

**TECHNICAL SPECIFICATION
FOR THE
MECHANICAL SERVICES INSTALLATION**



**REFURBISHMENT OF THE GALLOWGLASS COMMUNITY CENTRE,
MILFORD, CO. DONEGAL**

PROJECT No. 2361

APRIL 2026

PREPARED BY:

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CONTENTS

SECTION A – CONTRACT PRELIMINARIES

SECTION B – SCOPE OF WORKS AND PARTICULAR SPECIFICATION

SECTION A – CONTRACT PRELIMINARIES

CONTENTS

A1.0	GENERAL CLAUSES
A1.1	PROJECT PARTICULARS
A1.2	TENDER
A1.3	CONTRACT PRELIMINARIES
A1.4	DISCREPANCIES IN TENDER DOCUMENTS
A1.5	VISIT TO SITE
A1.6	PATENTED ARTICLES
A1.7	RESOURCES, TEMPORARY WORKS AND SERVICES TO BE PROVIDED BY THE SUB-CONTRACTOR IN CONSTRUCTING THE SUB-CONTRACT WORKS
A1.8	PROGRAMME OF WORK
A1.9	ALTERNATIVE MANUFACTURERS
A1.10	INFORMATION REQUIRED FROM THE SUB-CONTRACTOR
A1.11	RESPONSIBILITIES (SERVICES COORDINATION)
A1.12	DEFECTS LIABILITY
A1.13	VALUATION OF THE SUB-CONTRACT WORKS
A1.14	INSURANCE AND INDEMNIFICATION
A1.15	COMMENCEMENT AND COMPLETION
A1.16	DRYING OUT
A1.17	REGULATIONS
A1.18	SUITABILITY OF MATERIALS AND PRODUCTS
A1.19	ORDERING MATERIALS AND PRODUCTS
A1.20	HANDLING AND STORAGE OF MATERIALS AND PRODUCTS
A1.21	SAMPLES OF MATERIALS AND PRODUCTS

A1.22	<i>PROTECTION TO FIXED AND UNFIXED ITEMS OF PLANT</i>
A1.23	<i>DELETERIOUS MATERIALS</i>
A1.24	<i>HOUSEKEEPING AND SITE CLEANINESS</i>
A1.25	<i>CONDITIONS OF SITE ON COMPLETION</i>
A1.26	<i>TENDER DRAWINGS AND DOCUMENTS</i>
A1.27	<i>DISAGREEMENT</i>
A1.28	<i>DESIGN RESPONSIBILITIES</i>
A1.29	<i>TESTING AND COMMISSIONING</i>
A1.30	<i>LEGIONNAIRE'S DISEASE</i>

A1.0 GENERAL CLAUSES

This section is to be read in conjunction with the Main Contract Preliminaries. In the event of any conflict between the two documents, the matter shall be referred in writing to the designated Project Administrator for clarification. A definitive written instruction shall be issued prior to acceptance of the tender.

Claims arising from discrepancies between this specification and the main contract preliminaries will not be accepted where clarification has not been sought prior to tender submission.

Section B of this specification defines the Scope of Works together with the required Standards of Materials and Workmanship.

A1.1 PROJECT PARTICULARS

THE PROJECT

Name: Refurbishment Of Gallowglass Community Centre

Location: Milford, Co. Donegal.

Programme: Town & Village Renewal Scheme

EMPLOYER

Name: Milford & District Resource Centre

Address: Milford Co. Donegal

ARCHITECT

Name: Dedalus Architecture

Address: Bath Terrace, Main St, Ballynally, Moville, Co. Donegal, F93 FT72, Ireland

CIVIL & STRUCTURAL ENGINEER

Name:

Address:

QUANTITY SURVEYOR

Name:

Address:

BUILDING SERVICES CONSULTANT

Name: DMAC Consulting Engineers Ltd

Address: Glenturas House, 18 Beraghmore Road, Derry, BT48 8SE

PRINCIPAL CONTRACTOR

Name:

Address:

MECHANICAL CONTRACTOR

Name: NOT YET SELECTED

Address:

ELECTRICAL CONTRACTOR

Name: NOT YET SELECTED

Address:

A1.2 TENDER

Tender prices shall be submitted on the tender pricing schedules appended to this specification.

Tenders must be returned by the specified date and time, tenders received after the stated time may be rejected.

Unless specifically confirmed by the employer's representative, no payment will be made for the preparation or submission of tenders.

The scope of works within this tender includes, where applicable:

- Design development
- Detailed design and coordination
- Manufacture and supply
- Delivery to site
- Installation
- Testing and commissioning
- Handover of the complete installation in full working order

The tender shall cover the complete mechanical installation, including all ancillary components, fittings, supports and sundry items required for the proper execution and operation of the works.

The Mechanical Sub-Contractor shall include for the supply and installation of all structural supports and steelwork required to support mechanical services, unless specifically noted otherwise.

The Sub-Contractor shall liaise and coordinate with the Main Contractor to ensure all necessary supports and builder's work requirements are properly provided.

Any works excluded from the tender must be clearly stated in the tender submission. Any works not specifically excluded will be deemed to be included within the tender price.

Schedule of Rates

If requested by the employer's representative, the tenderer shall forward within 7 days of when required, a fully priced out schedule of rates with each item priced and totalled to agree with the sub-totals and final total of the tender. These prices shall be the basis for the valuation of any variance of the subcontract works.

The priced schedule of rates is to include all elements of the works. Items not shown separately in the schedule will be assumed to be included in the general rates noted. Detailed rates are also required for all sub-traders' work included in the subcontract.

Warranty to be given by the Subcontractor Employed by the Contractor

Prior to appointment, the tenderer shall provide the employer with the warranties as detailed in the main contract preliminaries. Failure to comply with this clause will invalidate the tender.

A1.3 CONTRACT PRELIMINARIES

Refer to the Main Contract Preliminaries and also contract preliminaries attached to these documents for the information with respect to:

- Contract Conditions/Appendices
- Statutory/General Obligations
- Management/Administration Procedures
- Resources/Temporary Work and Services
- Protecting/Cleaning/Drying/Completing
- Nominated Firms

Note the obligations imposed upon the main contractor and, where applicable, co-operate with him in his compliance with the said obligations, including provision of all necessary information in respect of the subcontract works to enable the main contractor to carry out his obligations in respect of the entire works.

A1.4 DISCREPANCIES IN TENDER DOCUMENTS

In the event of discrepancies within any of the tender information, queries must be sent in writing to the employer's representative, who will circulate the questions and answers to all firms tendering.

A1.5 VISIT TO SITE

The subcontractor is deemed to have visited the site during the tendering period to satisfy himself that he is aware of all local conditions relative to his contract. Claims with regards to lack of knowledge will not be paid.

A1.6 PATENTED ARTICLES

The subcontractor is solely responsible for any expenditure incurred through the employment of patented articles or devices, including all royalties and other such charges. The employer and employer's representative undertake no responsibility whatsoever in this matter.

A1.7 RESOURCES, TEMPORARY WORKS AND SERVICES TO BE PROVIDED BY THE SUB-CONTRACTOR IN CONSTRUCTING THE SUBCONTRACT WORKS

Staff

The subcontractor shall supply all the necessary skilled and unskilled labour required to carry out the works. During the execution of the contract observe the conditions of employment which have been agreed between the Employer's Federation and the Trade Unions relevant to the place and circumstances in which these works are to be carried out.

Additional net overtime costs shall only be permitted as extra when specifically authorised by the employer's representative in writing. Overtime working for any purpose necessary for normal

contract works, such as that necessary to keep on programme etc., is deemed to be included within the tender sum.

Work Area

The subcontractor shall take all precautions necessary to restrict the area of his works to the immediate vicinity of the work involved under his subcontract and shall prevent his workmen from straying beyond the boundaries of such works.

Planning

The subcontractor shall co-operate with the main contractor and plan the subcontract works before the work commences to ensure the efficient implication of the works.

The subcontractor shall prepare a schedule detailing all items of plant and equipment and true delivery periods.

The subcontractor shall liaise with the employer's representative and main contractor, providing them with a detailed programme confirming when Client supply items are required for installation.

The subcontractor shall advise the main contractor in sufficient time to allow access to be provided for the installation of large items of plant and equipment or long lengths of pipework, ductwork or cable, etc.

Statutory Undertakings

The subcontractor is responsible for programming, co-coordinating and progressing the involvement of the statutory undertakings and other authorities.

The subcontractor shall provide all necessary information required by the main contractor in respect of the statutory undertakings and other authorities.

The subcontractor shall, in addition to the above, allow for full attendance on the Statutory undertaking and other authorities and shall assist their engineers on site to the full.

Buildings and Security Measures

The subcontractor is to provide, as necessary, temporary sheds, offices, other temporary buildings and security measures for your own exclusive use and clear away everything on completion.

The subcontractor shall allow for moving the site accommodation from time to time as may be requested by the main contractor, subject to the confines of the site. Storage areas for the subcontractor's materials and plant, etc. shall be provided free by the main contractor. Suitable mess rooms and sanitary accommodation will be provided, free of charge, by the main contractor for all persons employed on the works all in compliance with the current statutory regulations and the Code of Welfare conditions of the National Joint Council for the Building Industry.

Telephones/Computer

The subcontractor is to provide and pay for all telephone, facsimile and computer facilities for your own exclusive use.

Local Authorities Requirements

The subcontractor shall comply with and give all notices required by any Act of Parliament, regulations or by-laws of any local authority, public services, company or authority who may have any jurisdiction with regard to the work or whose systems, the same, are or will be connected, and he shall pay and indemnify the employer against any fees or charges legally demandable under such an Act of Parliament, regulations or by-laws in respect of the works. No extra charge will be allowed due to failure to allow for this requirement.

Where the requirements of any water or electricity authority call for the submission to them of any component part of the works for approval, testing, stamping or certifying, the subcontractor shall, at his own expense, submit and deliver any such component part to the place required by such authority. After such component part has been satisfactorily approved, tested, stamped or certified, the subcontractor shall return it to the site for incorporation into the works. Expenses incurred shall be paid by the subcontractor.

Inspection and Testing at Works

The subcontractor shall provide and allow in his tender sum for all costs in this regard, all assistance, labour, materials, power, fuel, stores, apparatus and properly calibrated and certified instruments for carrying out the necessary works.

The employer's representative shall be entitled, during the manufacture, to inspect, examine and test on the subcontractor's premises the material and workmanship of all plant to be supplied under the subcontract. If part of the said plant is being manufactured on other premises, the subcontractor shall obtain from the employer's representative permission to inspect, examine and test as if the plant were being manufactured on the subcontractor's premises.

Such inspection, examination or testing, if made, shall not release the subcontractor from any obligation under the subcontract.

The subcontractor shall give the employer's representative two weeks written notice of the date and the place when plant will be ready for testing and unless the employer's representative attends within ten days of this date, the subcontractor may proceed with the tests which shall be deemed to have been made in the employer's representative's presence and shall forthwith forward to the employer's representative, duly certified, copies of the test reading.

In the event of the plant failing the tests, the employer shall be at liberty to deduct from the subcontract price all reasonable expenses incurred by him or the main contractor in repeating the tests.

Operation of Plant, etc.

Prior to practical completion the subcontractor must ensure that plant is working correctly and provide skilled personnel to attend the plant etc., while working including specialist personnel as necessary.

Damage Due to Inclement Weather

The subcontractor must take all measures for the protection of their works, and make good, free of charge, damage, defects or faults which appear during the works due to inclement weather.

Practical Completion

Before the subcontract works are included in a Certificate of Practical Completion, the subcontract works, or such part as is referred to in the certificate, shall be complete. The completion shall include setting to work, testing and commissioning, including proving the performance is in accordance with the specification, of all items included in the certificate, and full adjustment and balancing, in as far as is possible without the building being occupied or the system being subject to a full climatic cycle, subject to the approval of the employer's representative.

Unless otherwise agreed, the whole or any part of the subcontract works will only be included in a Certificate of Practical Completion when the employer's representative has been given the required number of sets of operating manuals and record drawings as detailed later in this document.

After the installation has been shown to meet the commissioning requirements, the employer's representative may call for further operation of the plant to evaluate the performance of the installation. Be prepared to operate the plant, the cost of which will be reimbursed. Include in the tender for all additional works and expenditure necessary as a consequence of phased completion and handover.

Training of Employer's Personnel

The subcontractor shall provide experienced personnel to instruct the employer's personnel in the operation, maintenance and servicing of all the installation.

The subcontractor shall, at a time to be agreed prior to completion or sectional completion as defined in the main contract preliminaries, instruct the employer's representative in the use and correct operation of the contract works and shall satisfy himself that such staff is capable of taking over the installation. During this period of instruction, the subcontractor shall be responsible for the correct operation and maintenance of the installation.

The training shall take place prior to completion and during the system reliability trial with all systems fully operational. The subcontractor shall allow for a minimum of five days training for two representatives. Both representatives will attend each day of training. The subcontractor shall provide training handout notes and background information to the employer's representative prior to the training period.

Training shall be structured to suit all the relevant building elements (building and its services) and shall include theory, demonstration and hands-on experience in the operation and maintenance of the building. Each training day shall allow for relevant instruction on an elemental basis.

Theoretical training shall be carried out in a suitable quiet room with all necessary visual aids and facilities. A register shall be kept of attendance at each of the training sessions and a certificate shall be issued to all attendees at the end of each training session.

Obligations after Practical Completion

Between the issue of a Certificate of Practical Completion and the Certificate of Making Good Defects relating to the whole or part of the subcontract works, provide the following:

- A prompt callback service, available at all times, to attend to any faults.
- A record of any failure or malfunction of any part of the subcontract, the remedial action taken, subsequent re-testing and the results thereof.
- Notify the main contractor of any malfunction in, or damage to, the subcontract that the subcontractor can demonstrate had been caused by incorrect operation of the system, vandalism or action of a third party.
- Inform the main contractor in writing when all defects are finally rectified so that an inspection may be carried out prior to the issue of the final certificate.
- Carry out a final test at the end of the defects liability period to demonstrate to the employer's representative that the subcontract works are operating efficiently and that all components are functioning correctly.
- Carry out all work using competent, trained personnel and except where made necessary by abuse, misuse or negligence by other than the subcontractor, make no charge to the employer.

Notwithstanding the foregoing paragraph, charge to the employer the net cost of replacement for life expired disposable parts.

A1.8 PROGRAMME OF WORK

As soon as possible after Contract costs have been accepted, the contractor shall, on receipt of instruction from the Project Manager, agree a programme of work.

The Contractor shall give consideration to the various electrical and mechanical services involved when ascertaining priority of installation of materials and first fix of the services in the various sections of works.

All materials, equipment, etc. shall be ordered as soon as instruction is received and delivery shall be arranged to suit the proposed programme of works.

A1.9 ALTERNATIVE MANUFACTURERS

The Contractor is advised that the costs included in the tender submission must be based on the equipment and material as detailed in the specification. The equipment and materials have been detailed to indicate the quality and standard considered acceptable for this project.

The Contractor is at liberty to offer alternatives to those items specified which can be demonstrated to be equivalent, or better, in all aspects. Written approval for the use of alternatives must be obtained before orders are placed.

A1.10 INFORMATION REQUIRED FROM THE SUBCONTRACTOR

The subcontractor shall select materials and products capable of the performances specified in the schedules and ensure that the various components of the systems can be coupled together in a proper manner to provide a workmanlike installation.

Provide installation drawings to demonstrate your solutions to the employer's representative and provide builders work drawings to illustrate your requirements in this respect to the main contractor and employer's representative.

Respond in good time to the directions of the employer's representative and assist in integrating the subcontract works into the design of the works as a whole.

Ensure you obtain through the main contractor, up-to-date copies of architectural, structural and working drawings for the other trades where they affect the subcontractor's drawings. Site dimensions should be used wherever possible in preference to drawings.

The employer's representative will be advised of the cost of the subcontract works by the quantity surveyor. Carry out the services with strict regard to the Employer's budget for the project.

Perform your duties in accordance with a programme to be agreed with the main contractor and/or employer's representative.

The subcontractor shall provide for agreement by the employer's representative fully documented Quality Assurance Procedure (QAP) to International or British Standards, prior to commencement of draughting, procurement or installation.

