

MECHANICAL SPECIFICATION

**High Performance Gym
T2 Tailteann Building
Mary Immaculate College
Limerick**

Project No: 26.3138-MFC-V1-XX-SP-M-5900

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A GENERAL PRELIMINARIES

A.1 STANDARD ENGINEERING SPECIFICATION

The Standard Mechanical and Electrical Building Services Engineering Specification shall be read in conjunction with all or any of the sections included in the Specification Summary Sheet.

The complete Specification of Works to be carried out shall include all forms of tender, forms of contract and contract drawings.

The aforementioned may be separate or combined together in one or more bundle to comprise the Tender Documents which shall be read as a whole, and **all** items shall be included for in the submitted priced Tender with **no** exclusions or qualifications.

A.2 DEFINITIONS

In the Standard Engineering Specification, the following words and expressions shall have the meanings hereby assigned to them except where the context otherwise requires: -

"The Employer" shall be as defined on or with the Form of Tender.

"The Contract Administrator" shall mean the appointed representative Defined, on or with the Form of Tender. The contract administrator for the mechanical, electrical and lift services shall be the consulting engineer.

"The Contract" shall mean the Form of Contract described on or with the Form of Tender.

"The Works" shall mean the whole of the Works described in the Specification to be executed by the Mechanical, Electrical, and Lift Contractor.

"The Specification" shall mean the complete Specification of Works described above.

"The Main Contractor" shall mean the firm appointed to carry out the whole of the Contract where applicable.

"The Mechanical and Electrical Contractor" shall mean the firm appointed to carry out the whole of the Works described in the complete Specification.

Where the Form of Tender states that the Mechanical and Electrical Works shall be carried out under a Sub-Contract with a Main Contractor then the Mechanical and Electrical Contractor shall be referred to, and act as, a "Sub-Contractor".

A.3 COMMUNICATIONS

The Contractor shall communicate only with the Consulting Engineer.

A.4 VISITS TO SITE

Tenderers shall visit the site by prior arrangement with the Contract Administrator before completing their tenders and will be deemed to have satisfied themselves on the full nature of local conditions as regard accessibility, transport and storage of materials, the supply of, and

conditions affecting labour and to have obtained all necessary information on all matters affecting the execution of the Works.

Claims on the grounds of want of knowledge in such respect, will **not** be admitted.

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A.5 INSPECTION OF ARCHITECTURAL/STRUCTURAL DRAWINGS

Where the Works are part of a building project, Architectural/Structural or other Services drawings will be available for inspection during the tender period at the Contract Administrator's offices within normal working hours. Tenderers will be deemed to have inspected these drawing and included for all matters relating to the execution to the Works.

Claims on the grounds of want of knowledge in such respect will **not** be admitted.

A.6 LABOUR & SUPERVISION

The Contractor shall employ experienced and qualified workmen to carry out the Mechanical Works. Such workmen may be assisted by apprentices or labourers, but always during the execution of the Works, their numbers shall not exceed the number of skilled workmen.

The Contract Administrator may at any time request proof of the level of qualification and / or competence of any person involved with the Contract on behalf of the Mechanical, Electrical, or Lift contractor and if not satisfied may request their replacement.

The Contractor shall employ one representative, whose name shall have been previously communicated in writing to the Contract Administrator, to superintend the carrying out of the Works on site. The said representative shall be present on the site at all times during working hours and any orders or instructions which the Contract Administrator may give to the said representative shall be deemed to have been given to the Mechanical, Electrical, or Lift Contractor.

The Contract Administrator shall have the power to request the contractor to remove from the works any person employed by them who in their opinion is incompetent or misconducts themselves or does not comply with the above paragraphs of this clause. Any person or persons so removed shall not be employed again on the works without the permission of the person who requested their removal.

A.7 IDENTIFICATION

The Contractor shall ensure that all his operatives carry an identification card c/w Photograph when requested.

The contractor shall, prior to commencement of any work on the premise, report to the responsible person for that premise and produce his/her identification card for all operatives intending to carry out work.

A.8 WORKING HOURS

Work shall be carried out during the normal working hours of the site. However, it shall not be carried out outside the hours of 8.00 am to 6 pm, on Mondays to Fridays without the written approval of the client.

A.9 OVERTIME

Payment of overtime will not be considered unless written authority is given by the Client, and only then with agreement.

A.10 PROHIBITION OF TRANSFER OF CONTRACT

No part of the contract, or any interest in it shall be Transferred or assigned by the contractor directly or indirectly to any person or persons whomsoever.

A.11 SITE MEETINGS

Periodical meetings will be held at the site as and when required by the design team.

The contractor shall arrange to have an accredited representative present at each of these meetings.

The Contractor shall have previously communicated the name of the contractor's representative in writing to the design team.

A.12 SCHEDULE OF RATES

A Schedule of rates giving details of prices and quantities for each section of the work **will be required** to accompany the submission of tender.

This schedule must show the rates of **each** piece of apparatus, labour rate for erection, rates per unit length (inclusive of labour) for the installation of each size of cable, conduit, trunking etc.

The final grand total shall agree with the tender figure.

A.13 VALUATION OF VARIATIONS

The Specialist Contractor's price is lump sum fixed price, there will be no variations to the Contract Sum, unless additional works are instructed by the Employer's Representative, and these will be carried out in accordance with the appropriate clauses.

Notwithstanding the Conditions of the Contract, no work shall be commenced upon any variation or cost incurred, unless otherwise authorized by the Contract Administrator, before:

- a) The value of the variation has been agreed.
- b) The Contract Administrator's written instruction has been issued.
- c) The Main Contractor's official order has been received.

A.14 PAYMENTS

In the case where the Mechanical and Electrical Services Installer is named Sub-Contractor, payments will be made via the Main Contractor and the appropriate retention and Main Contractors Discount will be deducted.

On the issue of the Certificate of Practical Completion, or the Certificate of Taking Over, retention shall be held as prior agreed.

At the discretion of the Contract Administrator, after twelve months of the Defects Liability Period has elapsed, all retention monies will be released, providing a Certificate of Indemnity is received from the Mechanical and Electrical Services Contractor, indicating that the Employer is indemnified against the cost of remedying any defects, including consequential damage to the building, to fabric and furnishings and the cost of builder's work associated with the remedying of such defects and consequential damage which shall appear in the latter six months of the twelve months Defects Liability Period of the Contract.

B PARTICULAR PRELIMINARIES

B.1 CONTRACT DRAWINGS & SPECIFICATION

The Contract Drawings are intended to show the general arrangements of the various items of the Works as described in the Specification to be supplied and installed under the Contract. They do not necessarily show exact runs or full details of all accessories, fitting etc, required and in some instances are merely diagrammatic.

However, the Specification and Drawings must be understood to cover everything required to make a first class installation and the Contractor should include for all items necessary for the proper execution of the Works in his Tender.

Anything shown on the Drawings which is not included in the Specification, or anything herein and not shown on the Drawings shall be deemed to be required as part of the Contract.

Any anomalies, which arise between Drawings or between Drawings and the Specification, should be reported to the Consulting Engineer before the Tender is submitted. Such discrepancies must be pointed out at the time of tendering and will not be accepted as a basis for extra claims and work during the progress of the installation. All Contract Drawings and the Specification are the property of the Employer.

All tender and contract drawings including specifications shall be issued in PDF format. If paper copies are required from the consultant, a charge for paper copies shall be applied. Payment for such copies shall be made in full at handover of the paper copies. The following charges shall apply:

A1 – Black and White	€2.50 per sheet
A1 – Colour	€4.00 per sheet
A0 – Black and white	€3.50 per sheet
A0 – Colour	€5.00 per sheet

Specification up to 150 pages €5.00 per copy

B.2 WORKING DRAWINGS

Notwithstanding the provision of the Contract Drawings the Contractor shall be responsible for taking his own particulars and providing at his own expense all necessary working and detail drawings as requested by the Consulting Engineer, copies of which must be first submitted for comment before the work is put in hand. Comments on working drawings will not relieve the Contractor of his responsibility to ascertain exact building dimensions and location of other services.

Where the Contractor chooses to prepare the working drawings utilising AutoCAD or equivalent, base building outline discs in .dwg or .dxf format will be provided at cost.

For ducting, pipework and containment installations, the Contractor shall submit for the Consulting Engineer's approval, either in electronic format or, three paper copies of drawings showing the proposed routes, dimensioned to show the exact points of vertical/horizontal runs

and positions. If any of the services are installed prior to comment, or not in accordance with the issued drawings, the Consulting Engineer will be entitled to instruct these to be altered, at the Contractor's cost, to comply with his requirements.

The Contractor will be responsible for taking dimensions from site for all equipment to be specially fabricated and for preparing his own detailed working drawings from these measurements. Such drawings shall be submitted, either in electronic format or, in triplicate for the Contract Administrator's comment before manufacture is commenced.

The Consulting Engineer's comment of working drawings will not relieve the Contractor of his responsibility for errors and incorrect setting out. The Consulting Engineer's comment is to be general and is not intended to serve as a check and does not relieve the Contractor from furnishing the materials and performing the work as required by the Drawings and Specification.

The Contractor shall be responsible for any discrepancies, errors or omissions in the working drawings and other particulars supplied by him, whether such drawings and particulars have been approved, in principle, by the Consulting Engineer or not, provided that such discrepancies, errors or omissions be not due to inaccurate information or particulars furnished in writing to the Contractor by the Consulting Engineers.

Following the comments of any working drawing the Contractor shall formally issue two copies of the approved drawing to the Consulting Engineers.

B.3 SETTING OUT

The Contract Drawings are for tendering purposes only and are not to be used for setting out. Except where specific dimensions are given, the Contractor will verify all setting out on site and shall make use of all detail, large scale, furniture, and internal wall elevation drawings held by the Main Contractor.

Notwithstanding the submission, approval and issue of Working Drawings, the exact positions of all services, plant and equipment must be agreed on site with the Consulting Engineer before they are set out. Drawings shall not be scaled for this purpose.

The Contractor shall accurately set out the works and he shall keep them correct in every way according to the Drawings and Specification.

In all instances where services such as gas, hot and cold water, heating, electricity, Telecom. TV, etc. run in conjunction with and/or parallel to any service installation, the setting out of the whole of the services is to be approved before work is commenced on that portion of the installation.

B.4 BUILDERS' WORK

The following work shall be deemed to be Builders' Work, which shall be provided by the Main Contractor: -

- a. Cutting away through walls, floors, and ceilings for passage of all mechanical and electrical services etc. and making good after.
- b. Chasing of walls for conduits, accessory boxes, pipework, and fittings

- c. Auxiliary timber noggins and the like for supporting luminaires and ceiling mounted accessories.
- d. All underground pipe ducts, lighting column pits, trenching etc.
- e. All painting of surface services.
- f. Removal and replacement of other parts of the building fabric as may be necessary.
- g. Items of general and special attendance.
- h. Taking delivery, unloading, taking on store, Hoisting materials, Power for fixing Scaffolding, Protecting completed installation

The Contractor shall inform the Main Contractor of the location and details of any of the above Builders' Work required by marking out on site or, if requested, by drawings.

The Contractor shall be responsible for the accuracy of the Builders' Work information and shall recompense the Main Contractor for any abortive work carried out due to inaccurate information.

The Contractor shall be fully responsible for the levels and squareness of fittings when fitted to chases etc., and to this end will ensure the accuracy of all works carried out in this connection by the Main Contractor.

The Contractor shall permit nothing to be done which may injure the stability of the works and no cutting through floors, walls, etc. will be allowed, other than where required by the Drawings, without the sanction of the architect.

The contractor shall be provided with general attendance, free of charge, general attendance shall include only allowing use of scaffolding, mess rooms, sanitary accommodation providing space only for office accommodation and for storage of plant and materials.

B.5 FIRE PROTECTION

When opes are cut through wall or floors to enable services to pass through, the Main Contractor must make them good with incombustible material. Internal fire barriers in conduit, trunking, ducts, etc. shall be the responsibility of the Mechanical and Electrical Services Installer.

B.6 FIXINGS

The Contractor shall include for all drilling and plugging for the erection of all materials and equipment required by the Specification. This shall include the fixing of metalwork, screws, clips, bolts, brackets, saddles, etc. for the proper support of services and for the suspension or support of services.

In any building partially or fully occupied by the Employer or other person's noise and hindrance whilst carrying out any of the above shall be kept to a minimum.

The architect's and the Main Contractor's approval shall be obtained as to all methods of fixing proposed before the work is commenced and, in particular, the approval shall be obtained, in writing, before welding, drilling, burning, cutting, cartridge injecting or altering structures or foundations in any way.

