

**VISITOR CENTRE DEVELOPMENT AT
CAPE CLEAR, CO CORK**

MECHANICAL SERVICES SPECIFICATION

FOR

**MECHANICAL SERVICES DESIGN
AND INSTALLATION**

Date	Issue	Section Changes	Written By	Checked By
22.01.26	Tender		VP	RY

CLIENT



PREPARED BY



**CBS CONSULTING ENGINEERS LTD
UNIT 12 ORANMORE BUSINESS PARK
ORANMORE
CO GALWAY**

TENDER ISSUE: JAN 2026

MECHANICAL SERVICES PERFORMANCE SPECIFICATION	4
CONTRACT PARTICULARS AND PRELIMINARIES	5
1.1 EXTENT OF WORK	5
1.2 SCOPE OF CONTRACT	6
1.3 CONTRACT DOCUMENTS	7
1.4 DEFECTS LIABILITY	7
1.5 PLANT WARRANTIES	7
1.6 ENGINEERS APPROVAL	7
1.7 WORKMANSHIP AND MATERIALS	7
1.8 SITE MEETINGS	8
1.9 RUBBISH/SITE CLEANLINESS	8
1.10 FIRE PRECAUTIONS	8
1.11 INSTRUCTING THE CLIENT'S STAFF	8
1.12 RECORDS OF TESTS	8
1.13 OPERATION & MAINTENANCE MANUALS AND RECORD DRAWINGS	8
1.14 ALTERATIONS, ADDITIONS AND OMISSIONS	10
1.15 SITE VISIT	10
1.16 CO-ORDINATION	10
1.17 PROJECT BER PART L REPORTS & SPECIFICATIONS	11
1.18 EXISTING SITE SERVICES	11
1.19 PREVAILING STANDARDS	11
ELEMENT 01 - GENERAL DESCRIPTION OF THE WORKS	13
01.0 GENERAL	13
01.1 GENERAL COMPLIANCE	14
01.2 GENERAL CONSTRUCTION WORKS	14
01.3 CONSTRUCTION PRODUCTS REGULATION (CPR 305-2011)	15
01.4 BUILDING CONTROL (AMENDMENT) REGULATIONS	15
01.5 DESCRIPTION OF SERVICES	15
01.6 DRAWINGS	18
01.7 ELECTRICITY SUPPLY AND ELECTRICAL WORK	18
01.8 SITE INSPECTION	18
01.9 CE CERTIFICATION	18
01.10 PLANT SUBMITTALS	18
ELEMENT 25 - FIRE STOPPING INSTALLATION	19
25.0 GENERAL	19
25.1 FIRE PROTECTION SLEEVES FOR PLASTIC PIPEWORK	19

25.2	FLAME AND SMOKE SEALING OF SERVICES OPENINGS THROUGH BUILDING STRUCTURE - PIPEWORK.....	19
25.3	FLAME AND SMOKE SEALING OR SERVICES OPENINGS THROUGH BUILDING STRUCTURE - DUCTWORK.....	20
25.4	FLAME AND SMOKE SEALING OF GRILLES/CEILING VALVES.....	20
25.5	CERTIFICATION.....	21
ELEMENT 52 - SOILS, WASTES AND OVERFLOWS INSTALLATION		22
52.0	GENERAL	22
52.1	PIPEWORK AND FITTINGS.....	22
52.2	JOINTING.....	22
52.3	PIPEWORK SUPPORTS AND BRACKETS.....	23
52.4	CISTERN OVERFLOWS.....	23
52.5	AIR ADMITTANCE VALVES.....	23
52.6	CONNECTIONS TO BUILDER'S FLOOR SOCKETS	23
52.7	SANITARYWARE – FITTING.....	23
ELEMENT 53 – HOT, COLD AND MAINS WATER INSTALLATION		24
53.0	GENERAL	24
53.1	PIPEWORK AND FITTINGS.....	24
53.2	VALVES.....	25
53.3	PIPEWORK BRACKETS AND SUPPORTS.....	25
53.4	SANITARY WARE SUPPLIES ISOLATION.....	25
53.5	PIPEWORK INSTALLATION	25
53.6	DOUBLE CHECK VALVES.....	25
53.7	THERMOSTATIC MIXER VALVES.....	25
53.8	COLD WATER STORAGE TANK	25
53.9	UNDERSINK ELECTRIC WATER HEATERS	26
53.10	DOMESTIC WATER PIPE INSULATION.....	27
53.11	SURGE ARRESTORS.....	27
ELEMENT 56 - SPACE HEATING & COOLING INSTALLATION		28
56.0	GENERAL	28
56.1	PIPEWORK AND FITTINGS.....	29
56.2	PIPEWORK INSULATION	30
56.3	VALVES.....	30
56.4	TESTS – PIPEWORK.....	30
56.5	HEATING/COOLING CONTROLS STRATEGY & EQUIPMENT.....	31
ELEMENT 57 - VENTILATION INSTALLATION		32
57.0	GENERAL	32
57.1	DUCTWORK CLASSIFICATION.....	32
57.2	MATERIALS	32

57.3	FLANGES & SEALANTS	32
57.4	BENDS AND FITTINGS	33
57.5	BRACKETS AND SUPPORTS.....	33
57.7	ACCESS DOORS.....	33
57.8	FIRE DAMPERS AND VOLUME CONTROL DAMPERS.....	33
57.7	GRILLES AND DIFFUSERS	34
57.8	EXTERNAL WEATHER LOUVRES	34
57.9	EXTRACT FANS	35
57.10	HEAT RECOVERY VENTILATION UNITS	35
ELEMENT 60 - ELECTRICAL WIRING OF MECHANICAL SERVICES.....		35
60.0	GENERAL.....	35
MECHANICAL SERVICES INSTALLATION COMMISSIONING PROCEDURES		36
1.1	COMMISSIONING MECHANICAL SERVICES	36
1.2	GENERAL - COMMISSION, TESTING AND BALANCING	37
1.3	INDEPENDENT COMMISSIONING.....	37

MECHANICAL SERVICES PERFORMANCE SPECIFICATION

CONTRACT PARTICULARS AND PRELIMINARIES

1.1 EXTENT OF WORK

The works detailed within this specification are for the Mechanical services installation of Visitor centre at Cape Clear, Co. Cork.

- Element 25 – Fire Stopping
- Element 52 – Above Ground Drainage
- Element 53 – Domestic Water Services
- Element 56 – Space Heating & Cooling Services
- Element 57 – Ventilation Services
- Element 58 – Insulation
- Element 60 – Heating Controls

1.2 SCOPE OF CONTRACT

- 1.2.1 The scope of works for the mechanical installation systems shall include the supply, delivery, off-loading, lifting/crainage, installation, co-ordination, testing & commissioning, set to work and demonstrate the complete installation as outlined in this specification. The mechanical contractor shall account for all components necessary for a safe, fully functioning, energy efficient, easily maintainable installation at design stage. These systems shall be included, but not be limited to, ventilation, space heating, water services and above ground drainage systems.
- 1.2.2 "Detail Design" shall mean:
- Attendance at design team meetings, preparation of detail design drawings and specifications, including sizing and material specification of the entire Mechanical installations and systems. The Contractor shall assume responsibility for the detailed sizing, selection, co-ordination with reflected ceiling plans. No variations shall be accepted arising from any changes to plant or equipment locations or changes in services routes. The contractor shall submit design documentation, drawings and builders work drawings to the client for review and commentary prior to execution of the works.
- 1.2.3 The Works shall comprise the whole of the labour and all materials necessary to form a complete installation and such tests, adjustments and commissioning as specified and as may otherwise be required to provide a complete working installation.
- 1.2.4 The words "complete installation" in the above clause shall include all the incidental sundry components necessary for the complete execution of the works, and for the proper installation with their labour charges, whether or not these sundry components are mentioned in detail in the documents issued with this sub-contract.
- 1.2.5 The Contractors responsibilities shall also include liaison with main contractor to ensure their work is programmed in co-ordination with the Main Contractor's overall construction programme. Liaison with the Project Supervisor (Design) Stage for design issued and liaison with the Project Supervisor (works) Stage for construction/on-site issues to ensure that Health and Safety Act 2005 Requirements are complied with.
- 1.2.6 Checking of dimensions on site and preparation of secondary supplementary steelworks, access platforms and lift equipment for maintenance purposes (including loads imposed on the structure). Co-ordination with the Works of other Sub-contractors and attendance at meetings as may be required by the Main Contractor.
- 1.2.7 Preparation of Method Statements covering the whole of the Works inclusive of, but not limited to, off and on-site testing, inspection, installation, setting-to-work, testing and commissioning.
- 1.2.8 Weatherproofing and flashing to all services supplied under this contract which penetrate external elements of the building.