The subcontractors QAP must be provided in accordance with the main contract procedures.

The QAP must detail specific procedures related to the tendered project.

The QAP shall be provided by the subcontractor at tender, its content is subject to the employer's representative and main contractors comment.

Subcontractor to State Objections

In the event of anything described in the specification, relevant documents, or shown on the drawings being, in the opinion of the subcontractor, unsuitable, undesirable or inconsistent with his guarantee and responsibilities under the subcontract, he shall draw the employer's representative's attention to such matters at the time of tendering or, in the case of matters arising out of documents, or in the case of instructions issued after the time of tendering, immediately on receipt of such documents or instructions and prior to the commencement of any part of works affected.

Integration

The subcontractor is to co-operate with the main contractor in planning the installation before the work commences.

The services routes and approximate position of the equipment and the apparatus are shown on the tender drawings. Attend such meetings as are necessary to enable you to provide the installation drawings which the employer's representative requires to process. The object of the meetings will be, to establish the inter-relationship of services in confined spaces such as ceiling voids, ducts and plantrooms, establishing adequate space for maintenance and access purposes and to assist in the proper provision of builder's work drawings.

Installation Drawings

Please note: DXF format CAD Building Services drawings will not be provided to the subcontractor, electronic PDF format drawings will be provided if required. Architectural general arrangement drawings may be provided, but this will be arrangement with the employer's representative.

The subcontractor is to prepare and supply in good time all detailed installation drawings (including wiring diagrams and builders work drawings) required to enable the subcontract works to be integrated into the design of the works prior to installation.

The drawings provided shall be drawn to recognised scales on A1 sheets. In addition to the project title, the architect's and consulting engineer's name and address, unique drawing number, drawing title, scale and date shall be entered in the title block, together with full cross-reference details of related drawings.

All drawings shall be produced and presented in print form and on computer disk with files in DXF format (unless agreed otherwise).

All drawings shall have independent layers of information in accordance with International or British Standards.

All layers shall be displayed 'on screen' in different colours.

The subcontractor shall verify the accuracy of all dimensions abstracted from the drawings, including verifying the accuracy by taking dimensions on site.

Drawings, schedules and other information provided by manufacturers, suppliers or approved specialist subcontractors shall be checked by the subcontractor to ensure all requirements of the design installation and working drawings/documents have been incorporated prior to submission.

The subcontractor is to inform the employer's representative prior to changing components or detail of installation shown on the tender drawings or described elsewhere in these documents.

The subcontractor is to notify the employer's representative of the total effect of these changes, including the design parameters of the system and effects on power requirements, cable sizes, performance and ductwork or pipework resistance, etc.

The installation drawings must clearly show withdrawal and access requirements.

Builders work drawings shall form part of the installation drawings and shall show the sizes and locations of all foundations, bases, plinths, sumps, chases, holes, etc, required and shall be based on certified manufacturer's drawings.

The scale of these drawings shall be 1:50 or, where necessary 1:20.

Ductwork shop fabrication drawings shall be to a scale of not less than 1:50 and in congested areas, not less than 1:20. They shall indicate the length of each duct section, the internal dimensions of the bare sheet steel, dimensions of bends and fittings, location of stiffeners and supports and shall be dimensionally locate the ducts in relation to the supporting or any adjacent structure.

In addition, the location and size of all equipment, grilles, diffusers, access panels, dampers, test points, penetrations and associated fittings for automatic controls and instrumentation, etc., shall be shown.

Switchgear, starter control and instrument panel drawings shall show the construction, external and internal layout of panels, and wiring diagrams comprising internal wiring diagrams, for the complete systems in the panels. The drawing shall also show all pipework and capillary connections from the panels to external equipment.

Manufacturer's equipment drawings shall show the precise details of each and every item they will be providing and shall highlight all dimensions and particular requirements necessary for the correct installation and maintenance of their equipment.

Specific installation drawings may, with written permission of the employer's representative, omit minor details such as conduit provided that a method statement rigorously covers the installation intent. This permission will not be unreasonably withheld but will not be given where either Client operation or visual appearance is affected or where details are needed for following trades.

The subcontractor shall submit such drawings as the employer's representative may reasonably require at any stage of the subcontract.

Supply four copies of each drawing for inspection by the employer's representative and, if required, four copies of each subsequent amendment. When agreement has been reached, issue further copies of the drawings as follows:

- | | |
|---|------------|
| - For the employer's representative | 4 Copies * |
| - For the main contractor, which includes one copy by the means | |
| - of which the main contractor will instruct the subcontractor | 6 Copies * |

*Unless agreed otherwise

Issue copies of drawings to those of your suppliers and subcontractors affected by the drawings.

Allow in your programme for the preparation and obtaining approval of drawings, plus time to make any necessary amendments.

Understand that whenever you submit information to the employer's representative for approval, such approval will be approval in principle only and will not, in any way invalidate your responsibility for ensuring the accuracy and suitability of the information in accordance with requirements specified elsewhere.

The employer's representative will approve the overall layout of plant and equipment, ducting, pipework, cabling, trunking, conduit, etc., shown on the installation drawings, and their general location, as well as the type and size of these items, in so far as they conform to the tender drawings.

The exact position in the works relative to grid lines, floors, beams, ceilings, walls and other structural/finishes items, and any other services is the responsibility of the subcontractor and the employer's representative's approval does not absolve you from the necessity of checking these items with the main contractor and other subcontractors.

When submitting drawings the subcontractor shall advise the employer's representative if, in order to avoid delay in the completion of the works, early approval is necessary.

A coordinating consultant will be identified by the employer's representative for each specialist subcontractor. In addition to the coordinating consultant, fabrication drawings will be commented on by other consultants as considered appropriate by the employer's representative.

The coordinating consultant will arrange receipt of other consultant's comments and transfer these to a single set of subcontractor's drawings to be returned to the main contractor within 10 working days (or less by special arrangement).

Drawings may be returned direct to the specialist subcontractor's by agreement in writing with the subcontractor and main contractor. Copies of correspondence covering the return of drawings will be copied to the main contractor or subcontractor in either case.

Installation drawings will be returned under one of three following categories.

- **CATEGORY 'A'** - Installation, manufacture or construction may proceed in accordance with the drawings submitted. Unless indicated to the contrary on such drawings, the works shall comply with the contract documents.
- **CATEGORY 'B'** - Installation, manufacture or construction may proceed in accordance with the drawings submitted subject to the subcontractor taking necessary action based on the employer's representative's comments and all annotations added to the returned drawings. Unless indicated to the contrary on such drawings, the work shall comply with the contract documents. The required number of copies of the amended drawings shall be sent to the employer's representative.
- **CATEGORY 'C'** - No work shall be installed, manufactured or constructed. The subcontractor shall re-submit new shop drawings to the employer's representative for review until re-submission is not required. Any submission marked 'C' is not permitted on site.

For coordinated responses, the most onerous classification awarded by any consultant making comment will take precedent.

During the subcontract works the subcontractor is to, keep on the site a complete set of up-to-date prints and schedules marked with "As Installed" details and make these prints available at any time to the employer's representative or his representative.

If, in the event, upon completion of the works, of it being discovered that, the subcontractor have failed to comply with this requirement and it becomes necessary for the employer's representative to

examine or trace through installed services in order to update the "As Installed" drawings, the cost of this work will be time charged and debited to the retention monies being held on the contract.

"As Installed" Drawings and Diagrams

Unless otherwise agreed, the subcontract works, or any part thereof, will only be included in a Certificate of Practical Completion when the final "As Installed" Drawings and Diagrams have been issued to the employer's representative.

These shall consist of two paper copies and two DXF format copies on USB drive.

The subcontractor may purchase copy negatives or DXF computer disks where appropriate of the tender drawings from the consultant and amend these to bring them into line with the works as fixed and then submit them to the employer's representative.

"As Installed" drawings are to detail: -

- The location, including level if buried, of public authority supplies provided within the subcontract, whether carried out by the subcontractor or by the appropriate authority together with the points of origin and termination, size and materials of pipes, line pressure and/or other relevant information.
- The layout, location and extent of all piped services showing pipe sizes throughout, together with all valves for regulation, isolation and other purposes, shown numbered in accordance with the actual installation.
- The layout, location and extent of all air ducts, including those formed in builderswork or otherwise outside this Subcontract but forming part of the system, showing all dampers and other equipment, acoustic attenuators, grilles, diffusers or other terminal components. Each duct and each terminal component shall be marked with its size and the airflow rate, as actually measured after approved regulation of the system or as computed by the addition of such measured quantities.
- Single line and schematic wiring diagrams for the whole of the subcontract works showing all terminal references and cable sizes.
- The layout, location and extent of all electrical plant, cable, cable tray, cable trunking, conduit, distribution boards, switches, outlets and lighting fittings which form part of the subcontract works, including dimensioned layouts of all concealed work. Where components are grouped or housed in a cubicle or on a common panel, an exploded arrangement must be incorporated.
- The layout, location and extent of all electrical plant, cable, cable tray, cable trunking, conduit, switches, outlets, terminals and indicators and alarms of all ancillary communication, detection, alarm and control installations which form part of the subcontract works, including dimensioned layouts of all concealed work.
- The location and identity of each room of space housing plant, machinery, distribution boards, draw-in boxes or apparatus.
- The detailed general arrangements, to 1:20 scale (minimum), machinery spaces, air handling plant, refrigeration plant, tank rooms, switchrooms, meter rooms and other plant spaces, including the location, identity, size, colour coding and details of each piece of plant and equipment.
- The detailed general arrangements, to 1:20 scale of service subways, ducts, meter rooms or other special sections of the work where, in the opinion of the employer's representative, the small scale drawings cannot provide an adequate record.

- Manufacturer's drawings showing the general arrangement and assembly of component parts of all machines and any pieces of equipment which may require servicing. Flow diagrams indicating the principles of the arrangements and operation of each of the services related to central plant, principal components and zoning of distribution etc.
- Diagrams illustrating the principles of automatic controls and of instruments, presented in combination with the foregoing or separately, as agreed with the employer's representative.
- Location of all earth tapes, earth electrodes and test points.

Comprehensive electrical diagrams or sets of diagrams which shall show:

- Size, type and length (to within one meter) of each main and sub-main cable, together with the measured conductor and earth continuity resistance of each. Manufacturer's internal wiring diagrams for each piece of electrical equipment supplied under the subcontract, together with physical arrangement drawings to locate and identify the component parts.
- Comprehensive diagrams showing in detail all power wiring and all control wiring and/or pneumatic of other control piping executed within the subcontract by others in accordance with detail provided by the subcontractor, including size and type of conductor or piping used and identifying the terminal points of each.

Before the above-mentioned final issue, send two proofed copies of the manuals to the employer's representative for approval of format and general content. Allow 14 days for approval. Include the following information in the operating manuals.

Operating Manuals

Preparation of operating and maintenance manuals shall be based on the following documents:-

- BSRIA Technical Note TN 1/84; Guidelines for building services operating and maintenance manuals
- BSRIA Application Guide 1/87; Operating and maintenance manuals for building services installations
- BSRIA Technical Note TN 12/86; Fault finding procedures in the building services industry

The arrangement of the manual shall be as follows:

Section One	Index
Section Two	Description of the Design Intent
Section Three	Description of the operational routes. The description must include step by step instructions on starting and stopping each plant or system and a fault diagnosis procedure in diagrammatic and tabular form to show the action necessary to correctly identify defective pieces of equipment and the steps to be taken to rectify faults.
Section Four	Planned maintenance instruction. This section must include step-by-step instruction on the maintenance of all items of plant. Data shall also be provided for ordering replacements. Full sets of manufacturer's maintenance instructions including wiring diagrams, cable schedules, and circuit chart. Protection and overload relay settings shall be recorded and calibration charts shall be Incorporated. This section shall include a set of drawings of the installation upon which is recorded all plant settings, water flow rates, pump

heads and noise level readings as adjusted and measured during the testing commissioning period.

- Section Five A set of record drawings and Test Certificates. If necessary due to the number of drawings which have to be included in the manual, each drawing shall be photographically reduced to size to suit the manual.
- Section Six Emergency measures including telephone numbers of the subcontractor's emergency staff, names, addresses and telephone numbers of all manufacturers.

Index

- General description of the installation, equipment used and method of operation of the installation.
- Handbooks, maintenance instructions, drawings and spare parts list for all components, plant and equipment used in the subcontract works.
- Line diagrams indicating the main features of the plant, drawing attention to the method of setting the controls, switchgear, safety precautions etc.
- Schedule of routine maintenance, complete with list of normal consumables, routine oil and grease points and recommended lubricants.
- Schedule of periodic and preventative maintenance for specialised equipment.
- Schedules of methods of adjustments, typical fault-finding routines.
- Schedule of operation and maintenance risk assessment sheets in accordance with the Construction (Design and Management) Regulations 2016.
- Wiring diagrams of plant etc.
- Service manual for all specialised plant, giving all details as listed above.
- Schedule for obtaining and ordering replacement parts.
- Schedules of equipment valves and motors related to the "As Installed" drawings and giving names, addresses, telephone and facsimile numbers of manufacturer, serial number of plant, kilowatt-power electrical supply, performance duties and location within the building.
- Description of emergency action which should be taken in the event of a breakdown of equipment. Telephone numbers of essential contacts shall be included.
- Outline design data of plant.
- Test and performance data.
- Test Certificates.
- Schedule of "As Installed" Drawings.
- Legend for colour - coded services.
- Copies of all manufacture guarantees.

In addition, and separate from the Operating Manuals, supply four sets of manufacturer's catalogues relating to specialised plant and equipment.

The requirements and obligations of manufacturers to provide literature as part of the installation record shall form part of plant and equipment orders and such orders shall be considered unfulfilled until literature requirements have been met.

Preparation of Manuals

The manuals shall be encased in A4 size, plastic-covered, loose leaf, four ring binders, with hard covers, each indexed, divided and appropriately cover titled. Drawings larger than A4 shall be folded and accommodated in the binder so that they may be unfolded without being in any way detached from the rings.

Prepare the Operation and Maintenance Manuals in draft as soon as the installation drawings are in hand.

Make two temporary manuals with provisional record drawings and preliminary performance data available at commencement of commissioning to enable employers staff to familiarise themselves with the installation. These should be of the same format as the final manuals with temporary insertions for items which cannot be finalised until the subcontract is commissioned and performance tested.

The cover shall be printed with the following information:

"Operating and Maintenance Instruction Manual" (Project Name and Service).

Where more than one volume is required, the cover shall also be printed with volume number.

Each section of the manual must be segregated by a stiff divider of the same size as the holder. The divider shall be labelled as to the section of the manual.

All written instructions within the manual shall be typewritten with a margin on the left hand side.

Submission of Operation and Maintenance Manuals

The final draft of the Operation and Maintenance Manuals shall be submitted in due time, and in any case not less than four weeks prior to practical completion, so that at least one copy of the complete final version is in the possession of the employer at practical completion in order to comply with the Health & Safety at Work Act.

If partial possession is required by the employer then the documentation shall also be phased accordingly and so arranged to finally form one comprehensive document.

It shall be the subcontractors responsibility, whenever a successive phase of subcontract is handed over, to amend and update the previously issued version of the Operation and Maintenance Manuals, bring it to the appropriate stage of completion and submit same to the main contractor in due time to comply with the Health & Safety at Work Act.

Maintenance Contract

The subcontractor must provide a separate quotation for the maintenance of all equipment and systems (pipework, ductwork, cabling, etc.) within his scope of works for a full 12 months period from the date of completion or completion of section as defined in the main contract preliminaries.

The maintenance to be carried out shall be strictly in accordance with the various manufacturers' recommendations and shall be sufficient to ensure that the services operate at optimum efficiency and that the life expectancy of the various items of equipment and system components are in no way compromised.

Spare Parts and Tools

The subcontractor shall submit a Schedule of additional spare parts and tools that he recommends should be supplied over and above those consumable spares required up to practical completion and for routine maintenance.