The Contractor shall rectify at his own expense any damage whatsoever caused by negligence on the part of his workmen to decorations, paintwork, building fabric or structure etc.

B.7 PAINTWORK

The Contractor shall be responsible for protecting all equipment that has been installed from damage, and shall thoroughly clean all equipment before it is handed over. Any damaged paintwork shall be made good in a colour and type of paint to match the original.

Mild steel or iron brackets or other items to be built in are to be painted before building in. In the case of materials or plant which is delivered to the site already primed, the Contractor shall ensure that the primer is suitable for the type of paint to be subsequently applied and shall make good any damage to the primer before further coats are applied.

All items that are to be painted shall have an under-coating and a finishing coat in addition to a primer appropriate to the material being painted, the finishing coat shall be to a colour to be approved by the Consulting Engineer.

All paints, including priming, undercoats and finishing coats shall be of the best quality, and shall be obtained from a reliable, and are to be used in accordance with the Maker's instructions. Painting shall be done in accordance with the best practices in the Trade, all surfaces to be painted, must be thoroughly prepared, including removal of dust, grease, and protective coatings, and in the case of iron and steel, the removal of rust and scale by abrasion, followed by the application of an anti-rust solution to remove pitted rust.

B.8 WORKMANSHIP

Workmanship shall conform to the highest standard of current Mechanical and Electrical installation practice. The Consulting Engineer reserves the right to reject any work, which in his opinion does not meet such a standard. Rejected work shall be rectified immediately or taken down within two days and corrected as soon as is practically possible.

B.9 MATERIALS

Unless otherwise specified all material to be used throughout the installation shall be new and shall be of EU manufacture.

All materials shall be of the best of their particular type and the Contractor may be called upon to submit for approval samples of the various materials intended for use in the execution of the work. All materials are to comply with the appropriate Standards and regulations.

Materials, which are specified, to be supplied by a particular Manufacturer shall **not** be varied without the written approval of the Consulting Engineer.

In these specifications trade names and/or suppliers are sometimes used for the purpose of brevity and clarity of technical, aesthetic, and functional intent. Such references are for the conveniences of the tenderer in clearly indicating the standard of technical, aesthetic, and functional requirements sought by the specifier. The intention is not to favor one product over another or to eliminate other products/suppliers.

Other materials/suppliers may be put forward for consideration as equivalent materials to those stated in the specification.

Approval for substitution of equivalent materials/suppliers will be given where the alternative material/supplier are demonstrable equal in full accord with the original specification.

Equivalence of an offered substitution will be judged on the basis of objective, clear and verifiable independent proof of similar compliance with equal standards to those specified.

Where appropriate verification is provided through a detailed technical dossier, drawings, data sheets and/or a test report from a recognized body, a material/product substitution will be permitted by the architect who is the client representative. Any increased costs arising whatsoever from such a substitution in terms of redesign, rescheduling, health, and safety issues etc. shall be borne by the Contractor.

Alternative suppliers/installers will need to prove their ability to perform their sub-element part of the main contract through the submission of proof of their technical and/or professional capacity (education, experience, equipment etc.).

The contracting authority, through its architect who is the client representative, will determine on a case by case basis, from a technical, aesthetic, and functional perspective, what constitutes an equivalent standard/product. Verification will take place only after the award of contract, as part of the contract management regime. Sufficient time is to be allowed to check submissions and provide samples as indicated in this specification.

When for any reason the Contractor proposes a change from the specified materials for approval, he shall provide samples, free of charge, to the Consulting Engineer for evaluation together with all back up technical and other reference information requested by the Consulting Engineer.

The Contractor shall ensure that all materials, which are installed or stored on site, are properly protected. The Consulting Engineer reserves the right to reject any materials which are damaged or corroded due to poor storage, installation, or lack of protection, or materials which do not comply with the Specification.

Rejected materials, whether installed or stored, shall be removed from site within two days and replaced as soon as is practically possible.

It shall be the Mechanical and Electrical Services Installer's responsibility to ensure that all materials are ordered and delivered to site in sufficient time to enable him to complete his work within the period of contract. No additional claims will be allowed for non-compliance.

B.10 PRODUCTS SPECIFIED BY NAME

It should be noted that, for tender purposes, the reference to any particular item or product within this specification lays down the parameters required for that product. These parameters will include type and standard of aesthetic finish, applied technology/inter-component compatibility, thermal capabilities, technical suitability, and physical dimensions.

Alternative products may be offered if full details are submitted in writing, at the submission of any tender for evaluation and approval by the Consulting Engineer. Any such alterations shall

be detailed in the form of a separate schedule indicating any projected cost savings against any scripted product.

B.11 TESTING AND COMMISSIONING

At an early stage of the Project the Contractor shall compile a programme of testing and commissioning of all services contained in this Specification document.

The Contractor shall further provide a method statement supported by risk assessments detailing the procedures for carrying out the on-site tests.

The opportunity shall be afforded to the Consulting Engineer, or his appointed representative, to witness all or any tests carried out either on site or at manufacturer's works, and to facilitate this, the Contractor shall give not less than **eight days' notice** of tests to the Consulting Engineer.

The Contractor shall provide all necessary facilities and equipment to carry out all tests and inspections either on site or at manufacturer's works.

An 'approved' engineer shall be appointed by the Contractor to supervise the whole of the testing, commissioning, performance testing and instruction of Client's staff together with all specialized personnel (including manufacturer's representatives) and all of their activities shall be coordinated by him.

All equipment, material and systems contained in this Specification document shall be tested and if such inspection/test fails, the process shall be repeated until satisfactory results are obtained.

Comprehensive records of all commissioning and testing shall be maintained and shall contain the following information: -

- a) Project title
- b) Details and date of test
- c) Instruments used, serial numbers, calibration dates
- d) Signatures of those witnessing test
- e) Mechanical and Electrical Services Installer's name
- f) Specific location of the item(s) in the Works

All such documentation shall be included in the O & M manuals.

Fuel for testing shall be provided by the Mechanical and Electrical Services Installer.

B.12 COMPLETION DETAILS

At the completion and final hand over of the project, the Contractor is required to have carried out the following: -

- a. Fully completed all works detailed in the Specification and shown on the Contract Drawings.
- b. Fully completed all works relating to Variations to the Contract, for which Architect's Instructions have been issued, thus forming part of the Contract.

- c. Submitted to the Consulting Engineer, all duly completed inspection and Completion Certificates.
- d. Submitted to the Consulting Engineer, Record Drawings.
- e. Submitted to the Consulting Engineer, a Maintenance Manual and Job Profile.

All of the above shall be produced in such a format as to allow for ease of inclusion into the Building Log Book.

B.13 INSTRUCTION PERIOD

After an installation has been completed, tested, and handed over to the Employer, and when instructed, the Contractor shall supervise and be completely responsible for the running of the plant detailed in this Specification, for a period during which he shall demonstrate to the persons appointed by the Employer to be in charge, the running conditions, operation of the plant, correct setting and maintenance controls etc. to attain the desired results.

The Contractor should ensure that the person(s) is familiar with the positions of equipment and facilities for the isolation of the installation, particularly under emergency conditions. The instructional period may not take place immediately on completion, but when considered desirable by the Consulting Engineer.

B.14 OPERATION & MAINTENANCE MANUALS

Prior to the issue of the Practical Completion Certificate for Works, comprehensive Operation & Maintenance Manuals finalized in detail and approved shall be provided. It is advised that great importance will be placed upon the quality, accuracy, clarity, and completeness of the Operation & Maintenance Manuals and upon their being made available promptly.

A complete draft copy of the manual must be submitted not less than **2 weeks before** the date of Practical Completion. Any amendments necessary in the light of any comments shall be made and the manual re-submitted for the Consulting Engineer's approval.

Only after the Consulting Engineer's approval are the final copies of the manual to be produced.

The finalised copies are to be provided to the Consulting Engineer not less than **2 weeks before** the date of Practical Completion

Failure to issue these in time will result in withholding the Practical Completion Certificate.

From time to time, as required throughout the execution of the Works, evidence of adequate and accurate records, to enable the ultimate completeness and accuracy of the Operation & Maintenance Manuals, shall be progressively examined as the work on site proceeds.

All Operation & Maintenance Manuals shall be provided in triplicate together with CD-ROM containing all documentation, following the issue of one set for approval.

The Operation & Maintenance Manuals shall be adequate for the following purposes: -

- a. To record clearly the layout of the various sections of the Works as actually installed, and to identify and locate all component parts thereof especially isolation points, distribution boards etc.
- b. To make it possible to comprehend the extent and purposes of the Works and the method of operation thereof.
- c. To set out clearly the extent to which maintenance and servicing is required and how, in detail, it should be executed.
- d. To provide sufficient and readily accessible information properly to facilitate the ordering of spares and replacements.

The Operation & Maintenance Manuals shall be correlated so that the terminology and the numerical and/or other references used therein are consistent with and similar to those used in the physical identification of component parts of the Works.

Operating and Maintenance Instructions shall be provided and shall comprise the following as applicable (all contained in volumes strongly bound in flexible covers and suitable for heavy usage over a long period), written to be read in conjunction with the Record Drawings:

- a. A general description of the scope, purpose, and manner of working of each system or apparatus forming part of the Works.
- b. A detailed description of the scope, purpose, and manner of working of each system of automatic controls and/or monitoring instruments.
- c. A detailed description of the scope, purpose and manner of working of each system of special services.
- d. Data on general design parameters and normal operating conditions (e.g., voltage, current etc.) based on commissioning tests.
- e. Clear and comprehensive instructions for the switching on, starting up, running, and closing down of each such system or apparatus.
- f. Clear and comprehensive instructions for dealing with emergency conditions for each system or apparatus.
- g. Instructions in respect of any precautionary measures from time to time necessary (e.g., against corrosion or freezing).
- h. Instructions in respect of the care of apparatus when subject to seasonal disuse.
- i. Instructions as to the nature, extent, and frequency of servicing necessary to properly maintain the Works in good condition and as to the materials to be used for the purpose. This information may be supported in detail, but not replaced by, maintenance instructions provided by the suppliers of particular component apparatus.
- j. The names and addresses of suppliers of all major components of the Works as may be required to obtain spare parts or replacements.

Copies of manufacturers' data shall be supplied with respect to the nature, type and method of operation of individual pieces of equipment, together with their detailed maintenance instructions. Such data, in the form of individual booklets and the like, shall be indexed and cross referenced to the Operating and Maintenance Instructions and presented suitably protected in box files or folders.

An asset list of all equipment and services together with all associated technical information pertinent to such services and information shall be included.

A copy of all Test Certificates, Inspection and Test Records, Commissioning and Performance Test Records for the installations and equipment, etc., used in the installations.

B.15 RECORD DRAWINGS

Prior to the issue of the Practical Completion Certificate for the Works, comprehensive Record Drawings finalized in detail and approved shall be provided. It is advised that great importance will be placed upon the equality, accuracy, clarity and completeness of the Record Drawings and upon their being made available promptly.

Draft copies of the drawings must be submitted not less than **2 weeks** before the date of Practical Completion. Any amendments necessary in the light of any comments shall be made and the drawings re-submitted for the Consulting Engineer approval.

Only after the Consulting Engineer approval are the final copies of the drawings to be produced.

The finalised drawings are to be provided to the Consulting Engineer not less than **2 weeks** before the date of Practical Completion

Failure to issue these in time will result in withholding the Practical Completion Certificate, or alternatively the Consulting Engineer may produce them, and the **actual** production cost will be contra-charged to the Mechanical and Electrical Services Installer.

From time to time, as required throughout the execution of the Works, evidence that adequate and accurate records such as will ensure the ultimate completeness and accuracy of the Record Drawings shall themselves be progressively examined as the work on site proceeds.

All Record Drawings shall be provided in triplicate, following the issue of one set for approval. In the case of drawings and diagrams prepared by the installers, they shall be produced on AutoCAD v 2008, with 3 no CD-ROMs and 3 no sets of prints provided.

Drawings prepared by suppliers of component items shall be in the same form as above, except where they are incorporated in Instruction Manuals when paper is acceptable. The Record Drawings shall include the information listed in the following paragraphs, as applicable. All such drawings shall clearly be endorsed **RECORD DRAWING** near to the title block and shall be drawn to a scale of not less than one hundredth full size, which shall show the following as installed: -

- a. The location, including level if buried, of Public Service connections provided, together with the points of origin and termination, size and materials of cables, ducts, pipes and/or other relevant information.

