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Mechanical Services Specification

Colaiste Mhuire
Boiler System Upgrade
Emergency Works

kcetb
Bord Oideachais agus Oiliúna
Chill Chainnigh agus Cheatharlach
Kilkenny and Carlow
Education and Training Board

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EnerJ Building Services Engineering
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EnerJ
BUILDING SERVICES ENGINEERING

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SECTION 1: GENERAL CONDITIONS & INFORMATION

1.1. COMMUNICATIONS

Where the contract is made between the mechanical contractor and the main contractor all written correspondence shall be with and instruction taken from the main contractor. Where the contract is made direct between the mechanical contractor and the employer all written correspondence shall be with, and instructions taken from the project manager.

1.2. VISITING THE SITE

The contractor is advised to visit the site at the time of tendering to ensure that they have included for all items necessary to complete the mechanical installation and to leave same in a complete working condition to the satisfaction of the consulting engineer. The contractor shall also have satisfied themselves as to the form and nature of the site to the extent and nature of the work and materials necessary for the completion of the works, the means of access to the site, the accommodation they may require and in general, to have obtained for themselves all necessary information (subject to the above-mentioned) as to risks, contingencies and all other circumstances influencing or affecting their tender. No extras will be entertained for works that could have been determined during the visit.

1.3. PROJECT IMPLEMENTATION

This project shall be constructed in a single phase. The mechanical contractor must coordinate with the project manager for an agreed programme of works. The mechanical contractor shall include in their tender for works to be carried out after normal working hours where deemed necessary to complete the project within the contract period.

Interfacing with existing services and systems on site shall be carried out outside of working hours and the contractor should price the works accordingly. The contractor shall ensure minimum disruption of the everyday use of roads, streets, and car parks throughout the duration of the project. The contractor must account for any cost implications due to out of hours work in their submitted tender.

The contractor must make the project manager aware of potential damage to property should this property remain on site prior to undertaking associated mechanical works.

1.4. PROTECTION OF SITE

The contractor shall effectively protect the site, works, constructed works, materials and plant, against all trespass and damage, either by means of the erection of suitable hoarding with gates or by means of any other acceptable methods. Notwithstanding any protective measures taken in this regard, the contractor shall be responsible for, and make good any damage to the complete works or the incomplete works that may occur.

The contractor shall also protect existing roads and services and adjoining properties, vehicles owned by adjoining property owners and they shall make good any damage to same that is caused by their operatives or by trespassers from the works site.

The contractor shall take particular account of the fact that when access to the scheme is through an existing housing estate, all access roads shall be kept clean and protected from damage. Provision shall be made as necessary for washing muck, soil and other dirt off trucks as they leave the site so as to ensure that roads are

kept clean. As and when any damage is caused to existing roads such damage shall immediately be made good and, on completion, these roads shall be left in a fully reinstated state (and to the satisfaction of the engineer). The contractor shall provide all requisite watching and lighting during the progress of the works and they shall be responsible for any damage occasioned by want of sufficient watching and lighting.

1.5. WORKING DRAWINGS AND SETTING OUT DRAWINGS

The contractor shall be responsible for the setting out of plant services and for the dimensional accuracy of the work and shall check all dimensions on site and where necessary inspecting the drawings and work of other trades.
Where installations are to be carried out in congested areas the contractor shall be responsible for determining the final positions in relation to other services and shall await final approval by the engineer.
The drawing accompanying this specification indicates generally the arrangement of the installation and is for assistance in tendering. The position of points, outlets, apparatus, may be altered during the course of the contract and the contractor shall allow for minor deviations from the preliminary drawings. The contractor must check all levels and dimensions of the site against those shown on the drawings and record same on a copy of the issued drawing. The contractor must notify the engineer in writing of any discrepancies and obtain instruction before proceeding.
Notwithstanding the provision of the contract drawings the mechanical contractor shall be responsible for taking their own particulars and providing at their own expense all necessary working and detailed drawings as requested by the project manager, copies of which must be first submitted for approval before the work is put in hand. Approval of working drawings will not relieve the mechanical contractor of his responsibility to ascertain exact building dimensions and location of other services.
The mechanical contractor shall be responsible for the preparation of the following:

- All builders work and building finishing works associated with the execution of the works.
- All required opes through walls, roofs, floors, etc. for services.
- Builders work drawings, including all necessary opes for installation
- Technical submittals for all items of plant and equipment that vary from the specified equipment herein.
- General layout drawings
- Sectional details
- Where deemed necessary by the project manager, the mechanical contractor shall provide large scale sections through ceiling voids, service ducts and trenches indicating dimensioned coordination details of all services

The project manager’s approval of working drawings will not relieve the mechanical contractor of his responsibility for errors and incorrect setting out. The contract project manager's approval is to be general and is not intended to serve as a check and does not relieve the mechanical contractor from furnishing the materials and performing the work as required by the drawings and specification.