A1.11 RESPONSIBILITIES (SERVICES COORDINATION)

The subcontractor is responsible for the full coordination and proper execution and completion of the installations. The positions of equipment, pipework, cables, etc., indicated on the drawings are given for tendering purposes only and the exact coordinated positions shall be proposed by the subcontractor for approval by the employer's representative. The subcontractor's tender price shall include for any modifications that may be necessary to provide fully coordinated and installed engineering services.

The mechanical subcontractor must make allowances within his tender price for taking responsibility as the lead subcontractor organising the coordination of all services drawings with the other trades. The successful mechanical subcontractor will be requested to provide a method statement showing how this will be carried out with coordination meetings etc.

The subcontractor is responsible for ensuring liaison with all trades to ensure that all engineering services are accommodated satisfactorily in the building, particularly in ducts, voids, cavities, and other potentially congested areas. The subcontractor shall, without cost to the employer, make any alterations that may be found necessary due to non-compliance with this clause.

The subcontractor shall acquaint himself with the general arrangement of all services and ensure that in fixing any work it will not obstruct the fixing or future maintenance of any other services. He shall also coordinate the engineering services with other trades and take all necessary precautions to ensure that the progress of any trade does not impede the progress of any other trade and that all engineering services are accommodated satisfactorily.

The subcontractor shall allow for obtaining and coordinating the submission of fully coordinated engineering services installation drawings and shop drawings from all his subcontractors and suppliers and all related builders work drawings. The drawings are to be compatible, correctly annotated and cross-referenced at their interfaces.

The subcontractor is responsible for the coordination of all his subcontractors and suppliers equipment.

The subcontractor is responsible for taking dimensions on site, checking runs and levels and marking out for the builders work and shall allow for such work in his tender. The subcontractor shall ensure that the setting out of plant and equipment, pipes and ducts, etc. fit into the space allocated and allows access for maintenance and replacement purposes.

The subcontractor shall allow for arranging and attending any necessary meetings with the relevant subcontractor's and/or suppliers in order to agree such priorities as are necessary and in order to monitor progress, obtaining the necessary data for and preparing coordinated drawings of all the work involved in the engineering services installation together with its associated builders work and giving all necessary instructions to overcome any potential conflicts. Where such coordination requires any amendment to the drawings or specifications prepared by the employer's consultants, the matter shall be referred to the employer's representative in the first instance.

The subcontractor shall allow for the cost of all amendments or revisions required to provide a properly coordinated engineering services installation.

A1.12 DEFECTS LIABILITY

It shall be deemed that the Warranty on the plant shall be for one year, commencing from the issue of the Certificate of Practical Completion, not upon delivery.

A1.13 VALUATION OF THE SUBCONTRACT WORKS

Sub-letting

The subcontractor shall state in his tender the names of all firms to whom you propose to sub-let portions of the work.

No section of the work shall be assigned or transferred to another company without the prior consent of the employer's representative.

Alternative Makes/Delivery Periods

If particular manufacturers are specified, alternative makes of equal quality will be considered by the employer's representative only if they appear on the preferred manufacturers list within this specification.

Important Note to Tenderers

Contractors must list within their tender return the manufacturers, suppliers and subcontractors on which the tender sum is based. Changes from this list will not be allowed unless there are mitigating circumstances. The employer's representative will make the final decision with regard to the any proposed changes and his word will be final. Failure to comply with this clause will render the tender return void.

The subcontractor shall ensure that the dates of deliveries covered by orders placed with manufacturers, suppliers or other subcontractors are confirmed at regular periods between the placing of the orders and the date of delivery. A delivery schedule of all major items must be submitted to the employer's representative within 60 days of acceptance of the subcontractor's tender.

Builder's Work

The formation of brick or concrete bases for engineering plant, boilers, calorifiers, pumps, switchgear, etc., the building-in of radiator, pipe and cable brackets, the formation of cable trenches, the provision of riddled earth in the trench, both before and after laying, and trench back-filling, the cutting of holes, chasing making good will be carried out free-of-charge by the main contractor.

Adjustments to the Subcontract Sum

No addition will be made to the subcontract sum if you have failed to ascertain, before tendering, all the requirements for carrying out the works, which inspection of the site or of the specification and tender drawings would have disclosed.

No change will be made to the subcontract sum unless the variation is authorised by an instruction from the employer's representative.

Within 14 days of the date of issue by the employer's representative of an instruction varying the content of the subcontract works, agree with the quantity surveyor the order of value of the variation, submitting documentary support where necessary.

Thereafter, proceed diligently, with the quantity surveyor to agree the final price for the variation. Variations shall be valued in accordance with the appropriate clause of the contract.

If you require work to be valued on a daywork basis, the employer's representative's permission must be obtained before work commences. Submit two copies of daywork sheets to the employer's representative for examination and signature during the week following the week in which the work is done.

Include on the daywork sheet the instruction number, details of other documentation, and the location of the work and the full details of the labour, plant and materials employed.

Include in your tender for all additional payments for overtime necessary to carry out the subcontract works in accordance with these documents. Where further overtime becomes necessary to overcome problems, seek the employer's representative's approval in each specific case to the inclusion of these overtime payments in the final subcontract sum. Keep detailed records of the labour involved. Submit to the employer's representative for approval and signature during the week following that in which the work is done.

At the time of the settlement of account, and as one of the documents referred to in the contract conditions, the main contractor will obtain a statement from each of the subcontractors that the sum and/or credits to be included in respect of such subcontractors are accepted in full and final settlement of their subcontracts.

Valuations for Interim Certificates

At the time of every valuation of the works for interim certificates, submit via the main contractor, to the Quantity Surveyor a statement showing:

The gross amount (including cash discount and retention) claimed supported by a detailed approximate priced statement of work executed and materials supplied.

The net amount received from the contractor to date excluding contract charge.

Revision and Variations

If schemes are subject to revision or instruction, the installation/working drawings, and record drawings, must show the full effect of such revision. Where revisions involve change to the architectural or structural details, immediate notice must be given to the employer's representative. Where scheme revisions are required in the main contract works or other subcontract works due to the subcontractor's variation or revision then all cost for such revision will be the subcontractor's responsibility including the design team consultants' costs.

Where drawings are revised and updated during construction these shall be issued to the employer's representative for comments on the revision only.

The subcontractor must substantiate that changes from the intent of the tender drawings have been necessary for a variation to be recorded. This will not include normal detail design development relating to inclusion of or development of, factors within the subcontractors design responsibility.

A1.14 INSURANCE AND INDEMNIFICATION

The subcontractor must include for all insurance other than those for which the main contractor is responsible.

The subcontractor is responsible for any damage caused to the main contract or other subcontract works by the execution of this subcontract and the cost of making good any such damage.

A1.15 COMMENCEMENT AND COMPLETION

The subcontractor shall execute his works within the dates described for the main contract.

The subcontract may require several visits to the site. Claims for the number of visits to the site or discontinuity of the work will not be paid, the subcontractor shall allow in his rates for all costs incurred due to this method of working.

The installation programme is to be agreed with the main contractor before materials are delivered to site.

The subcontractor, in conjunction with the main contractor, will be required to submit a programme to the employer's representative. The times must comply with the dates noted by the main contractor.

A1.16 DRYING OUT

The main contractor may, by arrangement with the subcontractor, wish to run the heating system for drying out the building. The subcontractor shall make due allowance in the sequence of his work to provide this in accordance with the main contractor's programme. This event will not relieve the subcontractor of his obligation to hand over the installation in good order, nor shall the interim period from the time of commencement of use for drying out to the handover, be considered as constituting any part of the maintenance guarantee period hereinafter specified.

However if the system is complete and signed off by the employer's representative or building services consultant, the warranties may be activated.

The system is not to be operated whilst any 'rubbing down' activities are being carried out.

A1.17 REGULATIONS

General

Materials, products and completed systems in this subcontract shall comply with the following:-

- This Specification.
- All local authority regulations.
- All national and European regulations.
- All Health and Safety regulations.

The subcontractor shall notify the employer's representative of any revisions or addition to the foregoing as they are published during the installation of the works. The employer's representative will give appropriate instructions in each case.

The subcontractor shall pay all charges made by an authority approving any part of the subcontract works.

A1.18 SUITABILITY OF MATERIALS AND PRODUCTS

Materials and products shall be supplied to suit the pressures, temperatures, voltage and other conditions of use normally expected to apply after the installation is completed and also to withstand the tests specified herein or in any documents referred to herein.

A1.19 ORDERING MATERIALS AND PRODUCTS

The subcontractor shall order the necessary materials and products immediately upon the employer's representative instruction to proceed. The subcontractor must not delay practical completion, or completion of any part of the works, due to late delivery of materials and products.

A1.20 HANDLING AND STORAGE OF MATERIALS AND PRODUCTS

The subcontractor shall: -

- Deliver, off-load, store and transport about the works all materials and products in the manner recommended by their manufacturer.
- Provide adequate safe, covered storage and protection for all materials and products in accordance with good practice.

A1.21 SAMPLES OF MATERIALS AND PRODUCTS

At the request of the employer's representative, the subcontractor shall submit, samples of materials and products proposed for use in the subcontract works.

Samples shall include but not be limited to labelling, sanitaryware, taps, valves, grilles, room sensors, and like items, particularly where the aesthetic appearance is of prime importance. Samples shall also be required to demonstrate standard of finish and colour. Approximate or 'similar' colour samples will not be accepted.

A1.22 PROTECTION TO FIXED AND UNFIXED ITEMS OF PLANT

The subcontractor is to take all measures necessary to screen and protect all plant, equipment and accessories, whether in storage, in course of erection or erected, from the ingress of dust, moisture or foreign bodies, or from damage or marking by other trades to practical completion of the subcontract works. Failure to arrange for such protection will make the subcontractor liable for all consequent reinstatement.

All parts of the installation liable to corrosion are to be properly cleaned and painted with heat resistant and/or corrosion resistant paint at works and a further coat immediately after erection.

Any plant, equipment and accessories found to be unduly marked by tools or damaged, corroded or distorted by any cause will be rejected by the employer's representative and must be replaced by the subcontractor at his own expense.

When final finishes are provided to equipment at manufacturer's works, all such finishes are to be of an approved material, process and colour and the subcontractor shall ensure adequate provision for the protection during transit, storage during and after erection to avoid damage to the finishes.

The subcontractor shall inspect all plant and equipment immediately on delivery and shall not accept any that are damaged. The employer's representative must be notified and the damaged works subject to inspection before remedial work commences.

The subcontractor shall be responsible for the protection of his work during execution, but the main contractor shall be responsible for necessary casing and protection after the subcontractor's work has been executed.

A1.23 DELETERIOUS MATERIALS

Refer to main contract preliminaries.

A1.24 HOUSEKEEPING AND SITE CLEANLINESS

It is the subcontractor's responsibility to keep his working area clean and tidy at all times and remove all rubbish to a dump or other place on the site on an agreed regular basis.

A1.25 CONDITION OF SITE ON COMPLETION

On completion of the contract, the subcontractor shall remove from the site all tools and plant used for the execution of the works together with all rubbish, packing cases and redundant material or equipment, and he shall make good or reimburse for making good any damage to buildings, roads or other parts of the site, where in the opinion of the main contractor such damage has been caused by or is the responsibility of the subcontractor.

A1.26 TENDER DRAWINGS AND DOCUMENTS

The subcontractor shall treat the details of this specification and attached documents as confidential and return them to the employer's representative after he has prepared his tender.

A1.27 DISAGREEMENT

In the event of any disagreement between the parties of the contract as to the requirements of the specification, definition of terms or value of works done, the matter shall, in the first place, be decided by the employer's representative, and, if such decision be challenged by either of the parties shall be referred to arbitration under the provisions of the signed contract.

A1.28 DESIGN RESPONSIBILITY

The installer shall be responsible for the detailed design activities listed below, in addition to those activities normally undertaken through the custom and practice of the industry, all of which shall be subject to the comment of the contract administrator.

The installer shall be responsible for ensuring that the detailed design which he undertakes is fully co-ordinated and compatible with the remainder of the project design.

All costs shall be allowed by the installer for the complete junction of his works and the remainder of the project. Specifically all supports will be provided by the installer up to and including the final attachment to primary structure. Similarly the installer shall provide all flashings, kerbs and stopping up or sealing required.

Comments by the contract administrator shall not relieve the installer of his responsibility for the suitability and correctness of the installer's designs and his other obligations within the contract documentation.

The installer's design obligations shall include:

- Fabrication drawings and the co-ordinated installation/working drawings and record drawings.
- Drain and vent point locations and pipework gradients in accordance with BSRIA documents Application Guide 1/89 Flushing and cleaning of Water Systems.
- Bracket and support detailed design and locations. (All types, loads and locations must be declared to the contract administrator prior to installation for comment (10 working days)).
- Details of electrical wiring diagrams of all equipment supplied by the installer showing all interconnections between equipment to enable the necessary wiring to be undertaken.
- Details of all equipment component design and selection necessary insofar as such items have been selected by the installer for that item of equipment to meet the engineering specification and performance indicated.
- Automatic controls detailed design insofar as it is required to meet with full physical and operational requirements of the engineering specification. The installer shall be responsible for ensuring the full compatibility of the plant and equipment with specified function. Where interfaces (relays or other devices or modifications to hardware or software) are required the design and incorporation shall be the installer's responsibility.
- Dimensioning of, and final installation details of, the automatic control panels to suit the detailed requirement of the particular agreed manufacturer's of controls equipment and cable entry/exit accommodation such that:-
 - Cable entry is possible in the selected location.
 - Doors are not fouled by other plant, equipment, services or structural elements.
 - Safe operating and maintenance clearances are provided in all access positions when installed on site.
- Fire alarm system, component and cabling requirements to meet with particular manufacturer's and the engineering specification's requirements.
- Lightning protection system, component, cabling and network to meet the British standard 6651 and 7671.
- Security/CCTV system, component and cabling requirements to meet with particular manufacturer's and the engineering specification's requirements.
- Attenuator design and selection to satisfy the particular and performance requirements of the specification, including spatial allowances made within tender drawings.
- Design of the diesel generator flue system to meet with the generator manufacturer, environmental health officer and requirement of discharging the flue gas at the

required velocity and altitude. A copy of the Clean Air Act application will be made available on request.

- Design of elements of the scheme provided by the installer for self-weight and other applied forces/loadings in reasonable use. In particular any buried tanks or pipework will require designed anchorage encasement or foundations.
- Thermal expansion accommodation and anchorage, including provision of bellows or bends.
- Acoustic design or modification of equipment to meet with the noise levels specified. All levels to be achieved with all plant operating at full load.
- Valve, damper and access locations.
- System water capacities, and chemical additives – and arranging of the facilities required by BSRIA Application Guide 8/91 pre-commission cleaning of water system.
- Selection of all anti-vibration mountings to suit the particular application of the mounts.
- Final exact locations of control sensors detectors and thermostats.
- Capacity, location and design of electrical conduit system, similarly trunking where used in lieu of multi-conduit installation.
- Duct platforms, access covers and gratings, ladders and additional structural steelwork where required and detailed in the sub-contract documentation.
- Selection of regulation devices to comply with CIBSE Technical Memorandum TM8.
- Sizing of cable terminations on items of equipment provided under the sub-contract where cable sizes are specified.
- Ensuring cable sizing selections as specified are not invalidated by subcontractor selection of alternative routes during installation.
- Detailed design of earthing and bonding requirements for electrical engineering services, mechanical engineering services, architectural and structural elements requiring earthing and bonding.
- Design of cable or cable trunking terminations on to electrical equipment provided under the sub-contract and dimensioning of and final installation details of electrical switchgear to ensure that:
 - Fuse sizes installed in plug tops and fuse connection units are appropriate for the rating of connected equipment.
- Sizing and detailed design of refrigerant pipework between items of equipment provided under contract works.
- Lift sub-contract design obligations shall additionally include:
 - Detailed design of all specialist and proprietary equipment associated with the lift installation to allow the installation to function in accordance with the performance requirements of the specification.
- Final location of all lift equipment within the lift motor rooms and lift shafts to ensure safe and efficient operation and to suit the detailed requirements of the lift installation.
- Production of design loadings/reactions on support structure within the installation.

A1.29 TESTING AND COMMISSIONING

The Mechanical Contractor shall be responsible for the complete testing and final commissioning of the mechanical installation to the satisfaction of the Consulting Engineer.