- b. Location, identity, size and details of all apparatus and control equipment served by, or associated with, each of the various services. The information with respect to size and details may be presented in schedule form subject to the prior agreement of the Contract Administrator.
- c. The location and identity of each room or space housing plant, machinery or apparatus.
- d. Main and sub-main cables, showing original, route, termination, size and type of each cable.
- e. Distribution diagram, or diagrams, which shall show size, type and length (to within one yard for imperial measure or one meter for metric measure) of each service.
- f. Control wiring diagrams, which shall show all equipment supplies as part of the Works.
- g. Manufacturer's drawings and internal wiring diagrams which shall show all special equipment supplied as part of the Works.

B.16 DEFECTS LIABILITY, MAINTENANCE & SERVICING

Notwithstanding the conditions of the Contract the Contractor shall be responsible for any defects which may occur, for a period of 12 months from Practical Completion, in the entire installation detailed in the Specification with the exception of GLS Tungsten lamps for which the Employer will take responsibility.

Following notification of a defect the Contractor shall rectify the item within 24 hours except as may be agreed otherwise with Consulting Engineer.

The Client will carry out routine maintenance to the installation in accordance with the documentation issued by for all building engineering services thus ensuring that such installation is maintained and serviced correctly thus meeting all statutory requirements.

B.17 COMPLIANCE WITH REGULATIONS

The whole of the installation carried out under this contract must comply with the following regulations and requirements, together with the latest revisions and amendments or substitutes, which apply at the time of installation.

- Building Regulations.
- Local Authority Bye-Laws, Regulations and Notices.
- The local Fire Authorities requirements.
- The relevant C.I.B.S.E. requirements.
- British, Irish and EU Standards, whether applicable in part or whole.
- Relevant British Standard Codes of Practice.BS 7671: 2008, Requirements for Mechanical, Electrical and Lift Installations
- ETCI: National Rules for Electrical Installations: IS10101
- ISEN62305: 2006 Code of Protection against lightning
- BS 848 Method of testing performance.
- Fire tests on building materials and structures
- BS 5274 Requirements for fire hose reels in fixed installations.
- BS 5432 Specification for portable metal bodies fire extinguishers.
- I.C.P 3 & 4 Codes of Practice for piped natural gas installations in buildings.
- DW 144.2 Codes of Practice for low pressure ventilation ducting and fittings
- DW 172 Codes for Kitchen Ventilation Systems
- BS 5750 Specification for design, manufacture, installation, final inspection
- BS 848 Method of testing performance.
- CIBSE CC A Air Distribution Systems - CIBSE Commissioning Code A. 199
- CIBSE CC B Boilers - CIBSE Commissioning Code B. 2
- CIBSE CC C Automatic Controls - CIBSE Commissioning Code C.
- CIBSE CC M Commissioning Management - CIBSE Commissioning Code M.
- CIBSE CC R Refrigeration Systems - CIBSE Commissioning Code R.
- CIBSE CC W Water Distribution Systems - CIBSE Commissioning Code W
- TM 13 CIBSE TM13 Minimizing The Risk of Legionnaires' Disease.
- CIBSE C CIBSE Guide C - Reference Data 2007
- Non domestic Gas Installations: I.S.820:2000
- Domestic Gas Installations: I.S.813:2000
- F-Gas Regulations

C GENERAL CONDITIONS OF CONTRACT

C.1 EXTENT OF WORK

The Scope of Work includes the following:

- Drain, isolate and strip out existing underfloor heating system in main sports hall (namely: High performance gym area)
Make adjustments to existing underfloor heating controls / BMS to ensure changes to the underfloor are accounted for and do not raise alarms on BMS system.
- Supply and install new Air conditioning systems to the new high-performance gym and Cardio gym areas including Air conditioning plant, refrigeration pipework, refrigerant, controls and plant support systems.
- Supply and install new heat recovery ventilation systems to the new high performance and Cardio Gym areas as specified including heat recovery units, ductwork, Fabric ducting, grilles, dampers, fire dampers, insulation, labelling, fittings and accessories and controls
- Minor modifications to existing extract ventilation ductwork in existing stores area
- Disconnect existing drinking water fountain and services to same and supply and install new services to new water fountain. Water fountain supplied by main contractor but to be installed by mech contractor.
- Test and commission new systems

All work will be carried out on a Live site.

The contractor is required to visit the existing site during the tender period to determine the full extent of services already installed.

C.2 FREEDOM OF INFORMATION

Information in relation to this tender may be made available on demand in accordance with Freedom of Information Act 2003. You are asked to consider if any of the information supplied by you in the tender should not be disclosed because of its sensitivity. If this is the case, you should, when providing the information, identify same and specify the reasons for its sensitivity. The Client will consult with you about sensitive information before making a decision on any Freedom of Information request received.

If you consider none of the information supplied by you as sensitive, please make a statement to that effect. Such information may be released in response to a "Freedom of Information Request".

C.3 DEFINITIONS

In reading this Specification, or any other tender documentation including drawings, the following terms shall have the accompanying meanings assigned to them:

Throughout this document the term "Client" shall be deemed to refer to:

Name: Mary Immaculate University
Address: S Circular Road, Limerick

Throughout this document the term "Architect" shall be deemed to refer to:

Name: Quinn Architects
Address: 12 Barrington St, Limerick

Throughout this document the term "Quantity Surveyor" shall be deemed to refer to:

Name: Linesight Consultants
Address: The Red Church, Henry Street, Limerick

Throughout this document the term "Engineer" shall be deemed to refer to:

Name: Moloney Fox Consulting,
Consultant Address: 46 O'Connell Street, Limerick

C.4 CONTRACT TYPE – PUBLIC WORKS

GCCC Form of Contract

The Main Contract Form shall be the current version of the Minor Public Works Contract reference PW-CW6 as published by the Department of Finance.

Submission of a tender shall be taken as acceptance of the proposed contract form.

C.5 AWARD OF CONTRACT

Contractors will not be remunerated for any trouble or expenses they may incur in making up their tenders. It is the responsibility of prospective tenderers to obtain for themselves, at their own expense, any additional information necessary for the preparation of their tender. The award of contract will be made at the discretion of the client and will be made to the contractor whose tender has determined to be the most economically advantageous tender and who meets the required standards capability and financial responsibility.

C.6 BILL OF QUANTITIES

The completed Bill of quantities shall be furnished by the successful tenderer within 7 days. The bill shall list separately the material costs and labour costs.

C.7 CHANGE ORDERS / CHANGE OF REQUESTS

No addition will be made to the Contract Sum if the tenderer has 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 Contract sum unless the variation is authorized by an instruction from the Client's Representative.

Within 14 days of the date of issue by the Client's Representative of any instructions varying the content of the Contract works, submit such pricing information to the Consultant M & E Engineer as he requires. Variations shall be valued in accordance with the Valuation Rules of the Contract, excepting that, where work is omitted, it shall be fully measured, and the quantities priced at the unit rates included in the Schedule of Rates or Tender Summary, as appropriate.

The Contractor's price is lump sum fixed price, there will be no variations to the Contract Sum, unless additional works are instructed by the Employer's Representative

C.8 VALUATIONS FOR INTERIM CERTIFICATES

At the time of every valuation of the works for interim certificates, submit to the Consultant Engineer a statement showing:

- a. The gross amount (including retention) claimed in the current application.
- b. A detailed breakdown of the amounts allocated to each section of the contract Works as detailed in the Tender Summary, and the relevant amount claimed for each section.
- c. The amount certified to date by the Clients Representative. Statements shall not include any equipment or material stored off site.
- d. Amounts in terms of valuations shall not be included unless these statements are issued by the Contractor.

C.9 LOCAL LABOUR

The contractor shall insofar as practicable and without affecting the efficiency of the work employ locally as deemed necessary.

C.10 PHASING OF WORKS

The contractors shall co-ordinate their programme of works in line with the main contractor's programme. The sub-contractors shall produce a sub contractor's programme in line with the main contractor's programme.

D STANDARDS, REGULATIONS & DIRECTIVES

D.1 STANDARDS

The whole of the installation carried out under this contract must comply with the following regulations and requirements, together with the latest revisions and amendments or substitutes, which apply at the time of installation.

General:

- Current Building Regulations, Ireland (Dept. of Housing, Local Govt & Heritage)
- Local Authority Bye-Laws, Regulations and Notices.
- The local Fire Authorities requirements.
- All relevant C.I.B.S.E. requirements including CIBSE Guides, Application Manuals, Commissioning Codes, and Technical Memoranda
- Irish, EU, & British Standards, whether applicable in part or whole.
- NSAI National Rules for Electrical Installations, IS10101.
- Construction Products Regulation (CE Marking)

Water Services:

- Irish Water Code of Practice for Water Infrastructure
- IS EN 806-1 Water for Human Consumption
- BS 8558 Domestic Water Services in Buildings
- WRAS Water Regulations Approval Scheme
- HSPC National Guidelines for the Control of Legionellosis in Ireland
- CIBSE TM13 Minimizing The Risk of Legionnaires' Disease.
- CIBSE Commissioning Code W: Water Distribution

Ventilation & A/C (Refrigeration):

- BESA DW144 Sheet Metal Ductwork
- BESA DW143 Ductwork Testing
- BESA DW145 Installation for Fire and Smoke Dampers
- BESA DW172 Kitchen Ventilation Systems
- BESA RAC80 DX Airconditioning & Heat Pump Equipment
- BS9999 2017-Fire Safety in the design management and use of buildings COP
- BS5588-9 Code of Practice for ventilation & A/C Ductwork
- IS EN 15650-2010 Ventilation for Buildings - Fire Dampers
- IS EN 15423:2008 Fire precautions for air distribution systems in buildings
- F-Gas Regulations
- CIBSE Commissioning Code A: Air Distribution Systems
- CIBSE Commissioning Code R: Refrigerating Systems

Gas/Oil

- Non domestic Gas Installations: I.S.820:2019
- Domestic Gas Installations: I.S.813:2014 + A1 2017
- Registered Gas Installers of Ireland (RGI) Technical Guidance Document
- Institute of Gas Engineers & Managers (IGEM) UP Series Guidance

Protective Services

- IS EN 671: Fixed Fire-Fighting Systems (Hose Reels)
- IS 291: Selection, Commissioning, Installation of Portable Fire extinguishers
- IS EN 12845: Fixed firefighting systems. Automatic sprinkler systems.

Heating Systems & Controls

- I.S. EN 15450 – Design of Heat Pump Heating Systems
- BS 6880-1:1988 Code of practice for LTHW heating systems >45kW
- IS EN 12098 Control equipment for hot water heating systems
- IS EN 442-1 2014-Radiators and convectors
- CIBSE Commissioning Code B: Boilers
- CIBSE Commissioning Code C: Automatic Controls
-

D.2 HEALTH & SAFETY

The Contractor shall take account of the general principles of prevention as stated below:

- Safety Health and Welfare at Work (Construction) Regulations, 2013
- Health and Safety Authority: "Guidelines to the Safety Health and Welfare at Work (Construction) Regulations, 2005".
- Architects Council of Europe: "Memorandum on Council Directive 92/57/EEC", January 1994.
- Construction Industry Research and Information Association: "Control of Risk: A Guide to the Systematic Management of Risk from Construction", Report FR/CP/32, 1995.

D.3 WORK SAFETY PROTOCOL (COVID 19)

The project will be subject to the requirements of the Work Safely Protocol (the "Protocol"), published jointly by the Department of Business, Enterprise and Innovation and the Department of Health in consultation with the Labour Employer Economic Forum on 9th May 2020

The contractor shall include in their tender for the following in their tender:

- (i) Augmenting site infrastructure and welfare facilities such as toilets, canteen, isolation spaces, and access, egress, and circulation routes to meet the standards set out in the Protocol.
- (ii) Cleaning to the standard required in the Protocol.
- (iii) Covid-19 supervisor role(s) as necessary to meet the requirements of the Protocol.
- (iv) Covid-19 Personal Protective Equipment (PPE) to meet the requirements of the Protocol.
- (v) Social distancing to meet the requirements of the Protocol.

The contractor shall include realistic prices in their tender against these items. The contract sum will be deemed to include for the implementation of all measures - including hygiene, access management, materials procurement and delivery, work sequencing and work practices - required to construct the work safely and to minimise the risk of disease contagion for the Contractor's Personnel, the Employer's Representative, Employer's Personnel and third parties visiting the site.