- 1.2.9 Supply of sleeves, inserts and any other items required under this contract to be cast in for the structure by others, including the co-ordination of positions.

1.3 CONTRACT DOCUMENTS

The contract documents shall include:

- 1.3.1 Tender Drawings.
- 1.3.2 General Specification
- 1.3.3 Performance Specification.

1.4 DEFECTS LIABILITY

- 1.4.1 The whole of the works, including the materials, workmanship and performance shall be guaranteed for a period of 12 months from the practical completion date, confirmed in writing.
- 1.4.2 All defects developed within this period to be rectified at the Mechanical Contractor's own expense. Defects resulting from lack of maintenance will be excluded. The nature of the defects shall be determined by the Engineers.

1.5 PLANT WARRANTIES

- 1.5.1 The warranties on plant and equipment shall commence from the date of commissioning and acceptance of plant by the Engineers, where a manufacturer's warranty applies or from the date of practical completion, whichever is the later date.

1.6 ENGINEERS APPROVAL

- 1.6.1 Where specified to be approved, all equipment and materials MUST be cleared in writing before orders are placed with suppliers. Adequate time (ten working days) must be allowed for to obtain the Engineer's approval. The mechanical contractor shall clearly demonstrate in each submittal how the proposed equipment complies in full with the requirements of the tendered drawings and specifications. This shall include a direct comparison between proposed equipment and tendered equipment.
- 1.6.2 The Mechanical Contractor shall include for the supply & erection of working samples to be installed in a mock-up room for comment by Architect and Engineer.
- 1.6.3 Any loss incurred by the Mechanical Contractor not complying with the above procedure will be at their own cost.
- 1.6.4 If the Mechanical Contractor wishes to "break spec", the contractor shall pay any fess due for re-working or recalculating the BER to ensure the change of equipment specs doesn't negatively affect the BER Score. This must be completed in advance of any installation works.

1.7 WORKMANSHIP AND MATERIALS

- 1.7.1 The workmanship and materials used on this contract shall be of the highest standard and only suitably qualified Labour shall be employed for the Works.

- 1.7.2 Any sub-standard materials shall be removed and replaced at the Mechanical Contractors own expense.

1.8 SITE MEETINGS

- 1.8.1 The Mechanical Contractor shall allow in his tender for his Contracts Manager to attend each site meeting, or any other meeting as dictated by the progress of the works. Site meetings shall normally be held at weekly intervals.

1.9 RUBBISH/SITE CLEANLINESS

- 1.9.1 The Mechanical Contractor shall keep the workplace tidy at all times. The Mechanical Contractor shall be responsible for removal of their debris/wastes from site.
- 1.9.2 The Mechanical Contractor shall, on completion of the project, remove from the site all their left-over materials and plant and they shall also remove their site accommodation.
- 1.9.3 Particular attention is drawn to the removal of all surplus materials, cartons, packing, off-cuts etc., from the ceiling void, plant rooms and concealed spaces. The clearing-out of these areas shall be carried out on an on-going basis by the Mechanical Contractor during the course of the installation period. This is in the interests of health, safety and hygiene.

1.10 FIRE PRECAUTIONS

- 1.10.1 The main contractor responsible to take all measures necessary to prevent fire so that existing tenants in adjacent occupied properties are not put at risk.
- 1.10.2 The Mechanical Contractor shall take all reasonable precautions to prevent the outbreak of fire, particularly in work involving the use of naked flames.

1.11 INSTRUCTING THE CLIENT'S STAFF

- 1.11.1 The Mechanical Contractor shall allow in their tender for instruction and demonstrating to the Client's staff the working and maintenance of all items supplied and installed under this contract.
- 1.11.2 The Mechanical Contractor should also allow for having the equipment Manufacturers demonstration staff in attendance where necessary.

1.12 RECORDS OF TESTS

- 1.12.1 After all tests have been carried out and the system set to work and commissioned, the Mechanical Contractor shall submit to the Engineers in triplicate detailed records of tests with all relevant commissioning information. The exact commissioning procedure shall be agreed in advance with the Engineers.

1.13 OPERATION & MAINTENANCE MANUALS AND RECORD DRAWINGS

- 1.13.1 The Contractor shall within one month of practical completion of the works, furnish to the Client 'as built' drawings, and all commissioning/test certificates and Maintenance & Operating Manuals relevant to the works.

Before completion, the Contractor shall submit a rough draft of each maintenance manual. After approval and before making application for Final Payments, the Contractor shall deliver two (2) corrected hard bound copies and two electronic copies to the Engineer. Scanned images shall be clearly legible and shall be not less than 300 DPI.

1.13.2 Preparation of Operating and Maintenance Manuals shall be based on the following documents:

1. B.S. 4884, Parts 1 & 2.
Specifications for Mechanical Manuals.
2. BSRIA Technical Note TN 1/84.
Guidelines for building services operating and maintenance manuals.
3. BSRIA Application Guide 1/87.
Operating and maintenance manuals for building services installation.
4. BSRIA Technical Note TN 12/86.
Fault finding procedures in the building service industry.

1.13.3 Operating and Maintenance Manuals shall include the following information:

1. Index, introduction and safety of work.
2. Description of all systems and equipment.
3. Names, addresses and telephone numbers of all sub-contractors, suppliers and local firms for each item.
4. Technical documentation.
5. Equipment schedules and spare parts list.
6. Operating information.
7. Maintenance instructions.
8. Maintenance schedules.
9. Fault finding.

1.13.4 The Mechanical Contractor shall provide two number complete sets of operation and maintenance instructions adequately prepared and bound together in manual form.

1.13.5 The Mechanical Contractor shall provide 1 no. set of reproducible as built drawings and 2 sets of prints from these drawings.

1.13.6 The Mechanical Services design drawings have been produced utilising "Auto-CAD 2016".

Upon completion of the project the Contractor shall be provided with discs of these drawings and will be expected to alter the drawings on Auto-CAD or a compatible computerised drafting system. In addition to the "hard copies"

stated above the Contractor shall submit 2 sets of 'As Built' drawings in disc form.

- 1.13.7 The above documentation shall be submitted to the Engineers for approval before handing over to the Client.

1.14 ALTERATIONS, ADDITIONS AND OMISSIONS

- 1.14.1 No departure from the tender plans and specifications or any other alteration or additions shall be permitted or paid for until the written instructions of the Engineers have been obtained.
- 1.14.2 Any alterations, additions or omissions shall be priced in accordance with the Mechanical Contractors Schedule of Rates.
- 1.14.3 Where it is not possible to apply the Schedule of Rates to any variation from the Contract, such variations shall be charged at the day work rates indicated by the Mechanical Contractor in the Form of Tender.
- 1.14.4 The Mechanical Contractor must advise the Engineers, in advance, of the details of any variations to the contract which may be necessary and the cost of same. He must in turn receive written approval from the Engineer before proceeding with any associated works.

1.15 SITE VISIT

- 1.15.1 Contractors tendering for the works shall be deemed to have visited the site of the works and ascertained the facilities for access thereto, the general convenience of working, the proximity of existing buildings and the supply of materials and labour the district will afford.
- 1.15.2 Contractors shall pay particular attention to the building structure regarding the supporting of the Mechanical Services Installation.
- 1.15.3 The Contractor shall be deemed to have made a thorough examination of the tender drawings, the site and all features thereof with all services, drains, mains or other things affecting the proposed works to ascertain precisely the nature and extent of same and the conditions under which they will have to be executed and shall obtain their own information on all matters and all other things which can in any way influence their tender.