A pre-handover meeting will take place 7 days before expected handover date and the Mechanical Contractor shall be advised that a draft Health and Safety File to be reviewed by the Project Manager and therefore the Mechanical Testing and Commissioning Certification shall be handed over to the Consulting Engineer for review in good time for review prior to issuing to the Main Contractor to allow him to include with the Health and Safety File. The following list of Mechanical Certificates are to be provided as applicable:

- ☐ Heating Pipework Pressure Test Certificates
- ☐ Heating Circulating Pumps Commissioning Certificates
- ☐ Heating Circuit Regulating Valves
- ☐ Radiator Heat Test Certificates
- ☐ Plumbing Pipework Pressure Test Certificates
- ☐ Thermostatic Mixing Valves Commissioning Certificates
- ☐ Legionella Sensors Test and Commissioning Certificates
- ☐ Water Cleaning/Disinfection/Chlorification Certificate
- ☐ Ventilation Fans Test and Commissioning Certificates
- ☐ Ventilation Grille Flow Rates Certificate

The Mechanical Contractor shall ensure that the Consulting Engineer shall have access, at all reasonable times, to such parts of the Mechanical Contractor's works, as may be necessary for the purpose of inspecting, examining and testing of materials, workmanship and performance of plant and equipment.

The Mechanical Contractor shall provide, unless otherwise specified, all labour, materials, power fuel and test equipment for carrying out the tests. Tests shall be on site and/or off site as applicable to the tests specified.

All mechanical installations shall be tested and commissioned as part of the Mechanical Contract in accordance with the manufacturer's instructions and the relevant CIBSE commissioning guide as listed below, to ensure that the relevant mechanical installation achieves the design performance and environmental condition: -

- ☐ CIBSE Code A: Air Distribution Systems
- ☐ CIBSE Code B: Boilers
- ☐ CIBSE Code C: Automatic Controls
- ☐ CIBSE Code M: Management
- ☐ CIBSE Code R: Refrigeration
- ☐ CIBSE Code W: Water Distribution Systems
- ☐ BSRIA Guide: AG 3/89.3 Commissioning of Air Systems
- ☐ BSRIA Guide: BG 2/2010 Commissioning of Water Systems
- ☐ BSRIA Guide: AG 1/91 Commissioning of VAV Systems In Buildings

- ☐ BSRIA Guide: AG 1/2001.1 Pre-commission Cleaning of Pipework Services
- ☐ BSRIA Guide: AG 16/2001 Variable Flow Water Systems
- ☐ BSRIA Guide: AG 20/95 Commissioning of Pipework Systems
- ☐ BSRIA Guide: AG 17/2000 Achieving Minimum Outdoor Air – Commissioning And Test Procedures

Stage 1 Testing

Carry out all pressure, vacuum and air leakage tests, which are necessary to bring the completed work up to a standard of 'static' completion.

Produce and issue Test Clearance certificates, which clearly indicate the tests carried out, the date of each test and the results. Liaise with the Consulting Engineer regarding witnessing of tests.

Stage 2 Commissioning

Prove the engineering systems from the static completion state to fully operational. Include in the proving of a system all the system balancing and all the recording of test data and set points. Relate test records to environmental and/or external conditions as appropriate.

Stage 3 Commissioning Prior to Handover

Immediately prior to handover of the completed building the Employer's Representative, the Consulting Engineer and the Mechanical Contractor shall witness final acceptance testing of all engineering services.

It is intended that spot checks will be taken on the installation being proposed for handover and compared with the test and environmental data obtained under Stage 2 commissioning. In the event that the spot checks are inconsistent with the test and environmental data, the element in question shall be checked in its entirety.

The Consulting Engineer shall be given a minimum of 7 days' notice of intent to carry out on site and off-site tests. All tests shall be witnessed by the Consulting Engineer or his representative together with the Mechanical Contractor.

Rectify all defects and repeat tests all at no extra cost to the contract or the Employer.

Leave no installation unattended during testing and commissioning whenever or wherever there is an inherent risk to the installation, building or personnel.

Carry out any additional tests as requested by the Consulting Engineer during the defects liability period. Tests will only be requested by the Consulting Engineer in this period if a system is not performing as specified. If it is found, after re-testing, that the initial tests were not in accordance with the performance specified, then any additional costs incurred shall be borne by the Mechanical Contractor.

Test all plant, including standby equipment, to ensure that it is operating in accordance with the specified conditions, and also that it is functioning in accordance with the control interlocking sequences specified, including emergency functions.

Carry out, as far as possible, the adjusting and balancing of the systems without the building being occupied or the systems being subjected to a full climatic cycle.

Finally adjust and balance to meet a full climatic cycle during the defects liability period. Where no test values are specified include for testing to the appropriate BS in accordance with the plant, equipment etc operating conditions.

The Mechanical Contractor shall provide triplicate copies of all test certificates with one copy retained for the Consulting Engineer.

Specialist Plant

The Mechanical Contractor shall use specialist suppliers where necessary to undertake the complete testing and commissioning of the following plant: -

- ☐ Heating Circulating Pump Installations
- ☐ Heating Circuit Regulating Valve Installations
- ☐ Water Cleaning/Disinfection/Chlorification
- ☐ Mechanical Ventilation Installations
- ☐ Mechanical Ventilation Installations

Pipework and Associated Plant

Comply with CIBSE Commissioning Code W unless otherwise instructed.

Cleanliness

Take all necessary precautions to protect the system during installation as called for in the specification; allow for flushing through the entire system or for blowing through the entire system, either in part or in whole, as required by the construction programme.

After flushing, chemically clean the heating circulation systems in order to prevent corrosion and scale formations. Carry out this work immediately prior to the start of commissioning. After flushing, sterilize the hot and mains water services as per Water By-laws for drinking water. Retain all results and test certificates for inclusion within the Operation and Maintenance Manual.

Isolate all items, which may be affected by direct or chemical action during these procedures.

Pneumatic and Hydraulic Testing

Pressure-test the complete installation to twice the maximum working pressure specified or as scheduled. Isolate or remove all safety valves, altitude or pressure gauges, or items of

plant or equipment, which may suffer damage during such tests. Maintain the test pressure for a period of one hour without undue loss.

All test certificates of pneumatic and hydraulic tests made on site and signed by the Mechanical Contractor who witnessed the tests, immediately after the satisfactory conclusion of the tests, shall be forwarded to the Consulting Engineer before any thermal insulation is applied.

Operational Testing

After the hydraulic tests have been successfully completed, subject the installation to the correct operating conditions. The duration of this test shall be a minimum of 48 hours during, which time all the pipework, plant and equipment shall be subjected to actual operating conditions, including cooling down periods.

Examine the installation to ensure that the correct expansion and contraction takes place. Inspect supports to ensure that their alignment is still correct.

Inspect all fittings, piping and equipment during the tests for leakage and other defects. Provide all skilled attention necessary during the test period to ensure that all controls are operating correctly.

Balancing

Balance all circuits by the regulation valves provided on a temperature and pressure basis. Utilizing details of design pressures/temperatures at the various points of the system provided, check overall flow by measuring the pressure differences across the pumps and relate this to the manufacturer's test curves. Adjust flow through the equipment to give the design temperature drop or rise utilizing commissioning valves.

Balance the system generally using the procedures outlined in CIBSE Commissioning Codes W, B and R.

Supply all necessary instruments to effectively test and commission the complete piping services and associated equipment and any additional instruments as may be reasonably requested.

Ventilation System

Test and commission ventilation systems in accordance with the CIBSE Commissioning Codes A and R, together with the HVAC Guidance Notes for testing and commissioning

Hot and Cold-Water Systems

Comply with CIBSE Commissioning Code W unless otherwise instructed.

On completion of the contract or at the various stages carry out comprehensive tests on the hot and cold-water installations, to ensure the correct functioning of the system and the final adjustment of the regulating valves.

In addition, carry out pressure tests on all pipework, equipment, appliances and ancillaries before any insulation is applied and ducts or chases sealed.

Carry out a complete cleaning and flushing through procedure for all plumbing pipework.

Commissioning of Controls

The Mechanical Contractor shall be responsible for the commissioning of the Automatic Control Installation, which shall be carried out in accordance with the following clauses:

a) Inspect and check the complete electrical work associated with the Automatic Control Installation whether installed by the Mechanical Contractor or by others to his detailed requirements.

b) Advise the Consulting Engineer of any site tests and give 7 days' notice in writing of final tests so that they can be carried out in the presence of the Consulting Engineer.

c) Test, calibrate, adjust, check and re-set thermostatic and automatic controls and provide test certificates and calibration charts where required.

The Mechanical Contractor shall position all thermostats and controls to ensure that their calibration is appropriate for the control set point and within the control limits as required by the manufacturer.

Should this differ from the drawings the manufacturer's instructions should be adhered to and the Consulting Engineer advised prior to installation of controls.

WARNING!

The Mechanical Contractor shall be responsible for scheduling all items of electrical equipment supplied as part of the Mechanical Contract but installed under the Electrical Contract at the commencement of the works on site.

All items on this schedule shall then be supplied by the Mechanical Contractor and handed over to the Electrical Contractor prior to first fix installations on site, to eliminate any delays caused to the mechanical or electrical installations.

The mechanical schedule of electrical equipment shall be signed and dated by both the Mechanical and Electrical Contractors and it shall then become the responsibility of the Electrical Contractor to provide safe secure storage for the scheduled electrical equipment until installation.

Any loss or damage to the electrical equipment after the schedule is signed and dated shall be replaced by the Electrical Contractor at their own expense.

A1.30 LEGIONNAIRE'S DISEASE

The Contractor should be aware that the building is designed with reference to CIBSE TM13, HSE's Guidance on 'Legionnaires Disease - The Control of Legionella Bacteria in Water

Systems' Approved code of practice and guidance L8 and HSG 274 Legionnaires Disease, Technical Guidance. The contractor shall take all necessary precautions to comply with these documents, for example in addition to the chlorination certificate the contractor should provide risk legionella assessments for inclusion in the O&M manual.

He shall ensure that the installation complies in every way with the above regulations and shall be responsible for taking any measures necessary to enable the water supply to be switched on to the building as per programme.

It is therefore in the contractor's interest to keep the Local Water Supplier Inspectors fully involved on this installation. Should the contractor become involved in any additional costs because his installation has not been carried out in line with the statutory requirements, then he will have to carry out this work at his own cost.

SECTION B – SCOPE OF WORKS AND PARTICULAR SPECIFICATION

CONTENTS

B1.0	GENERAL
B2.0	SCOPE OF WORKS
B3.0	UTILITIES/SITE SERVICES
B4.0	LPHW HEATING INSTALLATION
B5.0	DOMESTIC WATER SERVICES INSTALLATION
B6.0	MECHANICAL VENTILATION INSTALLATION
B7.0	ABOVE GROUND DRAINAGE INSTALLATION
B8.0	SANITARYWARE INSTALLATION
B9.0	TESTING AND COMMISSIONING
B10.0	OPERATING AND MAINTENANCE MANUALS
B11.0	FIRE STOPPING
B12.0	REMOVAL OF EXISTING SERVICES

B1.0 GENERAL

B1.1 Standards

All goods, products and materials shall comply with the latest editions of relevant Irish Standards (I.S.), European Standards (I.S. EN) and applicable EU Regulations, including the Construction Products Regulation (EU No. 305/2011).

The complete installation shall comply with:

- Irish Building Regulations (including Parts F, L, B, G and M where applicable)
- All statutory requirements and local authority requirements
- Current recognised codes of practice (e.g. CIBSE Guides)

The Mechanical Contractor shall carefully review all drawings and notes and include all associated costs in the tender.

B1.2 Materials

All products, materials and equipment shall comply with the project specification, as well as referenced standards and all applicable regulatory requirements.

Similar items of equipment and individual materials shall be selected from one manufacturer's range to standardise appearance, compatibility, maintenance and replacement.

Unless otherwise indicated, standard manufacturer's finishes and colours are to be provided.

All materials, products and equipment are to be transported, handled, lifted, hoisted and stored in accordance with the manufacturer's guidelines to prevent damage to equipment and injury to persons.

The manufacturer's installation recommendations shall be followed and adhered to in full including any requirements for additional or ancillary components not explicitly specified but recommended to complete the installations ensuring suitability for purpose.

B1.3 Co-ordination and Liaison with other Trades

The Contractor shall be responsible for co-ordination of his works with other Contractors and sub-Contractors and determine and advise of necessary builder's work and attendances by the Main Contractor.

The Contractor shall co-ordinate space requirements with other services in accordance with routing shown on drawings and utilise space efficiently to maximise accessibility for other installations and for future access and maintenance.

The Contractor shall review mechanical and electrical layouts with other Contractors prior to any installation.

The Contractor will make available the appropriate personnel for attendance at site co-ordination meetings.

The Contractor shall include for the production at an early stage of coordinated services layout drawings including sectional details of all primary services routes. These drawings shall be fully coordinated between mechanical and electrical Contractors and shall be issued to the Main Contractor and Engineer for approval before the installation of any works proceeds.

The Mechanical Contractor shall act as lead coordinator and be responsible for presenting agreed coordinated mechanical and electrical layouts to the design team. These should include for detailed plans and sections, indicating how all potential clashes with structure, architectural finishes and other services (whether responsibility of Mechanical Contractor or not) have been overcome accordingly. The Mechanical Contractor shall be responsible for obtaining and collating all requisite information from the Electrical Contractor, or any other relevant Sub-Contractor (i.e. natural ventilation / rainwater etc.)

The Electrical Contractor shall be responsible for detailing all primary electrical services and producing specific installation details and drawings which shall be provided to the mechanical contractor for inclusion in the final coordination drawings.

Any works undertaken resulting in critical dimensions not being achieved (for example ceiling voids) or requiring alterations of architectural finishes where coordinated drawings have not been produced and agreed with the design team will be removed and reinstated to design team satisfaction at the Contractor's expense.

Any installations undertaken by the Contractor resulting in less than satisfactory appearance or improper works in the opinion of the Engineer where insufficient coordination has taken place shall be fully removed and rectified at the Contractor's expense. (e.g. pipework crossing or in proximity to electrical distribution or comms equipment etc.)

B1.4 Production of Information - Procurement Details

The Contractor shall refer to individual sections of the specification and where requested, the Contractor shall provide full shop drawings and complete technical submittal documentation at an early stage to allow appropriate time for review and consideration of the information provided. The Engineer will endeavour to return comment or acceptance of proposals within 10 days of receipt of full submittals. The Contractor shall note that the programme implications of inadequate notice or late provision of information regarding submittals cannot be accepted by the Engineer.

The Contractor shall in advance of ordering any equipment submit a full and complete procurement schedule listing all items being procured providing the following information to the Engineer.

- Plant Item including specific Reference Name or identification.
- Returned relevant section of DMAC Consulting Engineer's specification, with each line item marked 'compliant' or 'non-compliant' by supplier/manufacturer.
- Manufacturer / Supplier Information.
- Lead time for delivery.

On receipt of the above information the Engineer reserves the right to request further information including technical data sheets or shop drawings in order to be fully satisfied of the Contractor's intent.

B1.5 Quality Control and Workmanship

The Contractor shall be responsible for on-site installation quality control. As such the Contractor will implement and maintain high standards of quality control governing materials and equipment, project management, site conditions and workmanship to provide a complete working installation to the highest standards that can be reasonably expected or attained.

Evidence of quality control procedures being in place must be demonstrated in this regard.

Only persons suitably trained with the necessary qualifications and experience appropriate to the task shall carry out installation works.

In recognition of the requirement to effectively train apprentices in the trade skill, workmanship and experience and to ensure the highest standards of installations reasonably attainable, the Contractor shall ensure that a ratio of two apprentices to each qualified trades-person is not exceeded on site.

Evidence will be requested to demonstrate compliance in this regard.

The Contractor shall execute his works in accordance with industry standards and any relevant guidelines offered by codes of practice or applicable regulations.

The Contractor shall establish and implement manufacturers' installation instructions and procedures in full.

The Consulting Engineers reserve the right to observe ongoing and completed work and comment there on, without prejudice, to the Contractor's responsibility for quality control.

Defective or sub-standard installations or workmanship shall be rectified at the expense of the Contractor.