Should there be a reason to impose greater restrictions on movement to combat any significant increases in the spread of the virus to the extent that construction activities cease in the manner imposed between 28 March 2020 and 18 May 2020, the contractor is entitled to an extension of time in accordance with the form of tender and schedule, part 1K (PW-CF1 to PW-CF5, or sub-clause 2.7 of CW-PF6), but no financial recompense.



Where the project involves an extension and/or alterations to an existing building, additional precautions will be required in relation to Covid-19 to ensure the safety of occupants of the existing building. Such precautions would involve, at a minimum, maintaining social distancing between Contractor's personnel and other personnel, wearing of appropriate PPE and sanitizing any work areas in the existing building on a daily basis.

E MECHANICAL TENDER SPECIFICATION

E.1 VENTILATION SERVICES

E.1.1 GENERAL DESCRIPTION

The ventilation and scope of works for this project includes the following

- Supply and installation of new Heat Recovery Ventilation system to High performance Gym area including, Heat recovery unit, Galvanised ductwork, Fabric ductwork, Grilles, Bellmouths, external louvres, Volume control dampers, ductwork insulation, support system, fittings and accessories
- Supply and installation of new Heat Recovery Ventilation system to Cardio Gym area including, Heat recovery unit, Galvanised ductwork, Grilles, Bellmouths, external louvres, Volume control dampers, ductwork insulation, support system, fittings and accessories
- Minor alterations to existing extract ventilation systems in existing store areas
- Test and commission all ventilation systems.
- Demonstrate Ventilation systems to client

E.1.2 STANDARDS

The systems must conform to the following standards and codes of practice

HVCA DW/144 Specification for Sheet Metal Ductwork 1998

HVCA DW/143 A Practical Guide to Ductwork Leakage Testing 2000

DWTM1 Acceptance Scheme for new products: Rectangular Cross Joint Classification

DWTM2 Guide to good practice: Internal Cleanliness of New ductwork installations

DWTM3 Guide to Good practice for the Design for the installation of Fire and Smoke Dampers

TR/17 Guide to Good practice: Cleanliness of Ventilation systems

BS 5588

BS EN 1886

Current EU F-Gas Regulations 2024/573

E.1.3 DUCTWORK GENERAL AND ERECTION

The contract drawings are general arrangement drawings only and the Mechanical Services Installer shall include for taking site dimensions for the preparation of his own detailed fabrication and installation drawings. These drawings shall allow for full co-ordination of other services, ceiling layouts, lighting fittings etc., to ensure that no clash of interest occur during or after erection.

All ductwork dimensions given for rectangular ductwork are for width x depth on both plan and section and the dimensions given will be clear internal dimensions and due allowance must be made for internal acoustic lining and external insulation where applicable for both manufacturing and clearance purposes. For circular ductwork the diameter dimension given will be clear internal dimensions.

All the fabrication and installation drawings shall be submitted to the Contract Administrator in triplicate giving full details of the method of construction, overlaps, seam, stiffeners, rivets, flanges, bolts support etc., for approval before construction commences.

General arrangement drawings of filters, heater batteries, grilles, fans and louvres, etc., shall also to be submitted for approval.

All ducting systems shall be erected in a workmanlike manner by an approved specialist contractor and when completed shall be rigid, true to size, free from movement, accurately aligned and airtight.

During erection all open ends of ducting shall have a suitable covering securely tied in position to prevent entry of dust, dirt and other debris present during building operations.

Before final fixing of grilles, the ducting shall be blown through by running the fans for a period of at least one hour and the interior of all ducts, as far as accessible, thoroughly cleaned by means of an industrial type of vacuum cleaner.

E.1.4 BIGFOOT ROOF SERVICES SUPPORT SYSTEM

A Bigfoot (or equivalent) support system shall be designed, supplied and installed by the contractor's specialist contractor to carry roof level ventilation ductwork and/or plant. The size and quantity of the support system shall be a specialist contractor design. The contractor specialist is also required to submit load management calculations and wind load calculations to the structural engineer for review. The support systems shall be manufactured from heavy duty recycled rubber and supplied with an integral galvanized steel strut adhered to the rubber with industrial strength adhesive. The product shall also be provided with drainage slots to the underside for rainwater runoff.

Specification:

- Foot – SBR recycled rubber to BS7188:1989 and A2:2009, BS EN 1176- 7:2008 – UV stabilized
- Steel strut hot dip galvanized steelwork to BS EN 102191:1997, strut sizes as per specialist design
- Galvanizing to be finished to BS EN ISO 1461:1999
- Robust high-quality materials shall only be used.
- Channel shall be compatible with industry standard fixings and fixtures
- Suitable for internal or external environments in temperatures between -40 deg C to +80 deg C to BS EN 60068-2-14:2009

E.1.5 MANUFACTURE OF SHEET STEEL DUCTWORK FOR AIR SYSTEMS

This ductwork shall be constructed of steel sheets hot galvanised to BS 2989, Grade Z2 Coating type C & comply with BS EN 10327:2004 and HVCA Specification DW/144 with latest amendment, and be constructed with mild steel angle, assembled with slip joints except for connections to fans, heater batteries, filter banks, diffusers, grilles etc.

Self-tapping screws shall not be used on any high velocity ductwork.

All ducts shall be adequately stiffened and braced to prevent drumming and/or vibration and all ducts shall be free from internal sharp edges or projections.

Cross-bracing" shall be permitted on sheet metal un-insulated ducts with one greater 475mm to give additional rigidity.

E.1.6 MANUFACTURE OF FLEXIBLE DUCTWORK

Flexible ductwork can be used to connect to grille diffuser boxes. The flexible ducts shall be good quality insulated type and maintain the integrity of the ductwork system to which it is connected with airtight seams. Joints to be fastened with bolted galvanised metal bands.

The length of flexible ducting connectors shall not without the Contract Administrator's approval, exceed 500mm run.

Flexible ducting shall comply with all the requirements of EN13180 BS 476 Part 7:1997(Class 1, Surface of very low flame spread) and shall be spring wire reinforced self-extinguishing grade rot-proof airtight material or spirally or machine formed interlocking self-extinguishing grade PVC, or alternatively consist of flexible corrugated metal tubing, such as aluminum or stainless steel.

Joints shall be by hose type galvanized or sheradised metal clamps with final sealing by 50mm adhesive tape of approved quality, or as indicated in part F of the Specification Document

E.1.7 DUCTWORK SUPPORTS FOR RECTANGULAR DUCTWORK

The ductwork shall be supported on mild steel angles beneath the ducts projecting about 76mm on each side of the duct. These angles are to be suspended on mild steel rods suitably threaded and located in the steel angles with nuts. All supports where site cut or modified are to be painted with galvafrond paint or equal and approved.

The dimensions of the angle iron supports and the flat steel clamping the duct to the support shall be as follows: -

Length of Bottom of Duct	Size of Angle Iron	Size of Flat Iron	Bolts
Up to 840mm	25 x 25 x 3.2mm	25 x 3.2mm	6.4mm
Over 840 to 1500mm	32 x 32 x 4.8mm	32 x 4.8mm	7.9mm
Over 1500mm	38 x 38 x 4.8mm	38 x 4.8mm	9.5mm

In general ductwork shall not rest directly on the building structure. Where approved however, builders work supports may be used together with vibration packing material.

Ducts shall be firmly and rigidly held in position and be free from vibration rattle or drumming. Approved anti-vibration material shall be inserted between the ducts and the supports

E.1.8 DUCTWORK SUPPORTS FOR CIRCULAR DUCTWORK

The ductwork shall be supported by means of Mild steel flat iron band clips formed in two half sections bolted together and hung from two mild steel rod hangers.

The dimensions of the flat iron supports for circular ducts shall be as follows: -

Diameter of Duct	Size of Flat Iron	Bolts
Up to 750mm	25mm x 3.2mm	6.4mm
Over 750 to 1500mm	32mm x 4.8mm	7.9mm
Over 1500mm	32mm x 4.8mm	9.5mm

All hangers shall have screwed sections incorporated for adjustment of ducting to ensure neat and true alignment.

All nuts shall be provided with washes and locknuts or alternatively be patent self-locking types.

Hangers used shall be made from mild steel rod to the sizes given below: -

Circular Ducts Diameter	Rectangular Ducts Longer Side	Hanger Rod
Up to 400mm	Up to 300mm	9.5mm
Over 400mm to 850mm	Over 300mm to 700mm	12.7mm
Over 850mm to 1500mm	Over 700mm to 1500mm	15.8mm
Over 1500mm	Over 150mm	19.1mm

Supports shall be spaced at not more than 1.83m centres according to the size and rigidity of the duct. Supports shall be provided at all branches, take-offs, bends and at all main flanged joints.

Vertical runs of ductwork shall be supported by means of angle iron flanges to the duct and resting on channel irons securely fixed to the building structure. This support shall take the vertical loading. Material movement shall be prevented with flat bar straps clamped around the ductwork and bolted back to the channel iron.

In general ductwork shall not rest directly on the building structure. Where approved however, builders work supports may be used together with vibration packing material.

Ducts shall be firmly and rigidly held in position and be free from vibration rattle or drumming. Approved anti-vibration material shall be inserted between the ducts and the supports.

E.1.9 TEST POINTS

Air flow test points shall be provided in the air ducting at all branches and regulating damper, adjacent to each plant item and control item, at all fan inlet and discharges and elsewhere as required.

The test points shall consist of a 38mm dia. hole drilled through the ducting and covered with a removable spring clip fastened cover.

Generally, air flow test points shall be provided as recommended in CIBSE Guide.

E.1.10 DAMPERS

The Mechanical Services Installer shall supply and install dampers as indicated on contract drawings or in part F of the Specification Document and will be either of the multi-vane or butterfly type as specified.

All duct dampers, except fire dampers and self-locking dampers shall be fitted with locking devices and position indicators.

Each primary control damper shall be fitted with a non-corrosion label stating the actual air flow in m³/s and the cross sectional area.

After final regulation and balancing of the system, the position of the dampers as set shall be indelibly marked on each damper quadrant.

All dampers have an inspection door provided adjacent to them.

Multi-vane design dampers shall have blade widths not exceeding 127mm with felt insert at tips with each alternative blade contra-rotating. Blades shall be of stream lined section mounted on square spindles linked together to heavy duty cast quadrant, indelibly marked open and shut, with finger operated locking device and spanner locking device for permanent setting.

Butterfly design dampers shall have blades constructed of 3.2mm galvanized mild steel sheet with 9.5mm spindle mounted on stout galvanized mild steel bearings secured to duct walls. Quadrant to be indelibly marked open and shut and all materials shall be galvanized. Edges of damper shall be rolled.

When air ducts are greater than 450mm in either plane, then splitters shall be incorporated, with rolled edges and two or more dampers, not greater than 450mm in either plane shall be incorporated. Such dampers shall be linked to a single quadrant.

Dampers shall be galvanized throughout and mounted in flanged casings.

E.1.11 FIRE DAMPERS – FUSIBLE LINK CURTAIN TYPE (FD)

The fire dampers where indicated on the drawings, shall be provided under the contract. The dampers shall be Actionair Fireshield stainless steel curtain fire dampers series FS201 with blades outside the air stream (rectangular ducts) or series FS301 (circular ducts).

The damper shall be supplied complete with installation frame I/F for masonry floors/walls, or dry wall fix cleats DWFX-C.

Fire damper classification shall be in accordance with EN 13501-3. Fire dampers shall be tested in accordance with EN 1366-2, corrosion tested to EN 60068-2-52. Fire dampers must be CE marked and comply with product standard EN15660:2010 ventilation for buildings – fire dampers.

Fire Dampers shall be installed in accordance with the manufacturer's instructions. Fire Dampers shall be installed in accordance with BESA Good Practice Guide DW/145.

In all cases the contractor is to install a Break-Away duct joint between the fire damper spigot and the attached ductwork. A break-away duct joint is to be as defined in DW/145 which is a flexible joint incorporating materials, fixings or clamps manufactured from a non-fire resistant material with a low melting point.

A properly sealed but easily removable access door shall be provided in the ductwork such as to allow easy access to the fusible link assembly. Access doors shall be Actionair removable, hinged, insulated access doors.

All Fire Dampers shall be fitted with an external visual blade position indicator. All fire dampers shall be provided with double pole micro switches for future connection to a monitoring panel.

All fire dampers installed in vertical ducts shall be installed such that the access side is the underside of the damper, and the access doors shall be fitted within the ceiling void where one exists.

Provide and fix in all ducts where shown on the drawings and where ducts pass through a fire resisting floor, wall or partition, fusible link operated fire dampers arranged to close completely against the air flow in the event of air at a temperature in excess of 72 deg. C (+/- 4 deg C) melting the fusible link.