1.16 CO-ORDINATION

- 1.16.1 Before any of the installation work commences the Mechanical contractor shall consult the engineers and other contractors to determine the correct, routes, heights and location of all services and to determine the correct sequence of erection. No claims for extras will be considered for work done due to the contractor's failure to predetermine the above aspects of the installation before the installation commences.
- 1.16.2 The Mechanical contractor is to employ full-time on-site person as a competent M&E services co-ordinator. The Mechanical contractor shall be fully responsible for their element of works. The Mechanical contractor shall ensure clashes with other services and trades are detected and addressed before commencing work. The service coordinators responsibilities shall include but are not limited to the following:

- Managing production of Technical Submissions
- Managing service installation – prior to installation approval and signoff required from ER.
- Reporting at site meetings
- Liaising with Site team
- Liaising with Utility Companies
- Progressing review of installations
- Managing Services method statements
- Managing commissioning
- Managing services demonstrations and handover process
- Complying with H&S Requirements
- Managing compliance with BCAR requirements
- Snagging & de-snagging
- Managing production & verification of As-Built Documentation
- Post hand over liaison
- Liaising with Design Team members
- Liaising with Employers representative

1.17 PROJECT BER PART L REPORTS & SPECIFICATIONS

1.17.1 The mechanical services contractor shall ensure all equipment selected for this development complies in full with the requirements of the project preliminary BER Part L reports and specifications. No deviations without prior approval shall be accepted as part of this project. Where the contractor proposes to deviate from the mechanical services tender drawings, documents or BER Part L reports and specifications, the contractor shall be required to demonstrate how the alternative equipment complies in full with the project requirements without affecting the required project BER Part L rating(s). This information shall be provided by the mechanical contractor well to the Design Team & BER Assessor well in advance of installation works in order to allow the BER Assessor to evaluate equipment performance and ensure compliance with Part L.

The contractor shall ensure that the services installations meet the requirements of Technical Guidance Document (TGD) Part L NZEB standards in order to achieve the Preliminary BER Ratings.

1.18 EXISTING SITE SERVICES

1.18.1 It shall be the responsibility of the Main Contractor acting as the PSCS to identify all existing services before commencing work. The main contractor shall ensure the continuity of all utility services to existing dwellings for the duration of the contract.

1.19 PREVAILING STANDARDS

1.19.1 The mechanical services contractor shall ensure the entire mechanical services installation is fully compliant with the most recent edition of the following codes and standards as a minimum:

- Irish Building Regulations Document B, Volume 2 – Fire Safety.
- Irish Building Regulations Document F - Ventilation.
- Irish Building Regulations Document G - Hygiene.
- Irish Building Regulations Document H - Drainage & Wastewater Disposal.
- Irish Building Regulations Document J - Heat Producing Appliances.
- Irish Building Regulations Document L - Conservation of Fuel & Energy, Dwellings.

- Irish Building Regulations Document M - Access & Use.
- F-Gas Regulations. Where the project requires works on refrigerant gas pipelines and equipment, the contractor shall be a registered and accredited F-Gas contractor and evidence of this certification shall be provided to the Consultant Engineer.
- RGII Registered Gas Installers TGD. Where the project requires works on gas pipelines and equipment, the contractor shall be a registered and accredited specialist gas contractor and evidence of this certification shall be provided to the Consultant Engineer.
- Irish Water Code of Practice July 2020.
- BS 6700 Design, installation, testing and maintenance of services supplying water for domestic use within buildings and their curtilages – Specification.

All relevant Acts of the Oireachtas and Statutory Instruments, in particular:

- The Safety, Health and Welfare at Work Act, 2005.
- S.I. No. 299 of 2007 (General Application Regulations) / SI No. 732 of 007) including all amendments.
- Safety, Health and Welfare at Work (Construction) Regulations, 2013 (SI No. 291 of 2013).

The requirements of the above noted Standards/Codes shall be applied to this project as appropriate.

Where the appropriate Standard is unavailable or a specific issue associated with this project is not explicitly detailed in the Irish Building Regulations, the relevant and appropriate BS standard will be consulted and become the governing document.

ELEMENT 01 - GENERAL DESCRIPTION OF THE WORKS

01.0 GENERAL

The project involves the complete mechanical services installation for the visitor centre at Cape clear, Co Cork.

The contractor shall carry out the complete mechanical installation as shown on drawings and described in this specification and the general specification.

The Mechanical Contractor shall supply all labour, materials, equipment and engineering services and perform all works necessary to install, test, commission and render operational a complete mechanical system as specified hereinafter, detailed in the Data Sheets and Schedules and shown on the Drawings.

Delivery, receiving, off-loading, handling, storing, putting into position, assembling and erection of all equipment shall form part of this Contract.

The extent of the work to be carried out under this specification shall include, but not be limited to, the following items:

- The contractor shall co-ordinate with the Main Contactor and all other Contractors on site to ensure the installation of all services is fully coordinated. **The engineer is not responsible for the onsite coordination of services. The mechanical contractor shall ensure no conflicts between the mechanical and electrical installation and prepare detailed co-ordination drawings reflecting same for review by the Consultant Engineer at the beginning of the project.**
- Supply samples for approval by Engineer and Architect. Supply and install samples in a mock-up for approval by the Engineer and Architect.
- Supply, install, test and commission all elements of the air-conditioning system(s) including VRF units, pipework, & controls.
- Supply, install, test and commission all elements of the water services system(s) including cold water storage tanks, under sink electric heaters, distribution pipework, manifolds, & valves.
- Supply, install, test and commission all elements of the ventilation services system(s) including heat recovery units, extract fans, ductworks, control dampers, diffusers, extract grilles & louvres.
- Supply, install, test and commission all elements of the above ground drainage system(s) including soil vent pipes, branches, cleaning eyes, traps and final connections.
- Design, supply and install all support steelwork, brackets and fixings required for the satisfactory installation of all items of mechanical plant & equipment.
- Inspect, test, commission and certify the completed installation including all pre-commissioning and attendance on others during the commissioning and setting to work of the installation.
- Remove from site all waste and surplus materials and plant, debris, packing materials and rubbish to render the site in a safe, clean and tidy condition.
- Provide spare parts and special tools for the installation.
- Provide detailed and accurate O&M manuals and record drawings in both hard copy and electronic format.
- Demonstrate to and train the relevant Client personnel on the operation and maintenance of the completed installation including presentation of O&M Manuals.
- Provide a comprehensive routine and emergency call out service throughout the Defects Liability Period.

- Supply and install all the fire stopping of associated mechanical services.

Mechanical Contractor shall make good all damage caused during this contract.

Mechanical Contractor is advised to visit the site to inspect the extent of the work involved before submitting their tender. No additions will be permitted to the contract sum because of site knowledge or conditions.

Mechanical contractor is reminded that it is their responsibility to co-ordinate with all other trades, particularly electrical services. The mechanical contractor shall provide all necessary wiring and shop drawings to the electrical contractor to facilitate cabling and connection of their systems. No additions or variations will be permitted to the contract sum because of failure to co-ordinate works. The mechanical and electrical services sub-contractors shall co-ordinate the requirement for opes and ope positions in any of the timber members. This is an essential part of the contract.

01.1 GENERAL COMPLIANCE

This specification shall be read in conjunction with all relevant Irish standards and codes of practice, Irish building regulations, technical guidance documents to the Irish building regulations and all the relevant laws of the Republic of Ireland. The requirements of these documents shall be fully adhered to by the mechanical subcontractor in their execution of the sub contract works. In the event of there being any conflict between the requirements of this specification and any of the above-mentioned Irish Standard documents, the requirements of the Irish Standard documents shall prevail over those of this specification. The Mechanical Subcontractor shall, giving adequate notice before taking any particular course of action, inform the architect or project manager of any such disagreement in the documentation. Adequate notice shall never be less than one week.

This specification shall be read in conjunction with the relevant drawings. In the event of there being any conflict between the drawings and specifications the Mechanical Subcontractor shall allow for the most onerous option when submitting a tender.

The Mechanical Subcontractor shall satisfy himself that the installation is in accordance with all codes and standards as set out in the Mechanical Specification.

01.2 GENERAL CONSTRUCTION WORKS

All works shall comply with the following regulations, standards and guidance documents.

- Requirements of the Health and Safety Authority/ SI 138.
- Building Regulations.
- Requirements of the Fire Officer.
- Requirements of the E.S.B Networks.
- Factories Act/ Statutory Instruments.
- Client Safety Protocol.
- Client Specifications.
- Chartered Institute of Building Services Engineers Guidance Documents.
- EMC Directive
- Low Voltage Directive.
- Machinery Directive.
- ERP Directive.

- All materials used shall be (CE) marked in accordance with the EU Construction Product Regulations (CPR) (No.305/2011). Refer to Annex IV of the Regulations for the list of applicable products.

01.3 CONSTRUCTION PRODUCTS REGULATION (CPR 305-2011)

All materials used shall be (CE) marked in accordance with the EU Construction Product Regulations (CPR) (No. 305/2011). Refer to Annex IV of the Regulations for the list of applicable products.

01.4 BUILDING CONTROL (AMENDMENT) REGULATIONS

The project falls under the requirements of the Building Control (Amendment) Regulations – BC(A)R and the Contractor shall be required to provide all necessary certification of his work and allow all required attendances and notifications to facilitate the inspections of the works by the design team in accordance with the Assigned Certifiers Inspection Plan for the project.