B1.6 Testing & Inspections

The Contractor shall be responsible for carrying out all commissioning, testing and inspections as required by the specification or by any governing regulations or codes of practice not specifically referenced in the documentation.

The Contractor shall maintain an accurate documented record of all commissioning and test results to include the type of test carried out, listing all observations and findings including defects and failures. The documentation shall also give details of proposed or instructed remedial actions taken to correct any defects or failures. A retest of all failures shall be documented.

The Contractor shall prepare a written schedule giving a **minimum 10-day** notice period of proposed test dates for witnessing by the Engineer and Client's representative.

The Contractor shall provide the original Test and Compliance Certificates for inclusion in the O&M Manual. These certificates must be presented prior to Practical Completion Stage, as failure to do so will delay practical completion and all costs for delays attributable will be borne by the Contractor.

Where required by the Specification the Contractor will be obliged to engage third party testing and commissioning specialists. The proposed third-party details together with the scope of their engagement shall be submitted to Engineer for comment or approval by the Contractor no less than 1 calendar month before the programmed pre-commissioning dates.

The Contractor shall prepare a detailed schedule and commissioning programme identifying tasks, durations and sequence together with key dates for co-ordination with the Main Contract Programme. The Contractor shall ensure that sufficient time is allocated within the Main Contract programme for successful and complete testing commissioning and witness testing.

B1.7 Site Facilities

The Contractor will provide secure covered storage facilities for all materials and equipment necessary for the proper execution of the contract. The Contractor shall allow for deliveries of materials and equipment commensurate to the space available. All costs associated with site storage will be deemed to be included within the tender return. The Contractor shall co-ordinate site facility requirements in line with the main contractor's compound

The Engineer may reject materials or equipment where it is considered that these materials are not being stored adequately and protected from damage and these will be replaced at the Contractor's own expense.

The Contractor shall provide site office facilities complete with telephone, fax, and e-mail capabilities for receipt of design information. The Contractor shall also include for the provision of on-site CAD facilities complete with A0 colour plotting facilities.

B1.8 Site Supervision

The Contractor shall include for the provision of a full time, on site, suitably experienced Foreman whose time and responsibility will be dedicated solely to the project for the supervision of trades-persons under his control. The Foreman shall not be involved in installation works as a trades-person.

Chargehands with responsibility for separately identifiable elements of the installation shall also be provided as required.

The Contractor shall include for the provision of a suitably experienced Contracts Manager with overall responsibility of the project. The Contracts Manager will be expected to be present on site for a minimum of 2 days per week coinciding with site meetings.

As works progress the requirement may increase to full time attendance of the Contracts Manager and allowances shall be made for same.

B2.0 SCOPE OF WORKS

B2.1 Description of the Main Contract Works

The main contract works comprise the refurbishment and alteration of Gallowglass Community Centre, Milford, Co. Donegal.

The scheme shall include the reconfiguration and upgrade of existing accommodation together with the provision of new facilities, including:

The provision of 2 no. new WC facilities.

The refurbishment and change of use of the existing first floor office to a meeting room.

The construction of a new glazed link to the rear of the building.

The installation of new heat emitters (radiators) throughout the areas of refurbishment.

The works shall include the disconnection and removal of all existing electrical services within the Main Hall G.09, Minor Hall G.07, and the first-floor office. Electrical services within the existing extension shall remain in place and unaffected.

A complete new electrical installation shall be provided throughout the areas indicated on the contract drawings and as specified herein.

The Contractor shall allow for the protection of all existing floor and wall finishes during the works. Any damage caused due to inadequate protection shall be made good or replaced to the satisfaction of the Employer.

The works shall include for protection of existing furniture, carpets and equipment using suitable protective coverings.

The Contractor shall also allow for all associated builder's work, including making good of finishes following removal of existing services and containment, and reinstatement of all penetrations, including fire stopping to maintain compartmentation.

B2.2 Mechanical Contract Works

The Mechanical Services Installation shall include the supply, delivery, off-loading, erection, connection, setting to work, testing and commissioning of all plant and materials as described in this Specification, as shown on the Drawings and as necessary for a complete, safe and satisfactory Mechanical Installation.

The mechanical works shall comprise the following:

- (a) New Radiators and associated pipework, valves etc
- (b) Domestic Water Services Installation
- (c) Toilet Extract Ventilation
- (d) Sanitary Ware Installation
- (e) Above Ground Drainage Installation
- (f) Commissioning and Testing of Mechanical Services
- (g) Provision of As Fitted Drawings and O&M Manuals
- (h) Disconnection and removal of existing redundant services

All services shall be provided in accordance with the relevant Codes of Practice and also with the requirements of the local Authorities and Statutory Bodies.

The works described shall be complete in all respects and shall be carried out in accordance with the true meaning and intent of this specification and accompanying drawings and shall include everything required for a complete installation whether described in the specification or indicated on the drawings or not.

The works outlined are based on providing a 25-year design life for the Mechanical systems.

All capacities and dimensions of plant, equipment or systems stated within the tender documents are approximate only and for guidance and shall be verified by the contractor prior to proceeding with the works.

B3.0 UTILITIES/SITE SERVICES

B3.1 General

The Contractor shall be responsible for contacting all utility providers and obtaining accurate details of services on and in the vicinity of the site and for all necessary modifications/diversions required.

All costs associated with Irish Water disconnections, removals, diversions, upgrades and the provision and installation of new utility supply services shall be included in the tender submission.

B3.2 Incoming Mains Water Supply

The contractor is to engage with Irish Water to establish the existing supply route and connection and make arrangements for an upgraded metered mains water supply as required.

The contractor shall include for a new metered mains water connection from the existing mains water network in the vicinity of the site. It is proposed that the new water supply will come from Main Street, Moville adjacent to the site and will be routed across the pedestrian walkway to the premises. However, the final connections point, meter location and underground pipework route is to be determined by the contractor and agreed with the DMAC Consulting Engineers and Irish Water.

The pipe shall be Barrierline MDPE blue and conform to IS EN 12201, 'Plastic pipe systems for Water Supply and Sewerage under pressure, The pipe and fittings shall be butt fusion welded type suitable for a maximum working pressure of 10 bar. Mechanical compression joints may be permitted on water mains up to 25mm diameter. Polyethylene pipework shall be installed in accordance with the Manufacturer's instructions and by an installer fully conversant with the correct installation procedures.

The Contractor shall include concrete thrust blocks for the water main prior to any changes in direction and at least every 60 metres straight run of pipe. The new water main shall be pressure tested and inspected by the contractor prior to backfilling of trenches.

Any pipework running within the building must take cognisance of I.S. EN 806 Parts 1-5 and CEN/TR 16355:2012 and avoid being located in proximity to heat generating equipment or pipelines.

Isolating valves shall be fitted on external pipework as indicated on the drawings. Provide an installation box at all external valves to allow future access and maintenance.

B3.3 Builder's Work Attendances

All excavation, preparation and backfilling of the trenching for the water main pipework shall be carried out by the Main Contractor.

Cover over the watermain shall be a minimum of 900mm deep with a 75mm bed and surround of 3mm compacted gravel.

B3.4 Hydraulic Testing & Commissioning

On completion of the installation, the installation shall be hydraulically tested to a pressure of 7 bar.

The test shall be applied for at least four hours during which period the Project Manager shall inspect all joints.

If any leaks are apparent they shall be repaired and a further test applied.

The external mains water installation may be installed in 2 phases. Any costs associated with phasing shall be included in the Contract.

The Contractor shall allow for testing any completed portion of the installation if required to suit the building programme.

B4.0 LPHW HEATING INSTALLATION

B4.1 General

This section details the Low-Pressure Hot Water (LPHW) Heating Installation, which shall generally be installed as indicated on the drawings and specified herein. However it shall be the responsibility of the Contractor to produce working drawings fully coordinated with all other services and trades to avoid clashes. Any abortive work, which occurs as a result of a clash due to lack of coordination, shall be resolved without cost to the Employer.

The Mechanical Contractor shall be responsible for liaising with the Building Contractor regarding all associated builders work and boxings for concealment of pipework.

B4.2 Internal LPHW Heating Distribution Pipework and Fittings

Pipework shall be installed in straight runs with the minimum number of joints and sized as indicated on the relevant drawings. Installation shall be neat and orderly, following building lines both vertically and horizontally, and graded as necessary to suit the service requirements.

Exposed pipework shall be copper tube in accordance with IS EN 12449:2012, light gauge suitable for bending, complete with lead-free soldered capillary fittings complying with IS EN 1254-2.

Heating pipework installed within floor screeds or insulation shall be cross-linked polyethylene (PEX), installed within a flexible protective conduit and complete with proprietary fittings suitable for connection to radiator valves.

Pipework rising from floor screeds to radiators shall incorporate jointless radiator termination assemblies suitable for both solid and timber floors, complete with chrome-plated pipe sleeves and chrome-plated pipe cover plates.

Where pipework rises from the floor to the upper radiator valve connection, the plastic pipe shall terminate using a proprietary Radiator Termination Kit at the level of the lower radiator valve connection. From this point, pipework shall continue in copper tube to the upper radiator valve connection and shall be adequately supported using wall brackets (minimum 3 No. supports). Connections between plastic pipe and copper pipe shall be made using brass compression or screwed fittings; push-fit connections will not be permitted.

Only proprietary manifolds shall be used. Plastic manifolds or site-fabricated manifolds will not be accepted. The Mechanical Contractor shall liaise with the Building Contractor to ensure that suitable boxing or enclosures are provided where required to conceal exposed manifolds.

Brazed joints will not be permitted except at anchor points or where specifically approved under special circumstances.

Where connections occur between copper pipework and fittings manufactured from non-copper metals, appropriate transition fittings shall be used and shall incorporate protection against electrolytic corrosion.

Pipework shall be installed to accommodate thermal expansion and contraction through changes in direction or the provision of expansion loops, complete with suitable anchor points and guides.

Due consideration shall be given to pipework levels and the provision of automatic air vents, including those required in addition to those indicated on the drawings. All such requirements shall be deemed included within the Mechanical Contractor's tender.

Due to space constraints within the building, close coordination between pipework, ductwork, electrical services, lighting fittings, trunking, and conduit installations is essential. Any additional works arising from failure to coordinate these services shall not be considered grounds for a variation.

B4.3 Zone Control Valves

Each heating zone shall be controlled by a two-port motorised control valve installed on the flow pipework serving the zone.

Valves shall:

- Be electrically actuated
- Provide spring return close function
- Include end switches for pump interlock
- Be suitable for LTHW systems

Typical valve size

- DN15 or DN20 depending on circuit flow requirements

Acceptable manufacturers include:

- Honeywell Home
- Danfoss
- Siemens

or equal approved.

B4.3.1 Thermostat Controls

Each heating zone shall be controlled by a digital wall-mounted programmable thermostat.

Thermostats shall:

- Be electronic digital type
- Provide programmable time and temperature control
- Be capable of controlling thermoelectric manifold actuators and/or two-port valves
- Be suitable for 230 V or low voltage control as required

Mounting height

- Approximately 1.5 m above finished floor level

Location

- Internal wall in representative room location
- Away from direct sunlight and heat sources

Acceptable manufacturers include:

- Heatmiser
- Honeywell Home
- Danfoss

B4.3.2 Thermoelectric Actuators

Provide thermoelectric actuators on manifold circuits where zoning is required.

Actuators shall:

- Be compatible with the manifold system
- Normally closed type
- Operate via signals from room thermostats

Typical supply voltage

- 230 V or 24 V as required by the control system.

B4.4 Valves & Fittings

All valves and fittings shall comply with relevant **I.S. EN standards** and shall be suitable for the system operating pressures and temperatures.

Valves shall be installed to facilitate the isolation, removal and maintenance of all items of equipment, together with the control and balancing of the various heating systems.

Valves shall be installed either with compression type fittings, unions or flanges and shall be suitable for 1½ times the test pressure of the heating system and sized as follows: -

- 50mm and below Screwed Connections
- 65mm and above Flanged Connections

Valves shall be installed on the various heating systems as follows: -

- Gate Valves (Bronze DZR) to I.S. EN 12266 with inside screw and non-rising stem
- Check Valves (Bronze DZR) to I.S. EN 12266:2010 with inside copper alloy, faced disc and swing check
- Regulating Valves (Bronze DZR) In accordance with relevant I.S EN Standards with inside screw and rising stem

- Double Regulating Valves (Bronze DZR) In accordance with relevant I.S EN Standards with close coupled commissioning set
- Strainer Valves (Bronze DZR) In accordance with relevant I.S EN Standards with grade 304 Y type stainless steel dirt screen.
- Drain Valves (Brass DZR) In accordance with relevant I.S EN Standards with integral isolation and hose union
- Temperature Gauges (Brass DZR) to IS EN 837-1:1998 with black steel case and 4" acrylic window
- Pressure Gauges (Brass DZR) to IS EN 837-1:1998 with black steel case and 4" acrylic window
- Combined Altitude Gauges (Brass DZR) to IS EN 837-1:1998 with black steel case and 4" acrylic window
- Safety valves (Brass DZR) installed as indicated to ensure that all items of equipment and heating pipework systems have a primary and secondary pressure relief system, which activates to elevate over pressurisation.
- Automatic and manual air vents (Brass DZR) installed at all high points within the various sections of the heating installation.

An automatic by-pass valve shall be installed between the flow and return pipework at the boiler to control the minimum flow requirement through the boiler and complete as follows: -

Pressure Relief Valve (Brass DZR) with female threaded connections

A magnetic water filter is to be fitted to the heating system as close as possible to the boiler which shall have a glass fibre reinforced nylon construction with 22mm pressure thread connections and a fluid capacity of 0.48 litres.

All thermostatic radiator valves shall be suitable for a working temperature of 2°C to 120°C. All thermostatic radiator valves shall be suitable for a maximum working pressure 10Bar.

All thermostatic radiator valves shall be supplied complete with an in-built double regulating facility. The TRV insert shall provide an adjustable function, limit / control the water flow through the emitter at full load. The commissioning function (or KV function) shall have six separate graduations / settings to assist in the commissioning of the heating system.

All thermostatic radiator valves are to be supplied complete with a liquid filled direct acting (unless otherwise stated) thermostatic sensing head. The head is to have a temperature range between 7-28°C and have limiting and locking facilities. Each sensing head shall have positive isolation.

All TRVs shall have the facility to change or replace the internal working mechanism without the need to drain the heating system. This is to be carried out using a specialist service tool.

A matching Lockshield valve is to be supplied to each radiator, the Lockshield valve is to come complete with isolating, regulation (with memory) filling and draining facilities.

All motorised valves shall be supplied by the specialist Controls Contractor for free-issue installation by the Mechanical Contractor (Unless otherwise stated or Unless motorised valves are integral to Dynamic control valve system). Where motorised valves are provided with a smaller diameter connection size than the pipework serving the valve, all pipework and associated valves and fittings either side of the motorised valve shall be installed to the specified pipeline diameter, with local reduction only immediately before and after the motorised valve flanges.

B4.6 Radiators

The Contractor shall supply and install the radiators as listed in the schedule on the drawings. All radiator connections shall be as shown on the drawing. Fully concealed wall brackets + mounting feet shall be supplied with each radiator. An air vent shall be fitted at the corner of each panel. All radiators shall be EN442 tested and certified.

The radiators shall comply with the requirements of ISEN 442-1:2014, Radiators and Convectors – Part 1: Technical Specifications and Requirements.

The radiators shall achieve a heat output as listed in the schedule at a mean water temperature of 50°C (55°C – 45°C F&R) and a room temperature of 21°C, any discrepancies must be noted by the Mechanical Contractor prior to ordering. The thermal outputs shall be determined with the test methods and test programme specified by ISEN 442-2: 2014 in a laboratory complying with EN 45001.

The Mechanical Contractor shall include for pre-painting radiators to a non-standard RAL colour, as specified in the schedule. Contractor must seek confirmation, on final RAL colour, from design team prior to placing order.