Unless otherwise indicated the fire rating of the damper shall be equal to the fire rating of the fire resisting floor, wall, or partition through which the duct is passing and will be constructed to meet the requirements of the Local Authority.

It is the responsibility of the Sub-Contractor to obtain all necessary approvals from the Local Authorities for the use of a proposed fire damper and also to obtain a waiver in respect of the use of shutter type, spring operated dampers mounted in the horizontal plane (where applicable).

E.1.12 FIRE & SMOKE DAMPERS – MOTORIZED TYPE (MSD)

The Mechanical Services Installer shall supply and install dampers as indicated and specified (supplier - Lindab) on the drawings, complete with motorized fire damper control panel as described.

Each damper is to be supplied complete with 24V actuator and local 240/24V transformer.

All ductwork which penetrates a fire barrier will be provided with suitably rated motorised fire and smoke damper.

As required by European and Irish Law through the Construction Products Regulation (EU)No305/2011, all fire dampers installed on or after 1st September 2012 must be CE marked.

The products must meet the requirements described in EN 15650:2010 to achieve CE certification in both directions. All fire dampers must comply with Technical Guidance Document B, Building Regulations of Ireland (2006).

A copy of the test certificate and physical samples of the product must be submitted to the engineer for inspection and approval.

As stated in BSEN1366-2:1999: "Fire dampers which are to be installed in both horizontal and vertical constructions shall be tested in both orientations" (Clause 6.3.2)

"A test result obtained for a fire damper installed within a structural opening is only applicable to other fire dampers installed in the same orientation as that tested" (Clause 13.2)

"A test result obtained for a fire damper installed on to the face of a wall or floor is only applicable to fire dampers installed on to the face of a separating element in the same orientation as that tested" (Clause 13.3)

"Determination of leakage at ambient temperature, Undertake this test prior to the fire test" (Clause 10.3)

"The leakage through the fire damper shall not exceed 200m³/hr/m² (corrected to 20°C)" @300Pa (Clause 11)

"If smoke leakage is required, an additional fire damper, representing the smallest size, shall satisfy the smoke leakage criteria when tested to the procedure Described in10.3" (Clause13.1).

The actuator damper connection shall be by means of a drive interface mechanism which is independent of the ductwork.

Fire and smoke dampers with appropriate control actuators shall have spring fail-safe control actuators with24V/230V supply and shall be activated by a local fire alarm detector.

All fire and smoke dampers shall be tested to EN 1366-1 and shall be in compliance with EN13501-3. Fire and smoke dampers shall be WH-25/WK-25/WH-45/WK-45 as supplied by Lindab (Irl) Ltd or equal and approved.

Fire dampers shall be of proprietary manufacture and constructed from a corrosion resistant material such as stainless steel or be galvanized or otherwise treated to minimize corrosion. The dampers shall be housed in a rigid frame of proprietary manufacture, corrosion resistant casing which shall not distort under fire conditions.

Each fire damper casing shall be clearly marked with a permanent indication of the correct fixing attitude of the damper, the direction of airflow and the side at which access or maintenance openings shall be located.

Fire dampers shall be located in such a position and be of a type that facilitates manual testing and re-setting.

Fire dampers which are supported only by the ductwork in which they are located, or by combustible battens, frames or other methods that do not provide the fire resistance required are not acceptable.

Fire dampers provided in fire resistant ceilings shall be adequately supported either by the ceiling or from the structural soffit. It is not acceptable to form an opening, install a diffuser or grille and fit a fire damper above if the gap between the ceiling opening and the fire damper does not achieve the fire resistance.

Fire dampers shall be fitted with a suitably sized access door to facilitate manual testing.

Fire dampers shall be provided complete with installation frames. The contractor shall provide details of fixing and supports to the Engineer for approval. No duct lining or flexible ductwork shall be installed within 1.0 metres of a fire damper.

All fire dampers will provide a level of protection to match that of the fire barrier in which it is to be installed. (Classification of the Dampers within CE)

30 minute fire barrier– FD to be EI (30ve,ho) S
60 minute fire barrier– FD to be EI (60ve,ho) S
90 minute fire barrier– FD to be EI (90ve,ho) S
120 minute fire barrier– FD to be EI (120ve,ho) S

The fire damper type should be able to: Test and result externally
All Dampers to be rated in both directions (i <-> o)
Installed in line with manufacturers recommendations

A 'Fire Damper Control & Monitoring System' shall be provided for all fire smoke dampers where These dampers are indicated as 'MFD' on the drawings.

The automatic fire damper control system shall utilize an industry standard open protocol platform and shall be a completely modular and flexible computerised system which operates and continuously monitors smoke/fire dampers. Each damper shall be graphically represented in the open, closed, travelling or fault state

Manual damper override shall be via touchscreen keyboard/mouse operation. Inputs and Outputs to/from the system are via the digital input/output devices, each providing 8 off inputs and 4 off outputs to/from the panel PC. Network shape and length shall be highly flexible and extendable utilizing the Network Router devices

Software based zoning and grouping of devices shall allow complex multiple 'cause and effect' schedules to be programmed. A Smoke Fire Damper Interface device shall be mounted at each damper in the field and shall be connected to a DISYS panel via a network cable. These field SFDI devices shall allow for full addressability and individual control of all dampers. Automated scheduled damper testing to be provided via in-built software programme. Remote access to the system shall be provided.

E.1.13 ACCESS DOORS

Access doors shall be provided to give access to all dampers and at fans, each side of heater batteries and filters for inspection cleaning and maintenance purposes.

Access door shall be provided on straight runs of ductwork every 10m & not greater than 1m from duct from duct bends.

Access for cleaning ducts and for internal inspection shall be provided on all ducts at intervals and at all bends, by means of approved type access doors mounted on the duct, as called for in DW144. The size of door shall normally be 610mm x 610mm, but the shape and size may vary in individual cases to suit the size and form of duct. The door shall be secured in the closed position against an airtight gasket by three non-ferrous swing-bolts and hand wheels, one to each side.

Small inspection doors or access covers secured with non-ferrous swing bolts shall be provided at dampers on branch ducts and at all internal duct fittings, i.e. thermostat and thermometer bulbs, etc.

E.1.14 GRILLES, REGISTERS AND DIFFUSERS

The Mechanical Services Installer shall supply and install grilles and registers as indicated and scheduled on the tender drawings. All grilles shall be complete with grille box as specified and opposed blade dampers.

E.1.15 TERMINAL UNITS

The Mechanical Services Installer shall supply and install where indicated on the contract drawings and / or in part F of the Specification Document terminal units of the type and manufacture specified.

The individual components of these terminal units shall comply with the appropriate sections of this specification, unless otherwise stated.

E.1.16 ANTI-VIBRATION MOUNTINGS

All fans shall be mounted on anti-vibration bases to isolate them from the main building structure.

E.1.17 TESTING, CLEANING AND COMMISSIONING

Fitting of sensors and test holes

Provide test holes in ductwork system to allow complete testing and balancing of system in accordance with CIBSE Commissioning Code Series A.

Site drill test holes on site in accordance with DW144 Part 7 Section 20.6.

Provide holes in metal ductwork, in accordance with DW144 Part 7, paragraph 20.7, to accommodate sensors.

Fill holes that are used only for test purposes with rubber sealing caps.

Balancing of the system

The contractor shall employ a commissioning Specialist to balance air systems in accordance with CIBSE Commissioning Code A, Section A2.

Provide written commissioning reports to the Employers Representative, demonstrating the air flow rates achieved in comparison to the design flow rates.

Carry out commissioning of installations in accordance with the procedures, checks and tolerances given in the BSRIA Application Guide for air systems to achieve the standards set in the CIBSE Commissioning Codes.

E.1.18 IDENTIFICATION

Within each compartment, identify ductwork with bands indicating the purpose of the ductwork and the direction of air flow within the duct.

E.1.19 TESTING AND COMMISSIONING

The Mechanical Services Installer shall engage the services of a specialist commissioning engineer to balance test and commission the ventilation systems in accordance with C.I.B.S.E. requirements. All test figures shall be submitted to the Contract Administrator for his perusal prior to the system tests being repeated in the presence of the Contract Administrator or his nominated representative at an agreed time

Following the aforementioned demonstrations all dampers shall be marked as earlier referred to and all readings shall be recorded for inclusion in the O. and M. Manuals both on individual sheets and on the record drawings.

Failure to comply with the above two paragraphs will result in with-holding the issue of the Practical Completion Certificate.

E.2 AIR CONDITIONING SYSTEM

E.2.1 Scope of work

The Scope of Work includes the following:

- The supply and installation of new R32 Heat pump Air Conditioning systems to service the High-performance Gym including Heat pump units, indoor high static fan coil units, refrigeration pipework & support containment, Condensate drains and traps, Plant support systems (big foot or equivalent), controls, control wiring and fittings and accessories.
- The supply and installation of new R32 Heat pump Air Conditioning systems to service the Cardio Gym including Heat pump units, indoor high static fan coil units, refrigeration pipework & support containment, Condensate drains and traps, Plant support systems (big foot or equivalent), controls, control wiring and fittings and accessories.
- Supply and installation of Central control panel to control both systems including BMS modus / Bacnet facility to facilitate central control panel connection to existing BMS system.
- Test and commission all ventilation systems.
- Demonstrate Ventilation systems to client

E.2.2 SYSTEM DESCRIPTION

The Air Conditioning Contractor shall supply, deliver, install, set to work and commission the systems and equipment as detailed in this section of the specification, as shown on the Tender drawings and described herein.

The design and installation of refrigerant-based air-conditioning systems shall be carried out in accordance with Current EU F-Gas Regulations 2024/573 & EN378.

Both Gym space needs for heating and cooling shall be covered by using the Daikin VRV 5 R32 series (All Inverter Heat Recovery) systems (or equivalent, having the same features) to provide independent heating and cooling to the zones as required.

SYSTEM FEATURES

General

The VRV system will operate with a low GWP refrigerant (GWP not more than 700). The refrigerant itself has to be a single component one to facilitate the reuse and recycling. The system should be considered as an “enhanced tightness refrigerating systems” and comply with all structural requirements of clause 22.125 of the IEC 60335-2-40 (Ed.6). If additional devices and controls (such as audio-visual alarms) are required for such compliance, they will be factory pre-installed and set up. They will have to be certified and approved by internationally recognized certification bodies.

The Heat Recovery system will control flow of refrigerant through the DX VRF indoor units and the outdoor units, by means of an electronic expansion valve fitted in each DX VRF indoor unit and the outdoor unit. It will have the following features:

- 1) The Heat Recovery system must utilise a dedicated discharge line in addition to the liquid and suction pipes to the DX VRF indoor units. The dedicated discharge line is required to maintain a higher degree of usable heat output in comparison to a two pipe Heat Recovery VRF system.
- 2) The Heat Recovery system will have inverter controlled fan motors to allow the system to accurately respond to head pressure control requirements.
- 3) The system must be able to vary evaporating and condensing temperatures based on ambient temperatures and/or load to ensure optimum seasonal efficiency and comfort. Or alternatively fix the evaporating temperature for continual very high off coil temperatures.
- 4) Part load conditions must be met by a combination of change of compressor speed and change in refrigerant temperature at a suitable reaction speed which is set at the condenser on commissioning.
- 5) The Heat Recovery systems will have a minimum of 50 step inverter fan control to allow the system to accurately respond to head pressure control requirements.
- 6) All condenser fans must be capable of at least 78 Pascal's of external static pressure.
- 7) The refrigerant must be distributed by the use of a refrigerant networking system (Refnet) to ensure low pipe pressure losses as well as keeping the required pipe work installation space and material used to a minimum compared to other parallel pipe work systems.
- 8) The changeover of DX VRF indoor units will be provided by Multi Branch Separator units (Multi BS – boxes). The Multi type BS-box range should be of models with up to 12 pairs of ports and will allow the connected DX VRF indoor units to change the operation mode independently per port.
- 9) The BS box shall be possible to be installed either with the use of refrigerant distributing kits made out of copper or without, allowing the refrigerant to flow through one BS box and to the next one
- 10) Changeover of an indoor unit from Heating to Cooling must not prevent any other indoor unit on a different Multi-port BS box port from providing continuous capacity by ensuring that pressure equalisation is performed within the Multi-port BS box and not across the whole system.
- 11) The BS boxes should withstand an internal sub-pressure of at least 300Pa.
- 12) The system will have the ability to sustain refrigerant piping lengths of up to 165m (equivalent piping length has to be at least 190 meters) with a level difference of 90m between fan coil units and condensing unit, providing connection ratios are suitable. The system shall be capable of having up to 1000m of refrigerant pipe work installed. The system shall be capable of having up to 90m from the first refnet to the furthest indoor unit, providing manufacturer system design guidelines are used. The elevation between the highest and lowest DX VRF indoor units must be able to be extended up to 30 meters.
- 13) The system must be able to adjust capacity depending on the load requirements and outside temperature to ensure that the efficiency is optimised and responsiveness maintained.
- 14) The system must be able to operate a continuous heating during defrost system on multi-unit installations resulting in no cold air dumping.
- 15) The system has to smoothly operate at ambient temperatures ranging at least from -5°CDB to +46°CDB in cooling and down to -20°CWB and up to +15,5°CWB in heating. The system operation must be possible outside above mentioned limits, unless safety devices are activated.
- 16) Systems containing multiple outdoor units shall sequentially cycle its start-up sequence to ensure equalised compressor operation to extend operating life and reduce lifecycle cost.
- 17) In the outdoors units it is preferable to have a 7 segment decimal display, displaying detailed error codes, stage of the start-up procedure as well as function and operating data of the system. For the commissioning of a system and in order to properly set all necessary data and values for the optimum operation of it, it is recommended for the starting-up the use of special software provided by the manufacturer of the system. The establishing of the values and the programming should be possible even offline.
- 18) The system shall have the capability to monitor and log data in a critical memory which will store and provide 5 minutes of real time operational data prior to any system failure. This information provides the system with "Black Box" data recording capability which can be used by a qualified service technician to perform efficient and precise interrogation.