The Contractor shall provide all certification required by the Engineer or the Assigned certifier in advance of completion of each dwelling in a timely manner so as not to adversely impact on the completions of sales of any dwelling in the development. Certification will be required for each and every dwelling all records/certificates will be dwelling specific.

01.5 DESCRIPTION OF SERVICES

The following describes the various elements of works associated with the mechanical services sub-contract.

Fire Stopping of Services (Element 25)

All penetrations of fire compartments including ceilings, floors or walls are to be fire stopped by a recognised specialist sub-contractor as part of this contract. Where ventilation grilles, valves or terminals in ceilings are fitted in fire-rated ceilings, the manufacturer's fire collar (where available) will be installed as part of the ventilation system installation. All fire stopping requirements must be considered by the contractor at the beginning of the project and as part of equipment selections and submittals.

Soils and Wastes Installation (Element 52)

All items of sanitary ware shall be connected to the above ground drainage system, which in turn will connect to upstands and back inlet gulleys as provided by the main contractor.

Sanitary ware shall be provided by the main contractor and connected by the mechanical services contractor.

The extent of the soil and waste systems to be covered under this contract shall be all work above the finished ground floor slab level. Below ground sanitary pipework installations will be provided through the main contractor. However, the mechanical services contractor shall fully co-ordinate the installation requirements with the main contractor including pop-ups/upstand positions etc.

The soil and waste sanitary systems shall be one pipe fully ventilated systems. Soils and Waste connections shall be provided to all items of sanitary and white goods as required. Drains shall also be provided for safety discharges on outdoor units, indoor

units, heat recovery units and cold-water storage tanks. All internal SVP's must be taken vertically and directly out through roof slate vents, and this shall be fully co-ordinated between the main contractor and mechanical contractor.

Bottle traps with 75mm seal shall be provided on the outlets of all sanitary fittings connected to the waste pipes.

Main vertical soil pipes and vent pipes shall be 110mm diameter premium low-noise soils pipework. The pipes and fittings shall be manufactured from Astolan (mineral reinforced polypropylene), which ensures continuous noise insulation by the system from the waste removal facilities down to the below ground piping.

The Mechanical contractor shall include for the supply and installation of fire collars to all soils and waste pipework penetrations through all fire rated floors, ceilings and walls.

Domestic Water Installation (Element 53)

Domestic potable water for hygiene purposes will be provided to all areas as detailed on the relevant drawings. All external site watermains (including boundary boxes) shall be completed by the main contractor. The mains water connections shall be terminated just above the ground floor slab in a feasible location by the main contractor. The mechanical services contractor shall complete the internal domestic mains water service connection from this point throughout the building.

The incoming metered mains water service will connect to the cold-water storage tank and kitchen appliances (if any). The cold-water storage tank shall have a boosted cold-water service which shall in turn serve the appliances and the under sink electric water heaters. All cold-water storage tanks shall be WRAS Approved and to Format 30 standard as a minimum. All tanks shall be fully insulated.

Domestic hot water to the building shall be provided by a dedicated under sink electric water heaters as detailed on the design drawings and scheduled herein.

All connections to sanitaryware etc as part of this development shall be provided with ballofix isolating valves as necessary.

The entire potable water services distribution system right up to the final draw-off demand points shall be fully chlorinated, treated and sterilised for potable water usage and certified accordingly.

All hot water outlets serving wash basins shall be provided with a thermostatic mixing valve to TMV3 specification whether shown on the drawings or not. This shall be supplied and installed by the mechanical services contractor.

All domestic water pipework used on this project shall be WRAS approved pre insulated multilayer pipework with minimum 13mm insulation.

Space Heating Installation (Element 56)

The Mechanical Services Contractor shall appoint a specialist air conditioning company to carry out all air conditioning works. The air conditioning works shall include the installation of all refrigerant pipework, insulation, condensate pumps and

pipework, galvanised cable trays on which to mount pipework and control cabling. Space heating and cooling shall be satisfied by means of the air conditioning system.

It is proposed to supply and install a VRV system consisting of fan coil units to serve the building as shown on the drawings. This system shall consist of indoor fan coil units each connected to a matching outdoor unit(s).

Ventilation (Element 57)

Mechanical heat recovery ventilation will be provided in accordance with the current building regulations for areas indicated on drawings. This shall generally consist of heat recovery units to serve all areas as shown on the drawings. Each heat recovery unit shall be provided with controller, attenuator and CO2 sensors linked to the system to optimise system performance. Local extract ventilation shall be provided to toilet areas etc.

The ventilation installation shall be fully co-ordinated on site by the mechanical contractor and all routes marked out on site. All wall penetrations required shall be marked out on site by the mechanical contractor. If alternative ducting, grilles or fan locations are required to complete the installation, this shall be carried out by the mechanical contractor at no extra cost.

Insulation (Element 58)

Insulation of all pipework and ductwork services will be provided as part of this contract. All domestic water service and space heating service pipework shall be pre-insulated multilayer pipe with an insulation thickness which is fully compliant with the requirements of the Irish Building Regulations Technical Guidance Document Part L (2021) for Buildings other than Dwellings.

Electrical Wiring (Element 62)

All electrical wiring associated with the mechanical services installation will be carried out by others.

Controls (Element 65)

The heating & cooling system shall be controlled by the controls system as outlined on the drawings and as per the Equipment Schedules. This controls system shall provide full control of the VRV system and all heating/cooling zones installed with the system.

The control panel and controls cabling and equipment associated with the VRV service installation shall be supplied and installed as part of this contract.

Fire Fighting Equipment (Element 68)

Firefighting equipment will be provided in locations as shown on relevant drawings.

The firefighting equipment will be supplied by a specialist sub-contractor as part of the mechanical services sub-contract.

01.6 DRAWINGS

The contract drawings issued with this specification are listed in the schedule. The drawings indicate the approximate location of the various fittings with the final location being agreed on site with agreed on site with the Architect or Engineer.

As the works proceed the Mechanical Services Contractor shall keep a record of all authorised variations and on completion shall supply a drawing showing the final layout of the changes as installed.

It will be the responsibility of the Mechanical Services Contractor to prepare and fully co-ordinate a full set of mechanical and electrical services co-ordinated drawings. This shall be included in the submitted tender.

01.7 ELECTRICITY SUPPLY AND ELECTRICAL WORK

Electricity supply will be from the Electricity Supply Board mains and will be AC three phase 50 cycles. Electricity required to operate tools for the erection of the works will be provided by the Building Contractor, without cost to the Mechanical Services Contractor. The Mechanical Services Contractor shall provide all extension leads for use with electrical tools and a 110-volt transformer if his tools operate on this voltage.

01.8 SITE INSPECTION

Mechanical contractor is advised to visit the site to inspect and examine the full extent of the contract before submitting a cost for the works as no addition will be allowed to the tender sum because of lack of site knowledge or conditions.

01.9 CE CERTIFICATION

All plant items procured and installed on this project shall be provided with "CE" certification to indicate conformity with health, safety and environmental protection standards. All plant must be provided with appropriate "CE" marking.

01.10 PLANT SUBMITTALS

The appointed mechanical services contractor is required to provide detailed technical plant submittals for all items of plant associated with this development. Plant submittals shall be submitted to the Consultant Engineer in a timely manner. This shall give due consideration to plant lead-times as well as the time required to review, seek clarifications and approve of plant. A minimum of two weeks should be given to review and approval of plant submittals. Note every effort must be made by the mechanical services contractor to clearly identify in each submittal how the proposed plant complies in-full with the equipment detailed and specified on the drawings and specifications. It is not up to the Consultant Engineer to identify differences or shortfalls in the proposed plant but up to the mechanical services contractor to clearly show how the proposed equipment complies and/or exceeds the requirements of the specifications. This also accelerates the submittal review/approvals process. Where equipment detailed in plant submittals falls short of the specification, the contractor will be required to proceed with the requirements of the drawings and specifications.

ELEMENT 25 - FIRE STOPPING INSTALLATION

25.0 GENERAL

This section of the specification shall include for all necessary fire stopping of all services that penetrate all walls and floors, or that pass up through enclosed vertical service ducts whose floors and ceilings shall be fire stopped as if for an opening through a fire compartment floor.

The Contractor must base his tender price only using rates received from one of the fire stopping specialists listed later.