Dimensional tolerances to be in accordance with IS EN442

B4.7 Pipe Sleeves and Wall Plates

Where pipes pass through walls, ceilings, partitions, bulkheads etc., the Sub-Contractor shall provide and fit pipe sleeves. The sleeves shall be manufactured from the same material as the pipe, and shall be cut/trimmed so that the sleeve finishes flush with the finished surface

The annular space between the pipe and sleeve shall be tightly packed with fire and smoke resistant material to provide a fire stop seal.

The Sub-Contractor shall supply and fit chromium plated wall and ceiling plates where exposed pipework passes through walls, ceilings, floors, partitions etc., and pipework spacing shall be arranged so that plates do not overlap

B4.8 Pipework Brackets and Supports

It shall be the responsibility of the Contractor to co-ordinate Mechanical Services supports, etc with those of other trades so that a neat and workmanship like installation can be achieved. Brackets shall be brass split pattern screw-to-wall type, fixed to the building structure with 50mm brass screws and plastic type raw plugs.

The pipework shall be supported at the following intervals:

Nominal Pipe Diameter (mm)	Support Interval (m)	
	Vertical	Horizontal
15	2.4	1.2
20	2.4	2.1
25	3.0	2.4
32	3.0	3.0
40	4.5	3.0
50	6.0	3.6
65-80	6.0	4.5
100-150	6.0	6.0

All 15mm and 20mm diameter pipework installed at low level shall be supported at 1,200mm centres, with all other sizes supported at 1,800mm centres.

All supports for steel pipes and fittings shall be ferrous.

It shall be the responsibility of the Contractor to ensure that all supports are adequate, firmly and truly fixed and that they do not promote vibration.

Brackets or supports shall be set out so that they do not obstruct the access to valves, flanges or other fittings requiring maintenance.

B4.9 Pipework Insulation

All Heating pipework, valves and fittings shall be insulated with preformed rigid glass fibre sections containing water repellent additives. The sections shall be supplied with a factory applied facing of reinforced aluminium foil incorporating self-adhesive overlap for fixing.

The mineral wool insulation shall be non-combustible. The aluminium foil covering shall be rated 'Class O' in accordance with the Irish Building Regulations.

All pipework shall be installed complete with insulation achieving a thermal conductivity of 0.043W/m.K. The aluminium foil covering shall achieve a maximum vapour permeance of 0.00024g/s.MN.

All insulation fixing shall be in accordance with manufacturer's instructions, by peeling protective tape from self-adhesive lap and pressing lap smoothly over joint. Where adjacent sections abut, approved 75mm wide aluminium tape shall be used to maintain integrity of the vapour barrier.

All pipework installed both within plant areas and externally shall be clad. Cladding shall be not less than 0.8mm aluminium sheeting or stucco embossed profile cladding.

All valves shall be insulated using 'valve blankets' to enable frequent access. All covers shall be designed to enclose the entire valve body including bonnet flange, mating flanges and overlap adjacent line insulation by a minimum of 50mm. Covers wherever practical will be constructed in one piece. All covers above 500mm x 500mm shall have blanket quilting pins installed at sufficient centres to prevent the insulation from shafting or pulling away from the outer jacket. All covers to be of aa sewn construction. All flaps to be installed in a manner which provides suitable water shedding. All insulation materials shall comply with the requirements of the Irish Building Regulations, including fire performance requirements under Part B, and shall achieve a minimum Euroclass rating as required for the application.. All blankets shall have the following characteristics:

- Temperature Range: 10 degrees C to 230 degrees C.
- Inner Face: 430g single sided silicone. (Insulation to achieve a thermal conductivity of 0.043W/m.K. The aluminium foil covering shall achieve a maximum vapour permeance of 0.00024g/s.MN.)
- Outer Face: 430g single sided silicone.
- Fasteners: Velcro type hooks and loop flaps, 25mm D-rings complete with clinch straps are optional.
- Draw Cord: 4mm spun fiberglass cord.
- Quilts: 100mm Stainless Steel.
- Thread: PTFE coated glass fibre thread.
- ID Label: Laminated.

LTHW Heating pipework insulation thicknesses shall conform to the table below:

Nominal Pipe Bore (mm)	Insulation Thickness (mm)
15	25
20	25
25	38
32	38
40	38
50	38
65	38
80	38
125	38
150	50
200	50
250	50
Above 250	50
Flat Surfaces	50

B4.10 System Dosing

The completed heating system shall be flushed out and cleaned and then treated with a rust inhibitor.

The system shall be charged to the manufacturers recommended ratio with Sentinel X 300 pre-commission cleaner, allowed to circulate for 24 hours and then flushed out with fresh water.

The system shall then be charged to the manufacturers recommended ratio with Sentinel X 100 inhibitor.

Test kits shall be provided to allow the Project Manager to check that all chemicals are present in their correct ratio.

B4.11 Painting

All mild steel brackets, pipework, fittings or equipment shall be painted prior to insulation being applied. All surfaces to be painted are to be wire brushed to remove rust & scale, 2 No. coats of rust preventative primer to be applied & a final gloss coat.

B4.12 Labelling

All pipework shall be identified by means of self-adhesive coloured bands at intervals not

greater than 3m, at valve or expansion joint positions, at inlet and exit positions to ducts or buildings and at either side of walls or floors. The identification shall be in accordance with I.S. EN ISO 20560.

The name of the service should be indicated on an identifying worded band located in a visible position, together with an arrow indicating direction of flow. Flow and return mains should have the letter F or R added to the identifying name.

Suppliers shall be requested to label all equipment and packages with identification numbers, to ensure items can be correctly identified.

All valves and fittings shall be individually numbered and identified by means of 'traffic labels' securely fixed to the valve or fitting. A valve chart suitably protected with a permanent finish, showing the positions and numbering of the valves should be fixed in an agreed position.

B5.0 DOMESTIC WATER SERVICES INSTALLATION

B5.1 General

This section details the domestic water services installation, which shall generally be installed as indicated on the drawings and specified herein. However, it shall be the responsibility of the Contractor to produce working drawings, fully co-ordinated with all other services and trades. Any abortive work, which occurs as a result of a clash due to lack of co-ordination, shall be resolved without cost to the Employer.

The domestic water services Installation has been designed in accordance with IS EN 806 Pt. 2 and shall be installed, tested, commissioned and set to work in accordance with IS EN 806 Pts. 4 & 5 to provide water at an adequate flow, temperature and pressure to all draw off points.

The domestic water services Installation has also been designed and shall be installed to minimise the risk of the growth of Legionella as laid down HSE Ireland Guidelines for Prevention and Control of Legionella (Minimising the risk of Legionnaires Disease 2002).

The domestic water services consist of an incoming mains water supply with all outlets being mains fed. Hot water provision shall be provided by localised point of use electric water heaters.

Copper pipework will distribute the mains and hot water throughout the various items of sanitary ware.

Wherever possible, advantage is to be taken of changes in direction to the hot water services pipework to absorb expansion. Where expansion loops are shown, they are to be fire set brazed short radius bends, cold sprung to a minimum of 25mm prior to fixing. Expansion loops are to be fitted with loose sliding saddles at their centres to prevent lifting during expansion. Anchors shall be fitted where shown. They shall generally be fabricated from 100mm x 50mm channel iron. Saddles, fabricated from flattened 28mm diameter pipe, shall be bolted to the channels.

The complete installation shall be in accordance with current Water regulations and Building Regulations.

B5.2 Electric Point-of-Use Hot Water Heaters

Provide and install electric point-of-use hot water heaters as indicated and scheduled on the drawings for local hot water supply to sinks and wash-up areas within the commercial kitchen and wash hand basins in the toilet areas.

Manufacturer:

Units shall be manufactured by one of the following approved manufacturers, or equal approved:

- Redring
- Heatrae Sadia
- Ariston

Capacity:

- Nominal storage capacity: 10 or 30 litres

Type:

- Electrically heated point-of-use storage water heater suitable for installation beneath sink or adjacent service area.
- Designed for commercial kitchen duty.

Construction:

- Glass-lined or corrosion-resistant steel inner tank suitable for potable water.
- High-density insulation to minimise standby heat loss.
- External casing: durable enamelled steel or polymer coated finish.

Heating Element:

- Electric immersion heater suitable for 230V single phase supply.
- Replaceable heating element.

Controls:

- Adjustable thermostat with temperature control typically 30°C – 70°C.
- Integrated over-temperature safety cut-out with manual reset.
- Operating indicator light.

Performance:

- Rapid recovery suitable for frequent hand wash and utensil washing.
- Designed for continuous use within commercial catering environments.

Safety and Compliance:

- Factory-fitted temperature and pressure relief valve.
- Supplied with expansion relief or pressure control device where required.
- Units to comply with relevant UK and European standards including IS EN 60335 and UKCA/CE marking.
- WRAS-approved components where applicable for potable water use.

Installation Requirements:

- Install in accordance with manufacturer's instructions and Water Supply (Water Fittings) Regulations.
- Provide isolation valve, check valve, and discharge pipework from safety valves to visible safe location.
- Provide electrical isolation via local fused spur with appropriate rating.

Accessories:

- Wall mounting brackets or under-sink mounting kit.
- T&P relief valve and discharge arrangement.
- All necessary connection hoses, fittings, and fixings.

Commissioning:

- Fill, vent, test and commission system.
- Verify thermostat operation, safety devices and electrical protection.
- Provide operation and maintenance manuals.

Completion:

- Demonstrate operation to client and ensure system fully operational prior to handover.

B5.3 Pipework & Fittings

Pipework shall be installed in straight lengths using the minimum number of joints and to the size as indicated on the relevant drawings. Pipework shall be neatly installed to follow building lines both vertically and horizontally and graded to suit the particular service.

Underground incoming water mains shall be medium density blue polyethylene pipework to IS EN 12201-1:2011 and Water Industry Specification 04.32.02 and shall have Water Main marker tape installed for the entire length of the incoming underground water main.

Plumbing pipework shall be copper to IS EN 12449:2012, light gauge for bending with lead-free soldered capillary fittings to IS EN 1254-2:1998. Chrome plated copper pipework to be installed as indicated on the relevant drawings with chrome plated service valves.

Plumbing pipework run within floor insulation shall be cross-linked polyethylene to I.S. EN ISO 15875 with flexible outer conduit. Pipework rising from floor insulation to items of sanitary ware shall incorporate solid floor termination kits with adjustable white outer metal pipework sleeves.

Plastic manifolds and site manufactured manifolds will not be accepted. Only propriety manifolds will be accepted, as indicated on the relevant drawings together with all wall framework brackets. Pipework shall be installed to allow for expansion and contraction by change of pipework direction. Brass fittings will not be acceptable and brazing will not be permitted except on anchor points and in special approved circumstances.

Where connections between copper pipework, fittings and non-copper metals are installed, only special copper pipe connections shall be used, which shall include protection against electrolytic action.

The domestic water services systems shall be installed and maintained in accordance with IS EN 806-4&5.

All capillary joint solders shall be tin/ copper or tin/ silver based. No lead composites shall be used.

All pipework fittings and joints of Ø67mm and above shall be brazed type. Threaded or flanged joints shall only be allowed where required for connecting to piping accessories, equipment, etc. No compression fittings shall be used.

All brazed joints shall use silver brazing filler alloy. No lead composites shall be used.

During construction all open ends shall be capped off to avoid ingress of foreign materials to the systems. All pipework shall be laid to a slight fall in the direction of flow to reduce the risk of air locks forming and to facilitate easy draining.

Drain points shall be provided at all low points in the system. Drain cocks shall be hose union type and glandless.

All thermostatically mixed water supplies shall have a maximum pipe length of 1m from thermostatic mixing valve to outlet connection.

All hot water supplies shall have a maximum 'dead leg' pipe length of 500mm from hot water service return connection to outlet connection.

B5.4 Pipework Brackets and Supports

Pipework shall be securely supported and bracketed with allowances made for expansion and contraction. The Mechanical Contractor shall ensure even when not indicated on the relevant drawings, that either change of pipework direction or expansion loops are installed to cater for expansion and contraction of pipework.

Pipework installed within voids, stores and linen cupboards shall be supported using brass split ring type clips used for wall mounted pipework. Supports shall be installed at the following intervals: -

- 28mm and below 1.8 metre spacing
- 35mm and above 2.4 metre spacing

Fixings shall be installed using aluminium or plastic plugs. Soft wood plugs will not be permitted for any fixings. Pipework supports on hollow construction and light partitions shall be fixed using spring clip or toggle type fixings.

Standard screw fixings will NOT be accepted and any item of equipment not securely fixed which sustains damage will be replaced at no extra cost to the contract by the Mechanical Contractor.

B5.5 Pipework Insulation & Identification

Pipework insulation or coverings shall be installed in accordance with the manufacturer's instructions, including jointing procedures. Any insulation or covering installation considered sub-standard by the Consulting Engineer shall be replaced by the Mechanical Contractor with no additional cost to the contract.

Therefore, the Mechanical Contractor should consider employing an approved firm of insulators.

Pipework shall be insulated with 25mm Semi-slit polyethylene insulation flexible closed-cell black insulation and shall be installed within cupboards, behind kitchen cupboards, concealment casings, service risers and unheated voids unless otherwise specified on the relevant drawings, ensuring that all insulation is installed in accordance with the manufacturer's instructions, using the correct adhesives and manufacturer's finishing tapes.

All external condensate pipework shall be insulated with 25mm Semi-slit polyethylene insulation flexible closed-cell black insulation suitable for external use ensuring that all insulation is installed in accordance with the manufacturer's instructions, using the correct adhesives and manufacturer's finishing tapes.

The Mechanical Contractor shall be advised that all valves located within unheated spaces shall be fitted with flexible insulation jackets of similar insulation thickness to that specified previously.

Pipework insulation shall be one piece snap-on pre-formed polyolefin/polyethylene sections of 80kg/m³ nominal density, made from non-combustible polyolefin/polyethylene with thicknesses ranging from 20 to 60mm. Thermal conductivity shall be an approximately 0.03 W/mK and have a Global Warming Potential of less than 5. The insulation is free from CFC's, HCFC's and any other material with ozone depletion potential and does not represent any known threat to the environment.

All exposed MWS and CWS pipework shall be insulated with 9mm thick insulation to prevent condensation, where installed adjacent hot service pipework.

Pipework identification shall comply with I.S. EN ISO 20560 and all subsequent amendments. Plastic pipework identification bands indicating direction of flow and relevant service shall be applied on all new pipework throughout the building at 3.0 metre centres and at 1.5 metre centres within Plant Areas.

All pipework installed both within plant areas, garage and externally shall be clad. Cladding shall be not less than 0.8mm aluminium sheeting or stucco embossed profile cladding.

All valves shall be insulated using 'valve blankets' to enable frequent access. All covers shall be designed to enclose the entire valve body including bonnet flange, mating flanges and overlap adjacent line insulation by a minimum of 50mm. Covers wherever practical will be constructed in one piece. All covers above 500mm x 500mm shall have blanket quilting pins installed at sufficient centres to prevent the insulation from shafting or pulling away from the outer jacket. All covers to be of aa sewn construction. All flaps to be installed in a manner which provides suitable water shedding.

B5.6 Valves & Fittings

Valves shall be installed to facilitate the isolation, removal and maintenance of all items of equipment, together with control and water saving devices for the various plumbing systems. Valves shall be installed either with compression type fittings, unions or flanges and shall be suitable for 1½ times the test pressure of the plumbing system and sized as follows: -

- 50mm and below Screwed Connections
- 65mm and above Flanged Connections

Valves shall be installed on the various plumbing systems shall be complete as follows to Irish EN Standards: -

- Gate Valves (Bronze DZR) with inside screw and non-rising stem.
- Check Valves (Bronze DZR) with inside copper alloy, faced disc and swing check.
- Strainer Valves (Bronze DZR) with grade 304 Y type stainless steel dirt screen.
- Drain Valves (Brass DZR) with integral isolation and hose union.
- Pressure Reducing Valves (Brass DZR) with tamper-proof pressure setting feature.
- Combined Service/Flow Regulator Valves (Brass DZR) WRAS approved c/w screw turn adjustment.
- Flexible Fill Loops (Brass DZR) with braided flexible pipework and service valve.
- Thermostatic Basin Mixing Valves shall be complete with integral check valves, strainers, isolation valves, wall mounting kit, white plastic cover and suitably sized to match pipework sizes.