Equipment manufacturer

The equipment manufacturer must be fully certified and registered to comply in the areas of CE, Eurovent, ISO9001 and ISO14001. The equipment manufacturer shall be responsible for the manufacture of the compressor, refrigerant oil and refrigerant used within the system to maintain integrity of design and optimise efficiency and reliability of equipment. All equipment shall be run tested prior to leaving place of manufacturing.

Testing and certification.

Efficiency testing according to Eurovent certification has to be executed. The results, as well as obligatory efficiency testing results according to Ecodesign LOT21, should be published for system configurations with DX VRF indoor units that can sufficiently dehumidify (sensible heat ratio of at least 85%) and having the air flow rate of not more than 4,6m³/min/kW.

All equipment shall be run tested in accordance with the following procedures prior to leaving place of manufacture:

- 1) A choke test carried out on the refrigerant piping to detect obstacles.
- 2) The total pressure and leak test are performed at a high pressure between 1 and 1,1 times the design pressure of the unit.
- 3) The pipework shall be tested to a pressure higher than 43bar.
- 4) Electronic leak testing shall be carried out to ensure maximum system refrigerant containment.
- 5) System vacuum test: unit pressure at end vacuum check < 2.7 mbar
- 6) Electrical tests shall include:
 - o an electrical safety test (flash testing at 1,000V AC to ensure that current leaks above 7mA are detected),
 - o a running test to check the correct operation of all safety devices, valves, thermistors, fan motors
 - o the earth continuity tests (according to EN50106-2-40/2008).
 - o an electric strength test at operation condition (according to EN50106-2-40/2008 and EN60335-2-40) where the insulation is subjected for 1 second to a voltage of 1000 V.

Necessary controls and parts for compliance to IEC60335-2-40 for common applications

All measures are factory integrated and 3rd party approved, allowing:

- ✓ Like-for-like R410A selection and installation
- ✓ Minimum concerns in case of refurbishment, room separation etc.

These measures will include visual and audible (min 65dBA) alarm signals in combination with shut-off valves, in order to minimize the amount of refrigerant that may be released in the unlikely event of a leak, still ensuring compliance to IEC60335-2-40:Ed.6.

SYSTEM COMPONENTS FEATURES

E.2.3 INDOOR UNITS

Outdoor unit physical appearance

The units shall be air-cooled type incorporating heat exchanger coils, consisting of tubes and fins, factory treated to reduce the effect of atmospheric corrosion.

The outdoor unit must have a compact casing with one or two vertical discharge fan(s), allowing application on horizontal floors.

The casing shall be manufactured from (70µ) polyester powder coated baked enamel finish sheet steel in order to have a high corrosion resistance and to protect against salt laden environment close to where the units may be installed.

The bottom of the unit will have a sheet of stainless steel for protection against oxidation.

The access to the internal components for maintenance purposes shall be by removable panels, allowing easy access to the unit's key parts like compressors, sensors, thermistors, expansion valves, PCBs.

The units shall include compressor(s), fan(s), electronic expansion valve(s), oil separator(s), liquid receiver, high pressure switches, fan motor safety thermostat, over current relay, inverter overload protection, fuses, necessary solenoid valves, liquid shutoff valves, gas line shut off valves, short re-cycling guard timer and all necessary sensors for a safe and trouble free operation.

Please refer to enclosed schedules for equipment details.

Outdoor unit mechanical features and components

The outdoor units will be able to deliver cooling capacities ranging from 8HP (22,4kW) and up to 20HP (56,0kW) in a single shell/housing. A combination of two outdoor units will be possible in order to have systems with cooling capacity reaching 28 HP (78,5 kW). Aforementioned cooling capacities will have to be clearly mentioned in the manufacturer's official technical documentation and literature and will have to be calculated, based on the following conditions:

Indoor room air temperature: 27°CDB / 19°CWB.

Ambient air temperature: 35°CDB.

Equivalent piping length: 5,0m.

Height difference: 0m.

Compressors

The outdoor units is equipped with inverter driven compressor(s) electronically controlled and capable of changing speed linearly to follow the variation in cooling and heating requirements. The compressor shall be also capable of soft start.

In the outdoor unit there will be either one or two compressors in separate shells, so in case one fails it will not be necessary to replace both.

The outdoor unit - and consequently the whole system - will keep on operating even if one compressor is turned off (emergency operation). In case of a multi-outdoor unit system it will be possible to isolate one module, while the rest of the system will continue to operate even if delivering reduced capacity. This ensures continuous air conditioning of the premises, until the cause of the issue seizes to exist.

Outdoor units should have a specific function and appropriate devices to prevent refrigerant in liquid phase to return to the compressor. This ensures the specified density of the oil and therefore the adequate lubrication of the compressor. This function increases the efficiency of the system and extends the lifespan of the compressor.

Compressors will have to be hermetically closed scroll type with integrated motor and sound absorbing jacket. They will have a DC inverter driven motor and be able to continuously change the frequency, resulting in a change to the volumetric refrigerant flow from the compressor, in

order to accurately and fast respond to the required load. The change in frequency should be done incrementally, but in enough steps so the change of delivered capacity can be approximated as linear. The minimum number of capacity steps will have to be no less than 150.

The motor windings will have to be specially constructed, in order to achieve the safe and smooth operation to avoid hazards due to the continuously changing of frequency and voltage. The compressors will be protected by an electrical crankcase heater to prevent oil condensation at low ambient temperatures.

The oil supply in the compressor will have to be on the high pressure side, ensuring optimum lubrication of all moving parts. Therefore a separate lubrication system will not be required for the moving parts of the compressor, since the oil in the centre of the crankshaft will be transported across the surface of the rotating parts from the centre to the perimeter. This optimizes the performance of the compressor and minimizes stress and wear, extending its lifetime. The compressors' motors will have a cooling system using compressed gas, to avoid sudden changes in temperature resulting in significant stresses on winding and bearings.

Compressors will alter the rotation speed linearly and consume energy in accordance with cooling and heating loads, ensuring operational autonomy and independent temperature control in each room. The two DC inverter compressors will vary their speed separately controlling the volumetric flow more accurately, with lower power consumption, resulting in higher efficiencies at all loads and connection ratios.

For protecting the compressor from frequent start-stops, there will be an appropriate timer.

Oil recovery system

The oil recovery from the piping network and the DX VRF indoor units has to be achieved by the use of a microprocessor. The oil will be recovered at least once every eight hours, via a special oil recovery function, ensuring smooth operation of compressors.

Fans

The fan motor(s) of the outdoor unit will have to be DC inverter to further increase energy savings, to more accurately adjust the fan speed and reduce noise. The setting of the fan speed will result in precise control of system's performance in accordance with the requirements of indoor and ambient conditions. The DC inverter fan motors will automatically adjust the rotation speed - thus the air flow - and have at least 120 different steps. Each fan will be separately controlled in order to further increase the accuracy of system control.

The impeller will be made of plastic and with a special configuration to achieve greater air flow with low noise level. Outdoor units will have a protective cover over the fan to guard against accidents and to avoid foreign objects entering the units. It will be special design and construction to minimize the external static pressure drop of the fan.

Fans will have a high external static pressure setting in order to reach at least 78 Pa. This will allow the installation / connection of duct(s) for greater flexibility during installation. In case of an outdoor unit with two fans, then each fan will have the ability to be separately ducted. Furthermore, the unit shall provide 5 steps of sound reduction without using any additional material or external equipment to be able to adapt to installation place noise requirements. At maximum sound reduction step, sound pressure of the unit should not exceed 57 dBA (nominal measured value, free field condition).

System control and functions

The capacity control of the outdoor units will be inverter driven and shall be determined electronically by sensing operational temperatures, pressures and ambient temperature and monitoring requirements for the DX VRF indoor units.

All DX VRF indoor units to be connected to a system must be independently controlled depending on the requirements of each room. The DX VRF indoor units will be connected to the outdoor unit via the wiring and refrigeration piping network. The wiring cables are not required to be shielded, but the installer will have to ensure that it will not be closer than 5cm to power cables.

The system's operation has to be based on pressure sensors and thermostats, which via a specially designed integrated circuit will control the frequency of the compressor motor (inverter) by varying the compressor's speed resulting in changes to the refrigerant's volume and temperature. The result, combined with ambient temperature and building's load requirements, will always deliver the necessary capacity while maintaining optimum efficiency.

The system will have the ability to perform capacity control from down to 9% and up to 100% of the nominal capacity. The capacity delivered by the system should match the building's load. This way the system will consume the minimum required energy, at the highest possible efficiency.

The room temperature for each room must be controlled by a microprocessor, where processing of the various parameters and the corrective settings are proportional and according to the integral - differential method of regulation.

Parameters; set temperature and return air temperature for the differential control, gas and liquid refrigerant temperatures for controlling the superheat

Corrective settings; opening of the expansion valve, fan speed

Variable Refrigerant Temperature

The system has to automatically adjust the evaporating and the condensing temperature in order to always deliver the exact capacity for the building's load, with the highest possible efficiency. In parallel, it must be possible to also set a target refrigerant temperature. This way the delivered capacity will be ambient temperature dependant thus having very high seasonal efficiency. In addition, it has to be possible to operate the system with at least three different set refrigerant temperatures. Higher evaporating temperatures will result in less dehumidification indoors, while the system will deliver mostly or even only sensible capacity. The adjustment of the evaporating and the condensing temperature will have to be easily field set, without any optional accessories prior or after the commissioning of the system.

Ambient temperature dependant variation of the refrigerant temperature – evaporating and/or condensing is required, and results in even greater energy savings and optimal seasonal efficiencies, as per latest directives of the European Union.

It should also be possible to fix the evaporating temperature at different values in order to have the system operate with different Sensible Heat Factors. This way and depending on the indoor relative humidity the supply air temperature can vary (e.g. higher), thus increasing comfort

levels through less cold air supplied in the rooms. At the same time relative humidity levels can be maintained within the comfort zone according to international standards and guidelines.

Continuous Heating During defrost

The VRV units should incorporate a function that guarantees continuous comfort during defrost cycles as defrost takes place regularly in order to increase efficiency of the system and protect the outdoor units from heat exchanger breaking down.

In order to avoid cold drafts and also the absorption of heat from the rooms, the indoors will not be used as the evaporator during defrost. The outdoor unit must have a special heat exchanger that will act as the evaporator during defrost. In case of multi-outdoor systems the defrost of the outdoor heat exchanger will take place in a consecutive way, by means of defrosting completely each heat exchanger one after the other.

Branch Selector units (BS-boxes) features

Physical appearance

Multi-port BS-box will allow the connected DX VRF indoor units to change the operation mode independently.

Multi-port BS-box must not exceed 300 mm in height to be installed in limited ceiling space. The overall required space for installation, including tolerance by the manufacturer, shall not exceed 400mm in height.

The Multi-port BS-boxes must be factory pressure tested and must not require piping caps cutting in order to save labour.