25.1 FIRE PROTECTION SLEEVES FOR PLASTIC PIPEWORK

Fire protection sleeves for all plastic pipes over 38 mm diameter passing through building structure, as follows:

- (a) Galvanized steel sleeve with intumescent liner enclosing piping where it passes through a fire compartment wall, floor or ceiling.

At a temperature of 150 DEG C intumescent line shall expand inward to close the softened plastic pipe and seal the aperture.

- (b) Two hours fire resistant in accordance with BS 476 Part B (1972) unless otherwise stated.
- (c) Suitable for horizontal or vertical installation.
- (d) Install in accordance with the Manufacturer's recommendations.

25.2 FLAME AND SMOKE SEALING OF SERVICES OPENINGS THROUGH BUILDING STRUCTURE - PIPEWORK

The spaces between and around pipework services (non-plastic) where they pass through walls or floors slabs to be sealed with Firetard mineral wool firebatt and finished flush with the face of the building fabric as follows:

- (a) All loose building fabric to be removed.
- (b) The same space is then to be tightly packed with Firetard mineral wool firebatt and finished with Firetard mastic to give a flame and smoke tight joints.
- (c) This work must be carried out by a Specialist Contractor who will issue a Certificate on completion of the work certifying that all openings have been properly treated.
- (d) Existing or new builder's work to be finished to an approximate dimension of 75 mm to the services.

25.3 FLAME AND SMOKE SEALING OR SERVICES OPENINGS THROUGH BUILDING STRUCTURE - DUCTWORK

The spaces between and around ductwork services where they pass through walls or floor slabs to be sealed with Firetard mineral wool fibrebatt and finished flush with the face of the building fabric as follows:

- (a) All loose building fabric to be removed.
- (b) The same space is then to be tightly packed with Firetard mineral wool firebatt and finished with Firetard mastic to give a flame and smoke tight joints.
- (c) This work must be carried out by a Specialist Contractor who will issue a Certificate on completion of the work certifying that all openings have been properly treated.
- (d) Existing or new builder's work to be finished to an approximate dimension of 75 mm to the services.

25.4 FLAME AND SMOKE SEALING OF GRILLES/CEILING VALVES

All wall and ceiling mounted supply and extract grilles are to be fitted with a fire sealant around the flanges to prevent smoke and or flame infiltration around the grille.

The sealant is to be applied as follows:

- (a) The Ventilation Sub-Contractor should fix the grille of diffuser, aligning where necessary and screw finger tight.
- (b) The grille or diffuser will then be removed and all loose building fabric cleaned.
- (c) A 5 mm thick fillet of Firetard mastic is to be applied to the back of the grille flanged which must then be fixed to the wall of ceiling/duct spigot before the mastic sets.
- (d) After fixing, all excess mastic must be removed immediately, and both the grille and wall/ceiling left in a clean condition.
- (e) This work must be carried out by a Specialist Contractor who will issue a Certificate on completion certifying that all grilles and openings have been properly treated.

Supply and Extract ceiling valves shall conform with the following specification:

- Fire tested to BS EN 1365-2:1999
- 60-minute fire rating for in ceiling
- Valve closes when temperature reaches 72 degrees sealing the duct from fire and smoke ingress
- Fully adjustable and features a locking nut to fix the position of the control disc upon commissioning.
- Supplied complete with a fixing body with pre-drilled holes for installation.
- Suitable for all types of Pipe/ Plenum installation

- Manufactured from white epoxy powder coated steel

Fire Rating: 60 minutes

25.5 CERTIFICATION

Upon completion of the work described above, the specialist contractor shall issue a certificate (in triplicate), which certifies that all the Mechanical Services within the building have been fire stopped to comply with the requirements of the Galway Fire Authority.

ELEMENT 52 - SOILS, WASTES AND OVERFLOWS INSTALLATION

52.0 GENERAL

The complete soils, wastes and overflows installations shall be carried out in accordance with Local Authority requirements and the relevant British and Irish Standards.

Drainage Surface and Foul BS 8301
Sanitary Installations BS 5572/BS 6465

Also, the Irish Building Regulations, Technical Guidance Document H shall apply and the mechanical contractor shall give due consideration to the requirements of this document and ensure the installation is installed in compliance with the document.

The Contractor shall be responsible for obtaining Local Authority approval before proceeding with the installation.

52.1 PIPEWORK AND FITTINGS

All soil pipe work and fittings shall be Wavin AS Acoustic Soil System pipework and comply with BS EN 1451, BS 4514, UPVC pipework.

All waste pipe work and fittings up to 55 mm dia. shall comply with BS 5255, MuPVC pipework.

All exposed branch waste and anti-syphon pipes, between stacks and sanitary fittings will be in PVC with compression fittings.

At the foot of all vertical stacks and changes of direction and at all principal junctions at each floor level, access shall be provided.

The soil and waste stacks shall be connected at lower ground floor level to the drainage system with an approved fitting. At the roof level all soil and waste ventilating pipes will terminate with suitable roof connector weathered (by others) and copper wire balloon gratings.

The connection of anti-syphon stacks to main stacks will occur above the flood level of the highest fitting or be taken to atmosphere independently. Unless otherwise indicated, soils and wastes pipework running through occupied spaces or concealed in void spaces shall also be fully insulated for acoustic purposes.

52.2 JOINTING

UPVC pipe work and fittings shall have neoprene 'O' ring joints.

MuPVC waste pipe work and fittings shall have solvent welded joints except at expansion joints or boss connections to discharge stacks, which shall be jointed using 'O' rings.

Joints on socket less cast-iron pipe work shall be flexible mechanical type to BS 6087.

Jointing to WC pans shall be made using patent connectors.

All jointing shall comply with the manufacturer's instructions.

Where applicable on a single stack system a collar boss may be used on the vertical stack to take bath discharge pipes.

52.3 PIPEWORK SUPPORTS AND BRACKETS

The complete soils, wastes and overflows pipework shall be supported using brackets as supplied by the pipework manufacturer and they shall be installed strictly in accordance with the manufacturer's instructions in regard to spacing, fixings, etc. Pipework shall not be fixed to any suspended ceiling or to its supports. All supports shall be fixed to the roof or immediate floor structure.

52.4 CISTERN OVERFLOWS

Internal WC's may have their overflows discharging to tundishes fitted to the WC flush pipe. This arrangement shall be completed in chrome plated copper or polished stainless steel and be so arranged as to be visible to the user.

Where WC cisterns are concealed, a Type 1003 single inlet indi-flow stainless steel overflow indicator complete with glass viewing panel shall be fixed to the duct cover.

52.5 AIR ADMITTANCE VALVES

Air admittance valves shall be provided as indicated on the drawing or where it is necessary in order to prevent syphonage of traps, etc. The valve shall be suitable for PVC pipe, and it shall be manufactured in high impact ABS with EPDM rubber seals. Each valve shall be installed vertically and shall operate when negative pressure in the system lifts the valve diaphragm and admits air to the system. The valves shall be as manufactured by Durgo Ltd.

52.6 CONNECTIONS TO BUILDER'S FLOOR SOCKETS

The mechanical contractor shall include for making the joint at each builder's floor socket at Ground Floor level.

The mechanical contractor shall include for installing and testing all wastes, soils/vent and overflows pipework above ground floor level and for making all connections to sanitary fittings. Connections to WC pans shall be made by using multi-quick adaptors.

52.7 SANITARYWARE – FITTING

The mechanical contractor shall provide for the fitting of all sanitaryware. Sanitaryware will be supplied and installed by the main contractor.

ELEMENT 53 – HOT, COLD AND MAINS WATER INSTALLATION

53.0 GENERAL

The hot, cold and mains water installation shall generally be installed as indicated on the drawings and specified herein, however, it shall be the responsibility of the Mechanical Services Contractor to co-ordinate his services with those of other trades to avoid clashes. Any abortive work, which occurs as a result of a clash due to lack of co-ordination, shall be resolved without cost to the client or his representatives.

The clauses outlining the standards of workmanship and materials within the General Specification shall apply as well as those outlined below.

53.1 PIPEWORK AND FITTINGS

ALL PIPES SIZES/DIAMETERS NOTED ON DRAWINGS REPRESENTS PIPE INSIDE DIAMETER. UNDER NO CIRCUMSTANCES SHALL THE CONTRACTOR INSTALL PIPEWORK ON THE ASSUMPTION THAT SPECIFIED SIZES/DIAMETERS REPRESENT OUTSIDE DIAMETER. NOTE, THE PIPING SYSTEM INCLUDING FITTINGS SHALL BE SELECTED TO ENSURE THE NARROWEST CLEAR BORE OF EITHER THE PIPE OR FITTING IS NOT LESS THAN THE SPECIFIED INNER DIAMETERS NOTED ON THE DRAWINGS.