Thermostatic mixing valves shall comply with **I.S. EN 1111 / I.S. EN 1287** and be suitable for healthcare and commercial applications where required and installed as indicated on the

relevant drawing and to ensure safe hot water temperatures at basins, baths and showers to in accordance with the Scheme standards with commissioning temperature to be set as: Basin 43°C, Bath 48°C and Shower 48°C.

All temperature test results to be recorded and a copy of which shall be included within the Operation and Maintenance Manual and for presentation to the regulating body.

Pressure Reducing Valve shall be installed on the incoming mains water supply suitably sized to match pipework size and complete with compression fittings. Valve rated up to 16 bar pressure and temperatures up to 45 deg C, to regulate down stream pressure to set maximum adjustable outlet pressure from 0.5 to 5.0bar. Valve complete with pressure gauge test point and fully serviceable strainer cartridge construction for ease of service and replacement.

The Mechanical Contractor shall ensure that adequate access is provided to all valves by the Building Contractor, especially those located behind kitchen cupboard backboards.

B5.7 Water Treatment

On completion of the various plumbing installations and prior to hand over, the Mechanical Contractor shall ensure that the plumbing installations are flushed through and all water points deliver clean water.

The Mechanical Contractor must ensure that all plumbing pipework installations are sterilised in accordance with Irish Water requirements and HSE Ireland guidance on Legionella control, ensuring that all chemicals are removed from all pipework and appliances prior to handing over to the Client.

All certificates for sterilisation and chlorination process shall be retained for inclusion within the Operation and Maintenance Manuals.

B5.8 Chlorination of Domestic Water Services Pipework

The Contractor shall employ the services of a specialist chlorination contractor to provide chlorination of all new domestic water services pipework prior to connection to the water authority supply. Contractor to provide chlorination certificates at the time of chlorination and ensure compliance with all water authority specifications such as:

- Swabbing
- Chlorine Level
- Chlorine Contact Time
- Microbiological and chemical analysis

The Specialist Chlorination contractor is to use specialist chlorination equipment to ensure accurate chlorine dosing to all of the ingoing water whilst ensuring no possibility of backflow

contamination. The chlorination of the domestic pipework is to meet the relevant guidelines; Irish Water requirements and HSE Ireland guidance. All chlorination contractors to carry the water hygiene blue card and CSCS card and be members of Construction line and the Legionella Control Association.

B5.9 Final Connections to Sanitary Ware

The Mechanical Contractor shall note that the use of flexible hose connections as a means of making the final connection from the plumbing pipework to the individual items of sanitaryware is not acceptable.

B5.10 Pipework Painting

The Contractor shall prepare and treat, including painting all parts of pipework supplied under this Contract.

The Contractor is to take due care to screen and protect all works whether complete or in the course of completion from the ingress of dust and moisture.

Pipework, fittings and valves which is unduly damaged or distorted in any way by any cause shall be rejected by the M & E engineer and replaced by the Contractor at his own expense.

All ferrous metals included in the Sub-Contract e.g. pipes, supports, etc. shall be given one priming coat of paint prior to delivery or during erection as applicable to prevent the formation of rust. After erection all ferrous metals not insulated shall be given two coats of heat resistance paint.

Where final finishes are provided at maker's works, all such finishes shall be of an approved material, process and colour and the Contractor shall take all precautions to avoid damage to finishes.

B6.0 MECHANICAL VENTILATION INSTALLATION

B6.1 General

This section of the Contract shall include for the supply, installation, testing and commissioning of the complete mechanical ventilation Installation in accordance with drawings/specification and to the satisfaction of the Engineer.

The Contractor shall note that the information contained on the drawings is for tender purposes only and shall not be used as fabrication drawings. Fabrication drawings must be prepared by the Contractor using actual site dimensions and must be submitted prior to manufacturing ductwork to the Engineer for appraisal. Any costs associated with abortive work due to failure to submit drawings shall be borne by the sub-contractor. The period of notice required to approve drawings is two working weeks.

B6.2 General Extract Fans

The Contractor shall allow for supply, delivery and erection in the position indicated and scheduled on the drawings the extract fans as noted thereon.

Extract fans shall be as scheduled on the drawings “or equivalent manufacturer / model”

All fans shall be fitted with an integral controller complete with an inverter variable speed controller. Fans shall feature ‘soft-starting’ and ‘step-less’ variable speed control. All fans shall be capable of control & monitoring by BMS. All fans shall have a Specific Fan Power of less than $0.5 \text{ W} / \text{Ltr.s}^{-1}$, at rated duty in accordance with current Irish Building Regulations Part L – latest edition.

Fans shall be selected to allow an increase in duty to 120% of design air volume at 120% of design external static pressure.

Fans shall be suitable for operation as detailed on the drawings and shall complete with speed controllers, PIR detectors, etc., all as indicated on the drawings.

The fans as detailed on the drawings shall be supplied with flexible connections and anti-vibration mountings and shall be type tested to IS EN ISO 5801 & IS EN ISO 12499.

Fans that required to be ducted to outside shall be complete with such ancillaries as wall fitting kit or roof cowls to complete extract installation.

B6.3 Extract Air Grilles

The Contractor shall allow for the supply, delivery and erection of the extract air grilles in the positions shown and scheduled on the drawings and of the sizes indicated in the schedules thereon.

All extract air grilles shall be polyester powder coated to an agreed RAL colour and shall be manufactured as detailed on the drawings.

B6.4 Weather Louvres and Associated Plenum Boxes

The weather louvres on this project shall be supplied and installed by the Contractor and the Contractor shall be responsible for supplying and installing interconnecting plenum boxes, wall sleeves and ductwork transformation pieces as necessary to complete the installation.

Air intake and discharge openings shall be protected by framed louvre bladed sections. All louvres shall be weatherproof with horizontal angled blades to prevent entry of driving rain, snow and heavy particulate matter. Louvres shall restrict rain penetration to the appropriate classification of the HEVAC/BSRIA test method. The minimum effectiveness shall be 0.95, Class B. The inlet section immediately behind or below louvres shall be tanked and adequately drained to remove deposits of moisture. All internal metal surfaces shall have a paint scheme selected for wet/dry alternating conditions and shall have a minimum life to first maintenance of 10 years. The bottom side of the inlet section shall slope downwards towards the louvre.

Any carried-over moisture shall be contained by an adequately sized closed-end gutter section at the bottom of each louvre or louvre section. Drain gutters shall have an outlet branch piped to the nearest gulley or to discharge on an adjacent drained roof as applicable. Frames shall be weather sealed and acoustically sealed into openings with a suitable mastic seal. Flanges shall fully mask the opening.

All materials, including fixings, shall be corrosion resistant or treated to resist corrosion in particular to exposure to sea air. Frames and blades fabricated from galvanized mild steel or aluminium sections and sheet shall normally be bolted together. If welding methods of assembly are used the galvanizing shall be reinstated immediately on completion of welding. Frames and blades fabricated from aluminium alloy extruded sections shall be inert gas shielded arc-welded, or bolted or riveted together. Galvanized wire bird screens shall be fitted to the inner face of louvres, shall be removable for cleaning, extend over the full face of the louvre and be of 10mm mesh size.

External louvres shall be polyester powder coated to an agreed RAL colour and shall be manufactured as detailed on the drawings.

B6.5 Ductwork

General ventilation ductwork shall be low velocity constructed of galvanized mild steel and the standard of construction and materials of all ductwork, fittings, dampers, access doors, etc. shall comply in all respects with DW144 "Specification for Sheet Metal Ductwork".

The drawings, which are diagrammatic, must be read in connection with the requirements of DW144. It is the responsibility of the Ventilation Sub-Contractor to co-ordinate the ducts with each other and with all other services and to allow for all necessary offsets, etc.

Flexible ducting shall have a PVC/fiberglass fabric cover fused to a PVC steel wire helix similar to Thermaflex ST manufactured by Flexible Ducting Ltd, Glasgow. Maximum length of flexible ducting shall be 500mm.

Test holes 25mm diameter fitted with rubber grommets shall be fitted at the commencement of all main runs and branches and at the fan outlets and, in any case, all places where it is considered necessary to effect the reading of fan duties and the proper balancing of the ductwork system.

Circular ductwork shall be spirally wound from hot dipped galvanized sheet steel with yield point 200/N/m², manufactured in accordance with DW144 and Eurovent standards and in material gauges specified by DW144. Spiral seams shall conform to leakage Class C (high pressure) as specified in DW 143.

Circular fittings shall be manufactured in materials as specified for spiral ductwork and comply to DW144 and Eurovent 2/3 standards for fittings. In addition fittings shall incorporate a factory fitted "safe" double seal gasket in EPDM rubber, with stainless steel retaining band. The gasket system seal shall conform to leakage Class C (high pressure) as specified in DW143 without use of any other form of duct sealant. Main fittings such as bends and tees shall have stop swages to ensure square conditions.

Operating temperature range for EPDM gaskets = 30°C to 100°C continuously.

All secondary steel supports to the ductwork installation shall be provided and installed under this Sub-Contract.

Ductwork shall be constructed in accordance with the following table:

Size of Ductwork	Nominal Sheet Thickness	Angle Iron flanged joints when specified
Circular Ductwork		
Up to 400mm Dia.	0.8mm	25 x 25 x 3
Over 400mm and up to 800mm Dia.	1.0mm	25 x 25 x 3

B6.6 Ductwork and Equipment Supports

The Contractor shall include all supports, brackets and fixings associated with the ventilation installation including attenuators, plant and extract fans. The recommendations of the HVCA Sheet Metal Ductwork Specification shall apply. All concealed ductwork supports and brackets shall be generally fabricated from galvanised mild steel flat, angle or channel sections and designed to incorporate as necessary anti-vibration mountings. Where possible ducting shall be supported direct from the building structure or main structural steelwork.

Where supported from structural steelwork brackets shall be where practicable of the clamp or type fastening to the steel structure. The Contractor shall include for all fastening and fixings to the constructional and fabric elements of the building. Brackets and supports shall be set out so as not to obstruct the access to other engineering services.

B6.7 Flexible Connections

The inlet and outlet connections to all fans shall be connected to the ductwork by means of flexible connections of heavy weight Neoprene held in place by sheradised steel straps or galvanised angle iron clamps. A clear distance between the metal ducts or connections connected by the Neoprene connectors shall be maintained generally at not less than 50mm and not more than 225mm long.

B7.0 ABOVE GROUND DRAINAGE INSTALLATION

B7.1 General

This section details the supply and installation of all services and equipment associated with the sanitary fittings in the building as detailed below together with the necessary soil, waste, vent and anti-siphon connections all as specified and/or indicated on the drawings.

The Contractor shall include for cleaning all sanitary fittings and removing all protective tape before the installation is handed over to the Employer. The water flow to outlet fittings shall be demonstrated at the request and in the presence of the Project Manager.

The complete above ground drainage installation shall be carried out in accordance with Local Authority Requirements, current British and European Standards and Codes of Practice, complying fully with the Building Regulations.

The above ground drainage installation has been designed to I.S. EN 12056 (Gravity drainage systems inside buildings) and it shall be the Sub- Contractor's responsibility to install the pipework, fittings and accessories to ensure that:

- (a) Appliances drain quickly, quietly and completely at all times without nuisance or risk to health.
- (b) Discharge is conveyed without crossflow, backfall, leakage or blockage.
- (c) Air from the drainage system does not enter the building.
- (d) Pressure fluctuations in pipework do not vary by more than + 38mm water gauge and traps retain a water seal of not less than 25mm.

B7.2 Above Ground Drainage – Installation Generally

Install pipework, fittings and accessories, ensuring compliance with design and performance requirements and I.S. EN 12056 (Gravity drainage systems inside buildings), to give a watertight pipework installation.

- (a) Obtain all components for each type of pipework from the same manufacturer.
- (b) Cut ends of pipes to be cleaned and square with burrs removed.
- (c) Allow for thermal and building movement when jointing and fixings.
- (d) Form junctions using fittings intended for the purpose ensuring that jointing material does not project into bore of pipes, fittings and appliances.
- (e) Avoid contact between dissimilar metals and other materials which would result in electrolytic corrosion.
- (f) Provide access covers and cleaning eyes as necessary in convenient locations to permit adequate testing and cleaning of pipework.
- (g) Prevent entry of foreign matter into any part of system by sealing openings during construction. Fit all covers and cleaning eyes as the work proceeds.

- (h) Pipe routes to be the shortest practical, with as few bends as possible and no bends in the wet portion of the soil stack unless specified otherwise or indicated on the relevant drawings. Pipe routes not shown on drawings to be approved before commencing work.
- (i) Where not specified otherwise, use plated, sheradised, galvanised or non-ferrous fastenings, suitable for the purpose and background, and complete with the material being fixed.
- (j) All surface mounted soils and wastes pipework to be white in finish.

B7.3 Above Ground Floor Drainage – Pipework and Fittings

Unless otherwise indicated on drawings all Soils and Wastes pipework shall be installed in HDPE Wastes and small vent pipework shall be installed in uPVC tubing to I.S. EN 1329 / I.S. EN 1451 / I.S. EN 1519 (as applicable to material type) with proprietary tees and bends. Exposed pipework shall be white.

The Mechanical Contractor shall be responsible for the making of all connections as manufactured by Marley, Hepworth or other equal approved to faucets left at ground floor.

Cleaning /rodding eyes shall be fitted to all waste pipe bends and soil float ends.

Expansion arrangements on soils pipework shall be strictly in accordance with the Manufacturer's recommendations, together with those indicated in the 'Institute of Plumbing' Booklet, Guide to the installation of PVC Soil Systems.

Soil and waste pipework penetrating the floors shall be in an enclosure, both above and below the floor. The material of the enclosure shall have a mass of 15kg/m².

All soil and waste pipework outside of bedroom riser shafts shall be insulated with 25mm thick Mufti lag Type S13 10 Acoustic installation as detailed on the relevant drawings. Where indicated on the relevant drawings soil vent stacks shall terminate in the roof void with 'Durgo' air admittance values or slate vent tiles.

A Hepworth HEPvO hygienic self-sealing waste valve complete with running adaptor and tundish adaptor shall be installed where indicated on the relevant drawings to permit pressure/temperature discharge and condensate discharge to terminate in a soil stack.

All systems shall be fully ventilated with soil stacks venting to roof level. In all areas drainage pipework will be accessible. Soil and waste pipes from upper floors are to connect into the drainage system via main soil vent pipes, which are located within service risers.

Access will be provided at all branches, changes of direction and connection to the drainage system.

Gravity discharge pipework will drop through the building height to connect to a suspended foul drainage systems located at high level within the ground floor before connecting to the below ground drainage systems at ground floor SSL.

Appliances located at ground floor are routed to underground drainage system located below slab level.

Contractor to include for a full CCTV drain survey of each soil stack and stub stack to ensure nothing has been dropped down pipework during the construction works— any items which appear on this survey are to be removed by mechanical contractor.

B7.4 Materials

It is proposed that the above ground drainage pipework is as follows:-

- Soil Stacks and suspended drainage - HDPE pipe and fittings
- Horizontal wastes branches
(Concealed pipework - uPVC pipework and fittings)
- Ventilation pipework
(Concealed Pipework) - uPVC pipework and fittings

All condensate pipework shall be installed in uPVC of the type as manufactured by Unidare Engineering, Marley or other equal and approved. Pipework shall have a nominal diameter of not less than 22mm to promote the clearance of condensate and shall be installed and terminated to the internal soil and vent stack in accordance with the requirements of BS6798: 2000, Part 4.3.

Unplasticised PVC pipework system manufactured in accordance with I.S. EN 1329 / I.S. EN 1451 / I.S. EN 1519.

Waste system from items of sanitaryware to floor faucets, gulley, etc. shall be the push-fit ring seal type and shall conform where applicable to the standards laid down by BS 5254, Kitemarked Certified, Ring seals shall conform to BS 2494 and as follows:-

(a) Waste pipework shall be either 32mm, 40mm or 50mm nominal diameters as indicated on the drawings and extruded in polypropylene with pipe fittings injection moulded in polypropylene incorporating rubber ring seals.

(b) Waste pipes shall be fixed using clips or hanging type clips as appropriate at the following maximum centres for support:-

(c) Waste floats to terminate with 92.5° swept tee and access plug with screw cap for rodding.