Features and functions

Multi-port BS-boxes should be capable of having any number of unused free ports capable of allowing additional DX VRF indoor units to be added at a later date without any loss of capacity. The nominal cooling capacity of each indoor or group of indoor units to be connected to each port will have to be up to 16kW.

Multi-port BS-boxes must have the possibility to unite 2 ports to allow the connection of large capacity DX VRF indoor units (up to 10HP/28 kW nominal cooling capacity).

Please refer to enclosed schedules for equipment details.

- Heating and Cooling will be provided by utilising an inverter Heat Recovery system(s) to provide heating and cooling to the zones as required from the load schedule.
- The Heat Recovery system must utilise a dedicated discharge line in addition to the Liquid and suction pipes to the indoor units. The dedicated discharge line is required to maintain a higher degree of usable heat output in comparison to a two pipe Heat Recovery VRF system.
- The Heat Recovery system must be able to heat continuously during the defrost cycle to gain higher integrated heating capacities.
- The system must be able to vary evaporating and condensing temperatures based on ambient temperatures and/or load to ensure optimum seasonal efficiency and comfort. Or alternatively fix the evaporating temperature for continual very high off coil temperatures.
- Part load conditions must be met by a combination of change of compressor speed and change in refrigerant temperature at a suitable reaction speed which is set at the condenser on commissioning.
- The Heat Recovery systems will have a minimum of 50 step inverter fan control to allow the system to accurately respond to head pressure control requirements.

- The compressor shall respond to control frequencies from 60 to 402Hz to provide stepless capacity control.
- All condenser fans must be capable of at least 78 Pascals of external static pressure.
- The refrigerant must be distributed using a refrigerant networking system (Refnet) to ensure low pipe pressure losses as well as keeping the required pipe work installation space and material used to a minimum compared to other parallel pipe work systems.
- The system must be able to operate a continuous heating during defrost system on multi-unit installations resulting in no cold air dumping.
- Changeover of a fan coil from Heating to Cooling will not prevent any other fan coil on a different BS box port from providing continuous capacity by ensuring that pressure equalisation is performed within the BS box and not across the whole VRV system.
- Both single and Multi BS boxes should be utilised. The single port Branch Selector boxes must not exceed 210mm in height.

E.2.4 INDOOR UNITS

Concealed Ceiling Medium ESP Ducted Units

- The unit casing shall be manufactured from galvanised steel plate and shall be fully insulated. The use of a polystyrene only construction for the outer casing will not be acceptable.
- The unit shall not be more than 245mm deep.
- Facility shall be provided for duct connection for introduction of the fresh air in the unit and branch ductwork from the unit.
- The return air to the unit shall be through the rear of the unit as standard. A facility shall be provided for alternative return air position through the underside of the unit.
- The fan shall be of the dual suction multi blade type, statically and dynamically balanced to ensure low noise and vibration free operation.
- External static pressure up to 150 Pa enables the use with flexible ducts of varying lengths
- Must be able to change External Static Pressure through wired remote control to allow optimisation of the supply air volume
- Must have multi-tenant capability to enable continuous operation in the event of a loss of local power via an optional PCB
- The heat exchanger coils will be manufactured from copper tubes and aluminium fins. It shall have electronic expansion valve to control refrigerant flow rate in response to the load variation in the conditioned space. The expansion valve shall be controlled by an integral computerised PID control system to maintain correct room temperature.
- A condensate lift pump shall be provided within the unit and shall be capable of discharging 625mm above the drain outlet.
- The condensate shall be drained from the unit using suitable tube and run directly to a main drainage point.

Roundflow discharge ceiling Cassette Units

- The unit casing shall be manufactured from galvanised steel plate and shall be fully insulated. The use of a polystyrene only construction for the outer casing will not be acceptable.
- Facility shall be provided for duct connection for introduction of fresh air to the unit via an optional accessory, up to 20% fresh can be accommodated by the optional kit.
- An option must be provided for a floor sensor that can detect the average floor temperature and adjust the air flow to ensure even temperature distribution between the ceiling and the floor.
- An option must also be provided that detects the presence of people within a room and adjusts the set point if no one is detected in the room. It must also direct the air flow away from individuals within the room based on a four-zone system.

- The unit to have a 360° Airflow pattern with reduced velocity and all-round air distribution pattern to avoid hot and cold spots and to ensure uniform airflow with a possible 23 airflow patterns
- The fan shall be DC for LOT 11 compliance of the dual suction multi blade type, statically and dynamically balanced to ensure low noise and vibration free operation.
- The heat exchanger coils will be manufactured from copper tubes and aluminium fins. It shall have electronic expansion valve to control refrigerant flow rate in response to the load variation in the conditioned space. The expansion valve shall be controlled by an integral computerised PID control system to maintain correct room temperature.
- The indoor unit shall contain temperature sensors, to control the unit's heating / cooling output.
- The heat exchange coil shall be manufactured to allow air discharge in up to eight directions to reduce the risk of draughts.
- Provision will be made to fit manufactured discharge blanking plates should air flow not be required in one direction.
- The low profile dedicated decoration panel shall be provided for each unit. The decoration panel shall incorporate the return air grille and supply air louvers. A facility shall be provided to automatically swing the supply air louvers or lock them at a desired angle between 300 and 600 to ensure even distribution of the airflow.
- The decoration panel should also be available in white with white louvers.
- The decoration panel shall be manufactured to allow free passage of tempered air in all eight directions.
- A condensate lift pump shall be provided within the unit and shall be capable of discharging at a height of at least 850 mm above the drain outlet.
- The unit must sit no deeper than 204 mm within the ceiling void for class 20-63, 246mm for class 80 & 100 and 288mm for class 125.
- The condensate shall be drained from the unit using suitable tube and run directly to a main drainage point.
- The air filters shall be incorporated within the unit and shall be mould resistant washable resin net type.

Fully Flat Cassette 4-way discharge 600 mm square

- The unit casing shall be manufactured from galvanised steel plate and shall be fully insulated. The use of a polystyrene only construction for the outer casing will not be acceptable. Facility shall be provided for duct connection for introduction of fresh air to the unit and branch ductwork from the unit.
- The unit must be full flat to the ceiling protruding no more than 8mm. The unit must also be able to fit and be installed within a standard ceiling tile. The surrounding ceiling tiles must be able to rest on a slight lip (5mm) to allow correct/ accurate ceiling alignment.
- An option must be provided for a floor sensor that can detect the average floor temperature and adjust the air flow to ensure even temperature distribution between the ceiling and the floor.
- An option (presence sensor) must also be provided that detects the presence of people within a room and adjusts the set point if no one is detected in the room. It must also direct the air flow away from individuals within the room based on a four-zone system.
- The fan shall be DC for LOT 11 compliance of the dual suction multi blade type, statically and dynamically balanced to ensure low noise and vibration free operation and give excellent low draught characteristics
- The heat exchanger coils will be manufactured from copper tubes and aluminium fins. It shall have electronic expansion valve to control refrigerant flow rate in response to the load variation in the conditioned space. The expansion valve shall be controlled by an integral computerised PID control system to maintain correct room temperature.

- The low profile dedicated 4-way air discharge decoration panel shall be provided for each unit. The decoration panel shall incorporate the return air grille and supply air louvers. A facility shall be provided to automatically swing the supply air louvers or lock them at five adjustable settings.
- A condensate lift pump must be provided within the unit and will be capable of discharging 750mm above bottom of the unit.
- The condensate shall be drained from the unit using suitable tube and run directly to a main drainage point.
- The air filters shall be incorporated within the unit and shall be mould resistant washable resin net type.

E.2.5 CENTRAL CONTROLS

Intelligent Touch Screen Controller

- Intelligent Touch Manager System will be provided with a true touch active screen with colour Liquid Crystal Display with Icon displays to provide simple user-friendly operation. The system:
- Must have no physical buttons, all commands via Touch Screen.
- Operate with easy to understand "Windows" operating system
- Have the capacity to control up to 512 Addressable Groups from a single device
- Proportional power consumption to make the controller capable of providing energy monitoring & client billing requests (option)

Controller Display

- On/Off selection
- Set Point adjustment (Range 16-32 degrees C)
- Fan speed adjustment
- Heat/cool/auto changeover mode selection
- Frost protection set point
- Timer settings
- Holiday period settings
- Priority settings for restriction of local access for start/stop, heat/cool mode and set point adjustment range limitation
- Reset ability for malfunction codes and filter maintenance warnings

Indoor Units Monitoring Display

- Room set point
- Room Temperature Display
- Operation mode; Heating or Cooling
- Display of number of devices operating within system
- Start/stop operation, set point control, cool/heat mode selection, air volume setting, air flow direction setting and enabling/disabling operation of the remote controllers by group, zone or collectively.

Other Features of central controller

- Monitoring of operation status of the indoor units, filter change indication and error code of the group or the zone.

- Comprehensive schedule set up to start/stop the air conditioning systems. This can be set for year, month, weekday, hour and minute. This will enable normal day-to-day time clock functions as well as yearly holiday set up. Up to 8 settings can be configured up to 13 months in advance and allocated to various groups/zones.
- Volt free forced stop input possible such as fire shut down.
- Flexible Group/ Zone selection Remote monitoring of common operation/fault
- Power proportional distribution with optional memory card and external kW hour meters.
- Running cost per indoor unit via optional software licence and external kWh meter(s) (option)
- To be connectable to the preventative maintenance system.
- Possibility to perform monitor operation/fault for 8 separate systems with optional control board.
- Possibility to perform on/off control and monitor operation/fault for 4 separate systems with optional control board.
- Password protection for zone, group and schedule set-up functions.
- The controller shall have wide touch screen control colour display and can be wired by a non-polar 2-wire transmission cable to a distance of 1 km away from the outdoor units.
- The controller shall contain an internal power supply system WITHOUT the need for any external power supply, the controller shall accept a direct connection of a 230V AC power supply.
- Modbus interfaces shall be provided to facilitate the connection and monitoring of the VRV systems from the BMS.

E.3 INSULATION

E.3.1 GENERAL DESCRIPTION

Supply and install ductwork insulation to new Ventilation ductwork systems as required
Supply and install refrigeration pipework insulation (see air-conditioning section)

On completion of the hydraulic tests, to be satisfaction of the Contract Administrator, all pipework in the roof spaces, false ceilings, wall chases, etc., including the cold water services and all pipework not required as heating surface shall be thermally insulated in accordance with the following specification.

All pipes and ironwork to be thoroughly wire brushed and cleaned to ensure complete removal of all rust and grease prior to the application of insulation and treated with two coats of red oxide or equal paint.

In all cases where rigid sectional or flexible insulation is used, all care must be taken that its density is not impaired by compression when tie wires or bands are secured in position, or when further layers of materials or enclosures are applied.

The whole of the work is to be carried out in accordance with the manufacturer's installation procedures and in a neat and approved manner to conform with BS 874:1973:1986 (and all amendments), BS 5422:2009, EN 14303:2009+A1:2013 BS EN 12664:2001, BS EN 13467:2001 and all associated standards and codes of practice

E.3.2 PIPE AND DUCTWORK INSULATION SPECIFICATION

All pipework and ductwork shall be insulated as detailed.

All pipework and ductwork insulation shall be Thermobreak foil backed insulation. The physical characteristics of the insulating material together with adhesive, fixing, vapour barrier and finishing materials, whether pre-applied or applied on site, shall conform to the following.

Technical Data:

Material:	Irradiation (physically) crosslinked polyolefin foam with factory applied reinforced foil.
Density:	25kg/ m ³ (foam core only)
Thermal Conductivity: (ISO 8302-1991)	0.032 W/mk (@ 23° mean temperature)
Water Vapour Permeability: (ASTM E96)	8.19 x 10 ⁻¹⁵ kg / Pa.sm (0.29 mg.m/Nh)
Water Vapour Permeance:	3.3 x 10 ⁻¹⁴ g/M.N.S

Permeability Resistance

Factor: $\mu > 20,000$

Water Absorption by Volume: 0.8% (after 28 days)

Resistance to Fungi: Zero Growth
(ASTM G21)

Operating Temperature: -80°C to 100°C

Fire and Smoke Behavior:

BS 476 Part 6 and 7 Class 0

AS 1530.3 (1999)

Spread Flam Index: 0

Heat Evolved Index: 0

Ignitability Index: 0

Smoke Develop Index: 0-1

UL94: HF-1

ASTME 84: Complies to: Flame Speed Index <25
Smoke Index <50

NFPA 90A & NFPA 90B: Complies with Requirements

ISO 5659-2 (1994)

All insulation shall be generally as follows:

Pipe Size: Insulation
Thickness

15-22 19mm

28 and above 25mm

Ductwork 25mm

Where frost protection is required: 38mm

All insulation joints both butt joints and horizontal joints shall be neatly finished with all joints being sealed with approved manufacturers adhesive. Insulation shall be neatly mitred at bends, tees, valves etc. end caps shall be installed at all valves, tees, etc.