The pipework system used for the domestic water services installation shall be as Frankische Alpex System Export 16 – 75mm (see equipment schedules or further information). The entire piping system including fittings shall have a valid a current WRAS approval certificate the entire piping system shall also be provided with manufacture's 13mm insulation.

The pipework shall be high-quality multilayer composite pipe. The Alpex fittings 16 – 32mm shall be PPSU (polyphenylsulfone) pipe connectors which provide high impact resistance, very low susceptibility to stress cracks and outstanding resistance to hot water. PPSU shall conform to EN 13501-1 fire safety Class E.

Brass connectors (dezincification-resistant brass according to DIN EN 12164) are to be used everywhere. Threaded adapters and compression fittings shall be used as required and as recommended by the manufacturer.

Crimping contours shall be as per manufacturer's recommendations.

Alpex 40 – 75 mm pipe shall feature F contours as required. The fittings in the size range 40 – 75 mm shall be made from PPSU plastic or dezincification-resistant brass with preassembled stainless-steel sleeves. The fittings can be crimped as per manufacturer's recommendations.

The type of pipework and fittings used throughout the system shall be as per manufacturer's guidelines. The tools used to complete the installation, jointing etc shall be those recommended by the manufacturer.

The installation shall have sufficient joints, especially flanges on welded installations to allow easy removal of pipework.

Any welded pipework within voids and exposed to view shall have flanges at 12 metre intervals maximum and all branches, joints, etc shall be by fittings and "Stub-in" branch connections shall not be permitted.

All vertical and horizontal pipework shall be clipped at 200mm centres.

53.2 VALVES

All valves on the hot, cold and mains water installation shall be as necessary. All valves shall be gun-metal and non-dezincifiable, brass valves are not acceptable.

All individual supplies to each item of sanitary ware shall be provided with a "Ballofix" isolating valve (finished to match exposed pipework).

53.3 PIPEWORK BRACKETS AND SUPPORTS

All pipework shall be fixed or supported by the mechanical sub-contractor.

It shall be the responsibility of the Mechanical Services Sub-Contractor to co-ordinate his supports, etc with those of other trades so that a neat and workmanship like installation can be achieved.

The design and installation of all supports and bracketing shall also be the responsibility of the Mechanical Sub-Contractor.

53.4 SANITARY WARE SUPPLIES ISOLATION

Each supply to each item of sanitary ware shall have a Ballofix valve fitted, which is non-dezincifiable.

53.5 PIPEWORK INSTALLATION

All pipework dropping to items of sanitary ware etc shall be concealed within the partitions and be insulated. Surface pipework droppers etc shall not be permitted.

53.6 DOUBLE CHECK VALVES

Double check valves manufactured in non-dezincifiable gun-metal shall be provided at the following locations whether indicated on the drawings or not:

- Hose Union Taps
- Mainswater Bell Valves
- All Locations Recommended in the Water By Law Regulations

53.7 THERMOSTATIC MIXER VALVES

Each wash hand basin shall be provided with a thermostatic mixing valve. The mixing valves shall be as manufactured by Meynell Limited or equal and approved and shall be as follows.

Thermostatic mixer valves shall be of the lock shield pattern for exposed mounting. Each valve shall be complete with isolating valves, in line strainers and non-return valves. The mixing valves shall be pre-set to a delivery temperature of 42 °C.

53.8 COLD WATER STORAGE TANK

The contractor shall supply and install in the locations shown on the design drawings a fully insulated Format 30 one-piece cold water storage tank c/w booster pump, drip tray, close fitting lid and overflow from both the tank and drip tray as indicated on the drawings. A minimum clearance of 500mm shall be provided above the CWS tank to ensure ease of maintenance of ballcock and pump in the future.

The tank dimensions shall be cross-checked on site prior to order. In any event, the mechanical contractor shall procure a tank which will fit within the allocated space with adequate provision for future maintenance as described above. Approx tank dimensions are as indicated on the drawings.

The tank shall be suitable for potable water and be of fibreglass construction, lids shall be sealed and insulated, shall have a screened inlet and overflow and insulated in CFC free foam on all sides.

The contractor shall provide for working at a height and for all alterations to pipework connection, vents and overflows as well as for all new connections. The contractor shall provide for full attendance and design from the tank specialist in respect of the cold-water storage tank.

All water services installations shall be flushed and disinfected with water having a minimum concentration of 20mg/l of free available chlorine. This can be achieved using a sodium hypochlorite solution.

The boosted cold-water services and cold feed services from the storage tank shall be fitted with PRV (pressure reducing valves) at the point of connection to appliances. The pressures shall be set as required to control the pressure to levels recommended by equipment manufacturers.

The Mechanical Sub-Contractor shall be required to prepare a Plant Submittal for the cold-water storage tank which shall be submitted to the Main Contractor and Consultant Engineer for approval prior to order.

53.9 UNDERSINK ELECTRIC WATER HEATERS

In positions as shown on relevant drawings and as scheduled herein, provide factory-assembled undersink electric water heaters complete with all necessary fittings, accessories and controls to ensure a fully functional installation.

Units shall be compact, pressure-rated, and unvented, suitable for installation beneath wash hand basins or sinks for the provision of localised domestic hot water.

Each water heater shall be of high-efficiency electric type, constructed with a stainless steel or vitreous enamelled inner tank, corrosion-resistant heating element, over-temperature and over-pressure protection, and an integrated thermal cut-out and thermostat for adjustable temperature control up to 75°C.

Heaters shall be complete with:

- Temperature & pressure relief valve
- Non-return valve and expansion vessel where required
- Isolation and drain valves
- Mounting bracket for secure fixing
- Factory-fitted electrical connection cable and power indicator
- Thermal insulation to minimise standing heat losses
- Tundish and safe discharge pipework to suit local regulations

Units shall be WRAS approved or equivalent and comply with all relevant BS EN and Irish Water Regulations standards. The capacity of each undersink electric water heater shall be as shown on the drawings, typically ranging from 10 to 15 litres, and shall be rated for operation at 230V single-phase, 50Hz electrical supply.

All electrical connections shall be carried out in accordance with BS 7671 and connected via a local isolator.

The contractor shall ensure that heaters are fully tested, commissioned, and labelled upon installation.

53.10 DOMESTIC WATER PIPE INSULATION

The entire installation shall be carried out in pre-insulated WRAS approved multilayer pipework with minimum insulation thickness which complies in full with Conservation of Fuel and Energy - Part L (2021) Buildings other than Dwellings.

Unless the heat loss from a pipe or duct carrying hot water contributes to the useful heat requirement of a room or space, the pipe or duct must be correctly insulated in accordance with Part L. The following levels of insulation should suffice:

- Pipe or duct insulation meeting the recommendations of BS 5422:2009 Methods of specifying thermal insulating materials for pipes, ductwork and equipment (in the temperature range – 40 oC to + 700 oC); or
- Insulation with material of such thickness that gives an equivalent reduction in heat loss as that achieved using material having a thermal conductivity at 40 oC of 0.035 W/mK and a thickness equal to the outside diameter of the pipe, for pipes up to 40mm diameter, and a thickness of 40mm for larger pipes.

Insulation materials used are to satisfy “non combustibility” test BS 476, Part 4. Alternatively, the materials used are satisfactory if they obtain a Class O finish when tested to BS 476 Parts 6 and 7.

Mineral wool insulation with taped joints and an aluminium foil back is required on all water services pipework.

All water outlets are to be fed from gravity from the water tank, unless they are supplemented by a booster pump as indicated on the drawings.

53.11 SURGE ARRESTORS

The mechanical contractor shall supply and install surge arrestors in the event that water hammer arises in the newly installed water services installation. The surge arrestor shall be Biworld 810 Series Water Hammer Arrestor or equal and approved.

ELEMENT 56 - SPACE HEATING & COOLING INSTALLATION

56.0 GENERAL

Mechanical contractor to provide and install a complete Variable Refrigerant Volume (VRV) air-conditioning system capable of simultaneous heating and cooling as indicated on the drawings and schedules. The system shall comprise outdoor condensing units and multiple indoor fan coil units connected via refrigerant pipework, control cabling, and associated accessories.

All equipment shall be supplied, installed, tested, commissioned, and handed over as a fully operational system. The installation shall include all interconnecting wiring, refrigerant pipework, drain pipework, controls, supports, insulation, and containment.