B7.5 Traps

Waste traps shall be provided on all wash hand basins. Waste traps shall be as manufactured by Bartol Plastics, Key Terrain Ltd or other approved manufacturer sized to match the sanitary appliance waste fitting.

B7.6 Fire Collars

Provide intumescent fire collars on all pipework equal and greater than 50mm pipework passing through floor slabs.

B7.7 Venting Above Ground Drainage Systems

All above ground drainage systems shall be vented to atmosphere at the high point and intermediate points of each foul drainage line. Intermediate points may be vented using proprietary air admittance valves. Air admittance valves (AAV's) shall comply with I.S. EN 12380. AAV's must be located in roof space areas and the amount of AAV's used must not adversely affect the amount of ventilation required to ventilate the below ground foul system.

B7.8 Above Ground Drainage – Pipework Supports

The complete soil and waste pipework installation shall be supported using brackets as supplied by the pipework manufacturer and installed strictly in accordance with the manufacturer's instructions in regard to spacing, fixings etc.

B8.0 SANITARYWARE INSTALLATION

B8.1 General

All sanitary ware shall be installed in accordance with Technical Guidance Document G – Hygiene and the relevant Irish standards published by the National Standards Authority of Ireland (NSAI) and shall be white or stainless steel. All mounting heights shall be approved by the Consulting Engineer prior to installation of the various items of sanitary ware.

The Mechanical Contractor shall liaise with the Building Contractor at an early stage of the contract, to ensure that all faucet positions meet the requirements of the above ground drainage locations.

It shall be the Mechanical Contractor's responsibility to ensure that all builders' upstands are located correctly, especially distance from walls for the installation of WC Pans. The cost of relocating builders' upstands due to lack of site co-ordination will NOT be accepted and will not constitute a contract variation.

All above ground drainage shall be white and complete with suitable connectors to connect to Builder's faucets or upstands. All WC pans shall be complete with suitable multiwik connectors and all taps shall be installed using grip washers. All brassware for sinks, basins, baths and showers must be complete with flow regulator valves.

The Mechanical Contractor shall supply and install white seats and covers matched to WC pans with stainless steel rods and chrome plated hinges. Plastic hinges will NOT be permitted.

All sanitary ware and brassware for basins within the same room must be from the same manufacturer and range.

All exposed pipework were indicated on the relevant drawings shall be chromium plated.

The Mechanical Contractor shall be advised that flexible connections must not be used on any item of sanitary ware or appliance as per the Client's Requirements.

All off-loading, handling and positioning of sanitary ware shall be carried out by the Mechanical Contractor. The Mechanical Contractor shall be responsible for installing all silicone sealants. White sealants shall be used with white sanitary ware and clear sealants with stainless steel. Insets sinks shall be fitted with the correct sealing strips and not silicone sealants.

The Mechanical Contractor shall be responsible for removing all protective tape, manufacturer's labels and ensuring that all sanitary ware is left in a clean and working state before handover.

B9.0 TESTING AND COMMISSIONING

B9.1 General

After the completion of the installations and when all pressure testing has been completed, the Contractor shall set the plant to work and regulate correctly and efficiently to the complete satisfaction of the Engineer.

To demonstrate compliance with Irish Building Regulations (Part L & Part F where applicable) of the Building Regulations the Contractor shall be required to provide commissioning reports on all systems (e.g. water distribution systems, automatic controls, heat pumps, air distribution, lighting, power etc) to CIBSE Commissioning Management Code M. Each report shall be provided by a suitably qualified person for the particular system being commissioned (e.g. Member of Commissioning Specialist Association or Commissioning Group of HVCA).

Each report shall include:

- A commissioning plan, all systems inspected and commissioned in sequence.
- System test results confirming in line with design.
- Ductwork air leakage testing, when required.
- Commentary on variations where they are to be accepted.

B9.2 Pre-Commissioning & Seasonal Commissioning

The Contractor shall be responsible for the pre-commissioning and commissioning of all systems as detailed hereinafter and shall include in his tender figure for all costs which may be incurred due to compliance with the requirements of this section.

Pre-commission shall mean the testing, checking and adjustment of each individual component within a system to ensure that its operation is satisfactory, its mechanical and electrical connection are correct and in accordance with the manufacturer and/or suppliers instructions and/or wiring diagrams and installation manuals and to ensure that it is functional and in working order. Pre-commissioning therefore shall apply to each individual motor controller, indicator etc.

Commission shall mean the testing and operation of each system to ensure that it is operating as designed and that the function under control (temperature, pressure etc.) is being maintained within design limits and also that the response of the system to changes in the variables being monitored by the system is satisfactory.

Seasonal commissioning shall mean the commissioning of each system under actual occupancy conditions and during times of exceptional weather. The Contractor shall allow for a minimum of 4 commissioning sessions to be overseen by the Commissioning Manager. The commissioning results shall include feedback from occupants on internal conditions.

Pipework and associated plant shall comply with CIBSE commissioning code W, B & C unless otherwise stated.

Ductwork and associated plant shall comply with CIBSE commissioning Code A unless otherwise stated.

A complete record of all control settings, flow rates, velocities, pressures, speeds, damper and valve settings, etc shall be taken by the Contractor, two copies of which are to be incorporated into the O&M manuals.

Commissioning is not intended to replace the various stages of inspection as already described, which should be carried out at the appropriate stage of the Contract.

Commissioning of all specialist equipment shall be carried out by either the manufacturers or their appointed representatives.

Commissioning of the various installations shall be carried out by a suitably qualified engineer or an approved commissioning company overseen by the Commissioning Manager.

After the Contractor is satisfied that successful commissioning has been achieved, each installation or system is to be fully demonstrated to prove that they are working to the intention of the Specification.

B9.3 Commissioning of New Systems

On completion of the installation of a ASHP/or a hot water storage system, together with associated equipment such as pipework, pumps and controls, the equipment should be commissioned in accordance with the manufacturer's instructions. These instructions will be specific to that particular unit and/or hot water storage system.

The installer should give a full explanation of the system and its operation to the user, including the manufacturer's instruction manual where provided.

B9.4 Cleaning and Flushing of Pipework

All pipework included in the Contract shall be thoroughly cleaned internally to remove any foreign matter. The following operations shall be carried out:-

The cleaning of completed pipework to remove dirt, burrs, etc., accumulated in pipework during installation by flushing out the installation.

Water for testing, filling and flushing out shall be taken from a mains water supply; the operating system will not be used for testing, filling and flushing out.

B9.5 Balancing of Pipework Systems

Balance all circuits by the regulation valves provided on a temperature and pressure basis. Utilising details of design pressures/temperatures at the various points of the system provided, check overall flow by measuring the pressure differences across the pumps and relate this to the pump manufacturer's test curves. Adjust flow through the equipment to give the design temperature drop or rise utilising commissioning valves.

Include for all necessary pressure gauges and temperature tapings to enable the water circuits to be properly balanced and also to determine precise pressure losses across control valves, coils and all equipment.

Balance the system generally using the procedures outlined in CIBSE Commissioning Codes, W and B. Upon completion of the testing balancing and operating of the installation allow for taking temperature readings in each room and submit these in a fully tabulated schedule for comment.

Supply all necessary instruments to effectively test and commission the complete piping services and associated equipment and any additional instruments as may be reasonably requested.

A detailed report showing the design duty, actual duty and valve settings shall be provided and included within the O&M Manual.

B9.6 Pressure Tests on Pipework (Heating & Water Services)

On completion of the pipework the Contractor shall carry out the following hydraulic tests:-

All Heating pipework shall be tested to 7 bar and held drop-tight at this pressure for a duration of 1 hour. The tests shall be only considered valid if witnessed by the Engineer or Client representative and certified accordingly.

All Heating pipework circuits shall be proportionately balanced and set to design flowrates.

The Water Services system shall be hydraulically tested to twice the working pressure for hot and cold water or 4 bar whichever is greater. The pressure shall be applied gradually and maintained for a period of at least two hours in the presence of the Engineer's representative and shall be inspected for leaks. All circuits and sub-circuits shall be balanced to ensure the correct flow of water is achieved.

Once the sanitaryware has been installed the Contractor shall adjust the rate of flow through each tap to achieve a satisfactory flow.

B9.7 Implementation

The Contractor shall ensure that all information necessary to comply with the above requirements is made available by the relevant suppliers.

The Contractor shall include for all site visits necessary by the suppliers or their agents to ensure compliance with the above.

The Engineer shall be at liberty to attend all pre-commissioning checks and commissioning checks as he deems necessary.

The final commissioning of the plant and all systems therein shall be carried out in the presence of the Engineer, the Client and any such representatives which the Client may deem necessary.

Should the systems fail to commission for any reason the process must be repeated at a later date after all faults have been corrected.

The Contractor may at his discretion employ the services of the supplier or his representative to carry out commissioning of any or all of the systems. A commissioning certificate must be supplied for each system tested.

Systems which are commissioned in the absence of the Engineer shall not be accepted and the commissioning will require to be repeated in the Engineer presence.

B9.8 Liaison with Other Trades

The Contractor shall liaise with all other trades through the Contract to ensure that all information necessary is obtained from other trades and that all equipment provided by others is obtained and all equipment to be handed over to others for installation is duly handed over.

B9.9 Commissioning Period and Demonstrations

The Contractor shall allow a period of 1 week within the project for commissioning of plant during which no other major items of work by any trades shall be carried out. The first week of this period the Contractor shall with the assistance of the Electrical Contractor and Controls Supplier demonstrate the function of every item of plant and control to simulate situations to prove the function of the item. Once each function of every items of plant has been proved the start of the second week shall constitute the commissioning and demonstration period so as to allow sufficient time to remedy, before handover, any faults found. All specialist contractors shall be present during this demonstration and associated costs included. Following an acceptance demonstration the plant shall be left to run under normal conditions and its ability to adapt to various control requirements monitored. All defects discovered during demonstration must be remedied and function reassessed before acceptance.

B9.10 Maintenance and Warranties

The Contractor shall include in his tender price provision to the Client a comprehensive service contract during 12-month period following handover. The Contractor shall cover preventative maintenance, breakdown call out. The Contractor shall arrange for the

specialist controls sub-contractor to guarantee the system and its operation for a period of twelve months following handover. At the end of the 12 month Defects Period the Contractor shall include for carrying out a service on all items of plant and the BEMS.

B9.11 Instruction and Information

The Contractor shall instruct the Client or his appointed representative in the operation of all systems supplied and commissioned with him.

B9.12 Building Control Documentation

The Contractor shall include for the timely provision of all certificates and notices required by Building Control. This information shall include, but not be limited to:

- Commissioning Data in accordance with CIBSE Commissioning Codes.
- Chlorination Certificate
- Notices in relation to the flues in accordance with Irish Building Regulations Part L.
- All Gas Commissioning Certificates
- Fixed Building Services Commissioning Notice for Non-Domestic Buildings

B9.13 Fuel for Testing and Commissioning

The Contractor shall make allowances in his tender for all fuel required to complete the full testing and commissioning of all mechanical engineering systems detailed within the mechanical tender documentation.

B10.0 OPERATING & MAINTENANCE MANUALS

B10.1 Operating and Maintenance Documents

The Contractor shall obtain, collate and hand over to the Engineer prior to the issue of the Certificate of Practical Completion the following documentation;

The Contractor shall ensure that all drawings and documents are brought up to date and accurately reflect the completed project.

The Manuals shall be presented in both hard copy and electronic format. Electronic copies shall be presented on USB drive with drawings in AutoCAD and PDF format and all other information in PDF format. Therefore, the tender shall allow for all costs associated with scanning all information onto PDF files.

Each manual shall contain the following information:

- 1 No. set of paper “As-Installed” drawings and 1 No. set of written instructions.
- 1 No. USB drive containing drawings in AutoCad and PDF format and written instructions in PDF format
- Manufacturers’ literature pertaining to the items of plant and equipment installed. Where periodic maintenance is required this shall be listed.
- All Testing and Commissioning Certificates relating to:
 - Heating and Plumbing pipework test certificates
 - Water treatment commissioning certificates
 - Mains water installation test certificate
 - Ventilation test certificate
 - Air-conditioning certificates
- Emergency contact references to include names, addresses and telephone numbers which may be needed during the Defects Liability Period.
- A detailed description of the scope, purpose and manner of working of each system of equipment and controls forming part of the Works.
- Data on general design parameters together with manufacturers' information concerning correct operation.
- Clear instructions on the operations and closing down of each system of equipment.
- Clear instructions for dealing with emergency conditions for each system of equipment.

- Instructions in respect of any precautionary measures.
- Instructions as to the nature, extent and frequency of servicing necessary properly to maintain the equipment in good condition.
- Names and addresses of Suppliers of all major components of the Works which may be required for spare parts or replacements. Copies of manufacturers' data to be supplied for individual items together with detailed maintenance instructions, including a list of recommended spares for all equipment installed under the Contract.
- All equipment guarantees provided by the Manufacturers.

B10.2 Building Log Book Requirements

The Main Contractor shall be responsible for providing all building, mechanical and electrical services information for the Building Log Book and also the operating and maintenance manuals as required by the Building Regulations. The log book shall be provided in the format given in CIBSE TM31 'Building Log Book Toolkit'. The mechanical and electrical services information shall be presented using the TM31 standard template. The information shall provide the client with a booklet about his building for easy reference suitable for day-to-day use.

The overall Building Log Book shall be developed in conjunction with all members of the design team including Client, Architect, M&E Consultants, Main Contractor, Mechanical and Electrical Contractors. As such the Contractor must make allowance for all necessary works to complete his section of the Log Book to the satisfaction of the Engineer.

The contents of the Log Book shall comprise:

1. Building history
2. Purpose and responsibilities
3. Links to other key documents
4. Main contacts
5. Commissioning, handover and compliance
6. Overall building design
7. Summary of areas and occupancy
8. Summary of main building services plant
9. Overview of controls / BMS
10. Occupant information
11. Metering, monitoring and targeting strategy
12. Building energy performance records
13. Maintenance review
14. Result of in-use investigations

The Contractor shall provide 1No. electronic version for handover to the Client. The electronic version shall be Microsoft Word format.

The Contractor shall note that this shall be an on-going process and shall ensure that the required information shall not be left until the end of the project.

The Log Book shall be provided along with the O&M Manuals which will provide the detailed operating and maintenance requirement and As Installed drawings.

B11.0 FIRE STOPPING

B11.1 General

The Contractor shall allow for fire stopping all pipework, ductwork and soils and wastes pipework where it passes through fire compartments.

Details of the fire compartments as agreed with Building Control are shown on the architects Fire Strategy drawings. Copies of these drawings should be requested from any Main Contractor who requested a price for the mechanical engineering service installation.

Allowance shall be made for fire stopping of all mechanical services whether detailed on the tender drawings or not.

B12.0 REMOVAL OF EXISTING SERVICES

B12.1 General

The Contractor shall set out a complete method statement for all disconnection works. The contractor is particularly advised to examine the site during the tender period and ascertain the full extent of these works in particular the existing building which is to be refurbished.

The Contractor is specifically advised and shall be deemed to have surveyed the full extent of strip –out during the Tender period and all costs are deemed included in the Tender return. No future claims in this regard will be entertained. The Contractor shall refer to all survey and existing layout drawings provided and shall consult these during his own survey. Any discrepancies shall be advised by the Contractor and included in the tender.

All work shall be carried out in an environmentally aware manner in order to minimise any adverse environmental impact caused by the works.

The contractor shall take all due care when carrying out this project to carry out the works in an environmentally aware manner and dispose of all redundant materials in an environmentally responsible manner, including the use of recycling or specialist disposal methods to avoid the release of pollutants to the environment.

All redundant materials containing material classified under 'European Communities Waste Management Act, 1972' and 'S.I. No. 73/2000 – Waste Management (Hazardous Waste) (Amendment) Regulations, 2000' shall be considered as hazardous waste and shall be disposed of in accordance with legislative requirements. This includes fluorescent lamps, cathode ray tubes, batteries containing mercury, etc.

It will be the responsibility of the contractor to survey and confirm all services to be stripped out to accommodate the architect's layouts only.