All insulation work shall be carried out by an approved specialist. all materials delivered to site shall be new and dry, and so maintained throughout the progress of the works.

The engineer will not accept poor quality or badly finished work neither will he accept irregularities in the thickness of insulating materials or in the material covering. All work shall be left smooth, clean, and properly finished.

Pipework shall be insulated separately, and adjacent parallel pipes shall not be married together in one insulation covering.

Where allowance must be made for pipe – duct expansion, and / or contraction, insulation shall be finished in a neat and approve manner permitting easy access and disconnection of removable items without disturbing the surrounding insulation.

Insulation materials and their finishes shall be free from asbestos.

The Engineer will not accept poor quality or badly finished work, neither will he accept irregularities in the thickness of insulating materials or in the material covering. All work shall be left smooth, clean, and properly finished.

All insulating material and associated products shall be applied strictly in accordance with the manufacturer's recommendations and instructions and work failing to comply with these will not be accepted by the Engineer.

All joints, surfaces, edges, and overlaps shall be neatly finished and where possible, overlaps shall be arranged to be on the 'blind' side.

Where allowance must be made for pipe / duct expansion and / or contraction, insulation shall be finished in a neat and approved manner permitting easy access and disconnection of removable items without disturbing the surrounding insulation.

Unless otherwise indicated, all thermal insulating materials used within any building shall, when tested in accordance with B.S. 476, Part 4, be classified non-combustible. Alternatively, all thermal insulating materials used within any building shall be non-combustible with a facing of combustible material providing that the facing is not more than 0.8 mm thick, and it has a Class 0 surface spread of flame when tested in accordance with B.S. 476, Part 7. Thermal insulating materials used within any building shall be free from substances which in the event of a fire would generate appreciable quantities of smoke, noxious or toxic fumes. When requested by the Engineers, evidence of fire classification, obtained from an approved testing laboratory, shall be provided by this Specialist to certify that materials comply with this Clause.

Insulation materials and their finishes shall be free from asbestos.

E.3.3 RECTANGULAR / CIRCULAR AIR DUCTWORK IN ROOF SPACE, VOIDS AND CONCEALED LOCATIONS

The ductwork installations on this project shall be insulated in 25mm thick "Isover" Multi-purpose duct slab ductwork insulation which is suitable for standard rectangular and circular ductwork.

The insulation shall be manufactured under quality management standard EN ISO: 9001:2000 and shall comply with the performance requirements and application standards of BS3958: Part 5: 1986 "Specification for bonded manmade mineral fibre slabs"

The insulation shall be mineral wool type and shall have a Euro-class A1 fire rating when classified in accordance with BS EN 13501-1.

Additionally, the aluminium foil face shall comply with the requirements of BS476: Part 6 "Fire propagation" and BS476: Part 7 "Surface spread of Flame" and rated to Class "O" to the building regulations.

The insulation shall be odourless and fully compatible with all standard HVAC materials and components and shall not accelerate corrosion with steel copper or aluminium. The insulation shall not sustain vermin, nor breed or promote fungi or bacteria.

The insulation shall have a thermal conductivity value of 0.032 W/m.k and water vapour permeance of 0.0037g/(s.MN) (foil facing).

The insulation shall be wrapped around the ductwork and bonded with a recommended fire resistant adhesive, applied in accordance with the manufacturer's instructions.

All insulation joints shall be sealed by means of a matching self-adhesive tape, 100mm wide. Any exposed edges of the insulation and any other points, where the covering is penetrated, are to be sealed with a suitable sealant.

Large ductwork sections greater than 600mm wide to include wire netting wrapped around insulation.

The Installer must ensure that the vapour barrier is not punctured when applying the wire netting.

E.3.4 RECTANGULAR / CIRCULAR AIR DUCTWORK EXTERNALLY (OUTDOOR)

The external ductwork installations on this project shall be insulated in 25mm thick Isover Climcover Roll Alu2 (Circular) or Isover Climcover Slab Alu2 (Rectangular)

Standards & Approvals:

Fire Performance: Classified A2 Euroclass

CE marked in accordance with EN 14303

Compliant with BS 5422 2009

Conductivity at 10°C: 0.032W/mK or less

External Weather Protection:

Final Surface Treatment to be: Aluminium Sheet Protection.

Apply embossed aluminium cladding (stucco cladding) directly to insulating material – 0.71mm thick on ductwork. Aluminium Sheeting to be fixed and installed in accordance with BS 5970

All insulation joints are to be securely taped with 100mm wide plain soft aluminium foil self-adhesive tape. Any exposed edges of the insulation and any other points where the covering is penetrated, are to be sealed with a suitable sealant.

The insulation shall be manufactured under quality management standard EN ISO: 9001.

The insulation shall be wrapped around the ductwork and bonded with a recommended fire resistant adhesive, applied in accordance with the manufacturer's instructions.

E.3.5 GENERAL PAINTING AND IDENTIFICATION BANDS

Where insulation is enclosed in aluminum cladding it is to be left thoroughly clean and in natural finish. Under no circumstances should the aluminum be painted. PVC identification colour bands shall be provided at 2m intervals in accordance with BS 1710 and applicable to colour chart code. PVC flow direction arrows shall be fitted at 3m intervals.

All pipework, whatever the finish, which is not immediately identifiable must have identity colour bands fitted at 2m intervals in accordance with BS 1710 colour code indicated on chart.

In order to standardize on colour bands for engineering pipework, the following colour chart will be used. This chart is in accordance with the latest B.S.1710:1984 (See also table 15:8 - Part 15 Symbols and Notations).

Pipe Contents	Basic Colour	Colour Code Indication
Drinking Water	Green	Blue
Cooling Water	Green	White
Boiler Feed Water	Green	Crimson/White/Crimson
Condensate Water	Green	Crimson/White/Crimson
Central Heating <100°C	Green	Blue/Crimson/Blue
Central Heating >100°C	Green	Crimson/Blue/Crimson
Cold, down Service	Green	White/Blue/White
Hot Water Supply	Green	White/Crimson/White
Fire Extinguisher	Green	Safety Red
Compressed Air Light	Blue	Light Blue
Steam	Silver Grey	Silver Grey
Natural Gas	Yellow Ochre	Yellow Ochre
Oil (Furnace Fuel)	Brown	Brown

All pipework above duct level and within the building, which is not included elsewhere in this specification will be finished by others.

On repair work, or where alterations to existing plant are involved, all covering which is disturbed must be made good and repainted as called for in this specification. Where this work is in an existing boiler house the whole of the equipment, new and existing, is to be repainted in accordance with this specification.

E.3.6 DUCTWORK PAINTING AND IDENTIFICATION

In accordance with BS 1710 identification tags are to be placed at 3m intervals, or as appropriate, on all ductwork outside the plant room for easy identification, indicating 'Warm Air Supply', 'Conditioned Air Supply' 'Recirculation Air', 'Fresh Air', 'Extract', or as appropriate.

E.3.7 LIAISON

Insulation work must be programmed in such a way as to ensure that no part of the work causes inconvenience or delay, either to other trades or the client, particularly in respect of services situated in ducts or trenches, which if left open for protracted periods of time, whilst awaiting the insulation works, can seriously impede the progress of the Contractor's program of works.

It is the Installer's responsibility to ensure against any such delays or holdups and to arrange the program of his specialist works to comply in full with the requirements of the Contract. Boiler house and plant room insulation and painting are to be completed in its entirety within a reasonable time of the completion of the plant and pipework installation therein.

E MECHANICAL SCHEDULES

F.1 SCHEDULE OF DOCUMENTS

Drawings

26.3138 Refer to Drawing Register for list of drawings

Drawing Registers

26.3138 Drawing Register

Technical Specifications

26.3138 Mechanical Specification

G SUMMARY OF PRICES

ELEMENT 1 – CONTRACT PRELIMINARIES

1. Amount for General Preliminaries	€
2. Amount for compliance with Conditions of Contract:	€
3. Amount for compliance with requirements of Building Regulations:	€
4. Amount for compliance with Health, Safety, Welfare at Work Regulations	€
5. Amount for compliance with Work Safety Protocol (Covid 19)	€
6. Amount for coordinated drawings:	€
7. Amount for “as-installed” drawings:	€
8. Amount for marking out builders works requirements:	€
9. Amount for labeling and charts	€
10. Amount for all attendances:	€
11. Amount for attendance at site meetings:	€
12. Amount for O&M Manuals:	€
13. Amount for client instruction:	€

TOTAL: (carried forward to Summary of Tender): €

ELEMENT 2 - HEATING INSTALLATION:

1. Amount for Isolation, draining and removal of existing underfloor heating system In the high-performance gym area and modifications to existing controls	€
2. Amount for modifications to existing heating controls in Cardio area to ensure Underfloor heating system is set back to control to 14degC	€
3. Amount for any item not listed (give details)	€

TOTAL: (carried forward to Summary of Tender): €

ELEMENT 3 – WATER SERVICES INSTALLATION:

1. Amount for isolation and disconnection of services to existing water fountains	€
2. Amount for new water and waste services to new water fountain and for fitting Water fountain (supplied by others)	€
3. Amount for testing and commissioning	€
4. Amount for any item not listed (give details)	€

TOTAL: (carried forward to Summary of Tender): €

ELEMENT 4 –VENTILATION & AC SERVICES:

1. Amount for Heat Recovery Ventilation unit to High Performance Gym	€
2. Amount for Galvanised Ductwork in High Performance Gym	€
3. Amount for Louvres in High performance Gym	€

4. Amount for Volume Control dampers in high performance Gym	€
5. Amount for Bellmouths in high performance Gym	€
6. Amount for ductwork insulation in high performance Gym	€
7. Amount for Ventilation and AC controls in high performance gym	€
8. Amount for duct fitting, support and accessories in high performance gym	€
9. Amount for AC plant to high performance Gym	€
10. Amount for Refrigeration pipework and containment to high performance gym	€
11. Amount for condensate drain services in high performance gym	€
12. Amount for Heat Recovery Ventilation unit to Cardio Gym	€
13. Amount for Galvanised Ductwork in Cardio Gym	€
14. Amount for Louvres in Cardio Gym	€
15. Amount for Volume Control Dampers in Cardio Gym	€
16. Amount for Bellmouths in Cardio Gym	€
17. Amount for ductwork insulation in Cardio Gym	€
18. Amount for Ventilation and AC controls in Cardio Gym	€
19. Amount for duct fitting, support and accessories in Cardio Gym	€
20. Amount for AC plant to Cardio Gym	€
21. Amount for Refrigeration pipework and containment to Cardio Gym	€
22. Amount for condensate drain services in Cardio Gym	€
23. Amount for Central controller and BMS Modus / Bacnet card	€
24. Amount for minor alteration works to existing extract ventilation services in stores	€
25. Amount testing and commissioning	€
26. Amount for any item not listed (give details)	€
TOTAL: (carried forward to Summary of Tender):	€

SUMMARY OF TENDER

1. Amount for element 1	€
2. Amount for element 2	€
3. Amount for element 3	€
4. Amount for element 4	€

TOTAL MECHANICAL TENDER Ex VAT €

Contractors Signature

.....

Contractor's Address

.....

Date

.....

H FORM OF TENDER

Tender for the:

**High Performance Gym
T2 Tailteann Building
Mary Immaculate College
Limerick**

I/We

.....

Hereby tender and undertake to execute and complete all the Service required to be performed in accordance with the Form of Contract, Contract Conditions, Specifications, instructions for tendering and Instructions to Tenderers, and contained therein and any other documents listed in the Specific Conditions of Contract for the following prices:

Tender Figure exclusive of VAT
(In words)

.....

Tender Figure inclusive of VAT
(In words)

.....

Contractors Signature

.....

Contractor's Address

.....

.....

Date

.....

I DECLARATION OF COMPLIANCE

Tender for the:

**High Performance Gym
T2 Tailteann Building
Mary Immaculate College
Limerick**

I/We

.....
.....

Hereby tender and undertake to execute and complete all the Service required to be performed in accordance with the Form of Contract, Contract Conditions and Specifications, instructions for tendering and Instructions to Tenderers.

In addition to this, we hereby confirm that our tender submission is in accordance and in full compliance with tender documents, including all associated specification and drawings.

Contractors Signature

.....

Contractor's Address

.....
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Date

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