The system shall operate using Refrigerant R32 and shall comply fully with the manufacturer's installation guidelines and all relevant standards.

Design Conditions-

Outdoor Conditions

- Summer: 23.3°C db / 17°C wb
- Winter: -3°C (fully saturated)

Indoor Conditions

- Summer: 21°C db
- Winter: 21°C db (19°C db minimum)

System Configuration

Each indoor VRV unit shall be connected to the outdoor unit via dedicated refrigerant pipework and control cabling. Maximum allowable vertical and horizontal separation distances shall not exceed the manufacturer's recommendations.

The mechanical contractor shall supply and install all galvanised steel cable trays and trunking required to support refrigerant pipework, power cabling, and screened control cabling. Trays shall be sized to accommodate all services with adequate spacing for future maintenance.

Each indoor unit shall be provided with a local controller and shall be fully integrated into the central VRV control network.

Refrigerant

The entire VRV system shall operate using R32 refrigerant, selected for its improved efficiency and reduced environmental impact.

All pipework, valves, fittings, and accessories shall be fully compatible with R32.

The contractor shall ensure compliance with all safety requirements relating to mildly flammable refrigerants (A2L classification).

Leak detection shall be provided where required by EN 378 and local regulations.

All refrigerant charging, evacuation, and testing shall be carried out by certified personnel.

56.1 PIPEWORK AND FITTINGS

The complete refrigerant distribution pipework serving the VRV outdoor units, branch selector boxes (where applicable), and indoor fan coil units shall be constructed from seamless, degreased, half-hard copper tube manufactured to EN 12735-1 (formerly BS EN 12735-1) and suitable for use with R32 refrigerant.

Pipework shall be selected in accordance with the VRV manufacturer's approved pipe sizing tables, taking into account allowable pressure drop, oil return requirements, and maximum system lengths.

All refrigerant pipework shall be of instrument-quality copper, with a minimum wall thickness appropriate to the system's maximum operating pressure. Under no circumstances shall soft copper, plumbing-grade copper, or non-rated pipework be used.

All fittings shall be proprietary brazed copper fittings compatible with R32 refrigerant and rated for high-pressure operation. Mechanical compression fittings, flare fittings (except where specifically required by the manufacturer), or push-fit fittings are not permitted.

All brazing shall be carried out using silver-bearing brazing rods and shall be performed by trained personnel. During brazing, the pipe interior shall be continuously nitrogen-purged to prevent oxidation, carbon formation, and contamination of the refrigerant circuit.

The contractor shall ensure that all pipework, fittings, and accessories comply fully with the following as applicable:

- EN 12735-1 – Copper and copper alloys – Seamless, round copper tubes for air-conditioning and refrigeration
- ISO 5149 / EN 378 – Refrigerating systems and heat pumps – Safety and environmental requirements
- Manufacturer's VRV installation standards, including maximum allowable pipe lengths, height differences, and branch configurations

All pipework shall be installed with proper support spacing to prevent sagging, vibration, or undue stress on joints. Supports shall incorporate anti-vibration rubber inserts and shall be spaced in accordance with manufacturer recommendations.

Except where otherwise stated, all refrigerant pipes shall be fixed at a sufficient distance from walls, ceilings, and other surfaces to allow for cleaning, maintenance, and proper insulation coverage. Where insulated, pipes shall be spaced to allow for full vapour-tight insulation and cladding. The clear distance between adjacent insulated pipes shall be not less than 50 mm.

Care shall be taken at all times to prevent dirt, moisture, or foreign matter from entering the pipework. All open pipe ends shall be sealed with timber or metal plugs during installation. Should any blockage, contamination, or circulation issue arise due to poor installation practice, the contractor shall rectify the issue at their own expense.

Special care shall be taken to avoid damage to the building structure, finishes, and furnishings during installation. The contractor shall be fully responsible for any such damage caused.

The installation shall be arranged such that no joints are located below floors, within inaccessible voids, or in concealed spaces unless specifically permitted by the engineer and fully accessible via removable panels. All joints shall be located in accessible positions for inspection and maintenance.

Pipework shall be routed to avoid excessive bends, unnecessary fittings, or sharp directional changes. Bending of copper pipe shall be carried out using appropriate bending tools to prevent kinking or flattening of the pipe.

All refrigerant pipework shall be pressure-tested, evacuated, and commissioned in accordance with the VRV manufacturer's requirements and the project testing specification.

56.2 PIPEWORK INSULATION

All refrigerant pipework shall be insulated to prevent condensation, heat gain, and energy loss. Insulation shall be:

- Closed-cell elastomeric insulation, Class 'O' rated
- Minimum thickness: 19 mm (larger where required by dew-point calculations)
- Installed with vapor-tight joints and sealed using manufacturer-approved adhesives
- Protected with aluminium or PIB cladding externally

Insulation shall be continuous across supports, with vapour barriers reinstated at all penetrations.

56.3 VALVES

The contractor shall provide all valves necessary for safe operation, isolation, and maintenance of the VRV system, including:

- Isolation valves at indoor and outdoor units
- Service valves for charging and evacuation
- Pressure relief valves where required

All valves shall be compatible with R32 refrigerant and rated for the system's maximum operating pressure.

56.4 TESTS – PIPEWORK

Before charging with refrigerant, the contractor shall perform:

Pressure Testing

- Pressure test with dry nitrogen to manufacturer-specified pressures.
- Hold test pressure for the required duration with no pressure drop.

Vacuum Test

- Evacuate the system to ≤ 500 microns.
- Hold vacuum to confirm no moisture ingress or leaks.

All tests shall be witnessed by the engineer and documented.

56.5 HEATING/COOLING CONTROLS STRATEGY & EQUIPMENT

The VRV system shall operate under an integrated control strategy that optimises comfort, energy efficiency, and system reliability.

Control Equipment

Local wired controllers for each indoor unit

Centralised controller for scheduling, monitoring, and fault management

Sensors for temperature, return air, and refrigerant conditions

Manufacturer-approved communication cabling

The contractor shall configure all addressing, zoning, schedules, and system parameters during commissioning.

ELEMENT 57 - VENTILATION INSTALLATION

57.0 GENERAL

The ventilation installation shall comply with, but not be limited to, the requirements of the Particular and General Specifications, all relevant CIBSE Guides, and the latest edition of DW144 – Specification for Sheet Metal Ductwork.

The contractor shall be responsible for full co-ordination of the ductwork with all other building services and structural elements. All design drawings are diagrammatic; detailed fabrication drawings shall be prepared, coordinated, and submitted for approval prior to manufacture and installation.

The installation shall include all ductwork associated with the Heat Recovery Unit (HRU), general supply and extract systems, and the toilet extract fan system, including all supports, access doors, dampers, flexible connections, and ancillary components.

57.1 DUCTWORK CLASSIFICATION

All ductworks shall be classified as Low Pressure and constructed to Air Leakage Class A, with a maximum leakage rate of:

$0.027 \times p^{0.65}$ litres/s per m² of duct surface area

All ductworks shall be pressure tested in accordance with DW144. Testing shall be carried out at 500 Pa, and the air leakage test pump shall hold a valid BSRIA calibration certificate.

Where required by the Engineer, sections of ductwork serving the HRU or toilet extract system may be selected for witnessed leakage testing.

57.2 MATERIALS

All rectangular and circular ductwork shall be manufactured from hot-dip galvanised mild steel sheet to BS 2989, Grade Z2 (or EN equivalent). Ductwork thickness, stiffening, and construction shall comply with DW144 tables for Low Pressure classification.

Where stainless steel components interface with galvanised ductwork, appropriate isolation shall be provided to prevent electrolytic corrosion. Only steel rivets shall be used for assembly.

Flexible ductwork, where permitted, shall be Class 0 or Class 1 fire-rated, and used only for final connections to diffusers or equipment, with a maximum length of 1.5 m unless otherwise approved.

57.3 FLANGES & SEALANTS

Flanges shall be:

- **Galvanised mild steel RSA flanges**, galvanised after manufacture, riveted or bolted at max. 150 mm centres, **or**
- **Proprietary flanging systems** (e.g. Mez, Verroflex) certified to DW144 Test Method TM1.

All corners shall be sealed to ensure airtightness. Where proprietary flanges are used, sizing, corner pieces, cleats, and gaskets shall comply with the manufacturer's recommendations and DW144.

Sealants shall be **DW144-approved**, manufactured by 3M or equal and approved. Sealants shall be non-hardening, fire-resistant, and suitable for use with galvanised steel ductwork.

