall not repeat works that are already in place. As these will be retained, unless specified.*

I. Door Closing System
The contract will provide closer to GFD.1 as specified, and include for the electrical operation each shall be fitted with an electrical supply, isolation switch, connection to the closures. Commission and leave in working order.
J. Solar & Movement Controls – As appendix items
The electrical contract will include the provision of solar & movement RIR controls on internal/external lighting overridden by internal manual switching within the plant room
K. Lighting – As appendix items
Lighting with the exception of emergency light. Shall be in accordance with Approved Document Part L2 1.48 & table 8., of the Building Regulations.
This shall be strictly adhered to throughout the building works.
L. Lighting Design:
The contractor shall use the lighting layout and fittings and fixtures as provided by "Dextra"

Any changes to the specified lighting shall be agreed with the client, at the contractors design stage.

K. Communications Installations:

Emergency Lighting:
The contractor shall provide lighting as required, which shall include internal and external emergency lighting system to each communal room created, disabled toilet, corridors. link, communal room, ensuite/s, bathroom, shower room, etc. inclusive.
All to BS 5266 Emergency Lighting: Part 1: 1988.

See Dextra Lighting layout and pricing

L. External Services:

A. Gas:
The contractor will connect the new boiler to the existing gas supply within the plant room

B. Electrical:
The contractor will on acceptance of his tender provide design solutions to facilitate the proposed alterations for the proposed layout, along with new MCB and at least 2 extra fuses, etc.

1. Note retain electrical outlets in plant room – update to regulation requirements
2. Provide all switched spur outlets for specified electrical items
3. Provide all controls for heating, water heating, lighting equipment

All in strict accordance with the Electric Safety regulations, recommendations, etc.

C. Water:
Allow for the extension of the existing cold water supply from the current location to new works, along with hot water installations, and isolation throughout to allow good maintenance protocols

All in strict accordance with the Water Safety regulations, recommendations, etc.

M. Drainage:

1 Existing Drainage:

Position noted on plans of the site, but should be checked on site.

The contractor shall allow for all works for the alterations required to alter, replace and re-route the private foul water drainage on site so as to understand the layout and requirements set out for the new shower basin, trough basin and toilet layouts

2 New Foul Drainage:

The contractor shall determine the route of the foul water discharge and clean/alter to suit. The contractor shall agree layout and design issues, related to the drainage, on site. The contractor shall however provide within his tender price full costing for foul water drainage & discharge to the building works.

All new drainage shall be 100/225 mm dia PVCu below ground drainage, flexible jointed with all necessary fittings and fixings to complete the works to the satisfaction of the LA BCO requirements, and laid in an approved granular bed and surround to falls as noted on the plans. Drainage that passes under the building shall be secured off the walls and or underside of the beams in an approved manner.

Build in suitable reinforced concrete pre-stressed lintels over drainage that passes through the new walls, and complete with 50 mm clear gap around the pipes. With the resulting opening being masked each side of the wall with 'Masterboard', or similar ridged boarding material being screw fixed to the internal and external faces.

Form new inspection chambers in class 215 mm class 'B' engineering brickwork all off a 250 mm concrete reinforced base that projects 300 mm beyond the outer face of the brickwork. The chambers shall be 900 x 675 mm internal dimensions up to and including 1000 mm depth and 1240 x 675 mm above 1000 mm depth, and complete with step irons, benching, concrete reinforced capping, and heavy duty covers and frames all with screw fixings to complete. The covers shall be galvanized finished and level with the new ground/paving levels.

All inspection chambers and gullies shall be suitable for the paving and recessed type.

Provide gullies as noted on the plans which shall have rodding access points within each, and a screw fixed cover to restrict access. All pipe connections to gullies shall be made below ground levels, and bedded in concrete in an approved manner. Provide a concrete base to the SVP also.

Provide protection to the foul drainage, and where less than 600 cover is provided above the top of any pipe.

The protection shall be of concrete paving slabs build over drainage within the garden and access path areas, and a 200 mm thickness concrete with A142 steel fabric reinforcement, with a bearing of 200 mm onto virgin soils.

Provide a rodding access at the head of the drain, and as noted on the plans with access cover and frame all screw fixed.

Provide a SVP where one may not be present, at the head of the drainage in a position agreed with the LA BCO.

Provide design layout for approval.

Provide as built layout on completion of the works for ongoing site maintenance.

3 Surface Water:

Replace the existing guttering and down pipes with new utilizing where possible extg. discharge and rise and fall brackets.

New shall be cast irn throughout complete with fittings and fixtures to complete, along with black finish to match the extg. design features.