57.4 BENDS AND FITTINGS

All bends, tees, reducers, and other fittings shall be constructed in accordance with DW144 and shall achieve a maximum CIBSE 'k' factor of 0.35.

All fittings shall be smooth-lined where possible to minimise system resistance, particularly on HRU supply and extract ductwork.

57.5 BRACKETS AND SUPPORTS

Ductwork supports shall comply with DW144 and shall be designed to prevent vibration, sagging, or undue stress on the ductwork.

- Proprietary support systems may be used subject to Engineer approval.
- All secondary steelwork required to span roof steels or structural elements shall be provided by the Mechanical Services Sub-Contractor.
- Suspension from roof purlins is not permitted unless written approval is obtained from the Structural Engineer.
- Drilling or welding to structural steel or purlins is strictly prohibited.

All supports shall incorporate anti-vibration rubber linings where ductwork is connected to fans, HRUs, or other rotating equipment.

57.7 ACCESS DOORS

Access doors shall be provided in accordance with DW144 and located as follows:

- At maximum 12 m intervals
- At all fire dampers
- At all volume control dampers
- At HRU connection points where filters, coils, or dampers require access

Access doors shall be double-skinned, insulated, and equal to Advanced Air Type 08 or equal and approved.

Doors shall include high-pressure fire-resistant gaskets and brass piano-type hinges.

Fire-resistant sealant shall be applied between the access door frame and duct.

57.8 FIRE DAMPERS AND VOLUME CONTROL DAMPERS

Fire dampers shall be Actionair FireShield Series 101, 201, or 301, or equal and approved, complete with:

- External visual blade position indicator
- Factory-fitted installation frame
- Compliance with DW144 and BS EN 1366-2

Dampers shall be 2-hour fire rated unless otherwise specified and shall comply with the requirements of the local fire authority and building regulations.

Approved manufacturers:

- Actionair
- Ozonair
- (or Equal and Approved)

Volume control dampers shall be opposed-blade type with aerofoil blades, double-skinned insulated casings, and manual quadrant controls capable of being locked in position.

Dampers shall be equal to Actionair Air/Shield model or equal and approved.

Approved manufacturers:

- Johnson
- Rega
- Netaline
- Actionair
- Air Fab
- (or Equal and Approved)

Where dampers are installed in HRU supply/extract ductwork, they shall be sized to maintain balanced airflow and system commissioning requirements.

57.7 GRILLES AND DIFFUSERS

The grilles and diffusers shall be as indicated on the schedules appended hereto and as shown on the drawings.

All grilles and diffusers shall be manufactured from extruded aluminium sections with all welded construction.

The grilles and diffusers shall be finished in sprayed baked enamel paint to a RAL colour to be chosen by the Architect/Project Manager.

All grille supports shall be independent of the suspended ceilings. Details of the supporting system shall be submitted by the Mechanical Sub-Contractor to the Engineer for his approval in the form of a detailed working drawing for each situation. If the system is found to be unacceptable to the Engineer, then the methods shall be revised as necessary to gain approval. Any claim on the part of the Mechanical Sub-Contractor in respect of additional monies for same shall not be entertained.

57.8 EXTERNAL WEATHER LOUVRES

External louvres shall be constructed from extruded aluminium alloy with fixed horizontal louvres at 50 mm or 75 mm pitch in flanged border frames and with concealed lug fixing. Bird screens shall be provided behind each louver in electro-galvanised wire mesh.

Louvres shall be standard as manufactured by:

Waterloo Grille Co - Type WG/EF + BS

Netaline - Type A/BWG

Royair - Type BAR/MS/F
Gilbert Grilles - Type WG 50

The finish shall anodised aluminium.

All intake and discharge openings larger than 300 mm square shall be fitted with burglar bars set at 100 mm centres and fixed at 100 mm pitch by 50 mm brass wood screws to the wall structure. The bars shall be 13 mm dia minimum and be manufactured from high tensile steel. The bars shall be welded into a frame of the same dimensions as the wall opening.

57.9 EXTRACT FANS

The extract fans shall be provided as indicated and scheduled on the drawings and shall be "Lo-Carbon" type fan units.

The fans shall be controlled as indicated on the schedules. Each fan shall be provided with solenoid or motorised back draught shutters.

Each fan shall be mounted on vibration isolators and suspended or fixed to the main structure of the building by purpose-made frames or supports. Flexible inlet and/or outlet connectors shall be provided on each fan set.

57.10 HEAT RECOVERY VENTILATION UNITS

The mechanical contractor shall install heat recovery units as outlined on the design drawings. The units shall be provided complete with all required brackets and supports, CO2 sensors, control keypad, spare filters and interconnecting control cabling as part of this contract.

Each heat recovery unit shall be provided with spare filters for future use. Each heat recovery unit shall be provided mounted on anti vibration mountings and provided with acoustic blankets as part of this contract.

The final position of each heat recovery unit shall be carefully co-ordinated by the mechanical contractor giving due consideration to ductwork requirements, the position of the cold-water storage tank as well as allowing sufficient space for ease of future maintenance.

The duct connections to the heat recovery units shall be fitted with Daikin attenuators specially selected to match the unit.

ELEMENT 60 - ELECTRICAL WIRING OF MECHANICAL SERVICES

60.0 GENERAL

The electric wiring of the mechanical services shall be carried out under a separate electrical services contract and shall not form part of this contract. The mechanical services contractor shall however provide attendance on the electrical contractor for the wiring of all mechanical plant and equipment. The coordination of the mechanical wiring is the responsibility of the mechanical contractor.

MECHANICAL SERVICES INSTALLATION COMMISSIONING PROCEDURES

1.1 COMMISSIONING MECHANICAL SERVICES

The Contractor shall be responsible for commissioning the entire mechanical services for all phases and stages of the installation to the satisfaction of the Engineers. The Contractor shall produce for the approval of the Engineers a detailed specification for Commissioning Procedures for the completed installation. This Specification shall be provided well in advance of the commissioning programme and at a time agreed with the Main Contractor.

The Commissioning Procedures Specification shall include the following:

Detailed operating programme.

Bar chart showing weekly analysis of programme.

Data to be used for each stage of commissioning.

Detailed commissioning schedules for each item of plant and equipment.

Requirements and involvement of Resident Engineer.

Method of logging all performance data with processing and issuing to Client's representatives.

Method of issuing certificates including supplier's certificates.

Instruments and method of measurement to be used in commissioning.

Instructing Staff in use of plant and systems.

The Contractor shall co-ordinate with the Mechanical contractor in arranging a seminar to present and explain the commissioning methods and programme he proposes for the installation. He shall also arrange for all specialist suppliers/installers involved in the mechanical installation to be in attendance to outline their own commissioning procedures.

Important Note:

The mechanical services contractor shall fill and pressure test all heating pipework prior to pouring of the liquid floor screed. The pressure readings shall be recorded from each pressure gauge and re-checked after 30 mins. The developer and site foreman shall witness all tests and pressure readings.

Once satisfied that there are no leaks, the floor screed can be poured. Once the floor screed is complete, all heating pipework shall be re-tested with pressure readings recorded from each pressure gauge and compared to the initial readings to ensure no leaks have arisen from the installation of the floor screed. All the heating pipework installation in the floor screed shall be installed in the protected floor sleeves as indicated on the drawings.

1.2 GENERAL - COMMISSION, TESTING AND BALANCING

The Contractor is to carry out and be responsible for the complete testing, balancing, commissioning, certification, reporting and setting to work of all the mechanical systems and equipment. The Contractor must employ a specialist commissioning Contractor to carry out this work. For a period of not less than ten (10) working days, the Contractor is to demonstrate to and fully instruct the clients appointed staff in the complete operation of the system and equipment.

1.3 INDEPENDENT COMMISSIONING

Final balancing of the new heating and water distribution systems shall be carried out by an independent commissioning company approved by the Engineers. The Contractor shall measure and record the flow rates and amperages on all pumps, coils, commissioning sets, etc.

The Contractor shall include in his tender for the cost of the independent commissioning.

COMMISSIONING COMPANIES NAME

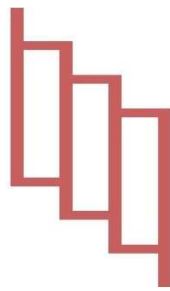
NAME

The commissioning shall be carried out strictly in accordance with the following CIBSE Commissioning Codes.

Series A – Heating/Cooling System

Series B - Water Distribution Systems

Series C - Ventilation Systems



CBS Consulting Engineers

MECHANICAL & ELECTRICAL ENGINEERS