1.6. HEALTH AND SAFETY

The Main Contractor is advised that the works shall be carried out in accordance with the following Health and Safety procedures:

- Safety, Health and Welfare at Work Act, 2005.

- Safety, Health and Welfare at Work (Construction) (Amendment) Regulations 2019 (S.I. No. 129)
- Safety, Health and Welfare at Work (Construction) Regulations 2021 (S.I. No. 291)
- Safety, Health and Welfare at Work (Construction) Regulations 2006 (S.I. No. 504)
- Safety, Health and Welfare at Work (General Applications) Regulations 2007 (S.I. No. 299)
- Safety, Health and Welfare at Work (Construction) Regulations 2013 to 2021, S.I. 291/2013 as amended by S.I. 129/2019, S.I. 102/2020 and S.I. 528/2021

The contractor is advised to familiarise themselves with the statutory documents listed above. The contractor shall be deemed to have included in his tender sum for complying with the terms of the above act and regulations. The contractor shall be deemed to have included for the preparation of safety statements and for taking all steps necessary to ensure the safety of all persons likely to be affected by the execution of the works.

The contractor shall submit a safety statement, as defined in the act, which shall identify hazards and risks arising while the works and specifying how it is intended to safeguard the safety, health and welfare of parties likely to be affected.

The contractor shall comply in all respects with the requirements of the above act and regulations with respect to his employees, nominated and domestic sub-contractors, visitors and other third parties. The safety statement shall be updated during the works to include any further hazards, which may arise.

The contractor must include adequate provision in the overall tender sum for the following:

- The execution of the project in compliance with all relevant statutory enactments and regulations.
- The acceptance of the role and the duties of the PSCS (Project Supervisor Construction Stage). The contractor will be required to nominate a competent person, employed by the contractor, to fulfil this role

PSCS (Project Supervisor Construction Stage)

The Main contractor shall undertake to act, under the provisions of the Health and Welfare at Work (Construction) Regulations 2005, as the Project Supervisor for the construction stage of the project. They shall be responsible for carrying out all the duties as set out in, or reasonably to be implied from, these Regulations including the following: -

- The PSCS shall warrant to the Employer his competence to undertake the duties of Project Supervisor Construction Stage.
- The PSCS shall issue to the Health and Safety Authority where required, the Notice of Commencement of the Works and shall keep a copy displayed on the site.
- The PSCS shall be responsible for having the Insurance Policies of all Contractors and Sub-Contractors working on site checked and approved by a competent party.
- The PSCS shall develop a Safety Plan for the project and shall revise this Safety Plan as the work proceeds.
- The PSCS shall be responsible for supervising and coordinating the implementation of the Safety Plan by their own staff and that of all sub-contractors employed on the works whether domestic, nominated or labour only.
- The PSCS shall control access to the site and be responsible for the proper status of all personnel therein in regard to safety training and equipment.

- The PSCS shall prepare and maintain a Safety File on the project as required in the Regulations and shall hand over this file to the Employer at Practical Completion of the works.
- The PSCS shall provide the Employer with a copy of his Firm's Safety Statement before commencing the works.
- The PSCS shall submit to the Contracting Authority weekly Health and Safety Audits set by the Contracting Authority.

1.7. INSURANCE

The contractor is required to hold all such insurances as required by prevailing legislation and, in particular, the following:

- Employers Liability Cover for a limit of not less than €13,000,000 for any one occurrence unlimited to any one period.
- Public and Products Liability for a limit of not less than €6,500,000 for any one occurrence unlimited to any one period.
- Third Party Workman's Compensation.
- Motor Fleet Insurance on a comprehensive basis including Third Party Property Damage for a limit of not less than €2,000,000.
- Contractors All Risk Cover for a limit of not less than the contract value.
- Specific confirmation shall be required confirming, that there is a working at height limit of not less than 8 metres.
- The main contractor and client must be provided with details of the contractor's insurances for approval.

1.8. FREE ISSUE ITEMS

Where it is the employer's intention to offer certain items of plant as free issue items, the contractor shall include in his tender for handling, erection and connection of such plant.
He shall also include for commissioning where specified. free issue items once delivered to site shall become the responsibility of the contractor.
The contractor shall ensure that all free issue plant delivered to site is in perfect condition before signing for such plant.
The contract shall note damage to plant and inform the engineers of damage within two days of acceptance of plant on site, otherwise the contractor will be liable for the full cost of repair or replacement of such damaged plant.

1.9. DISPUTE RESOLUTION

Irish law governs the Short Public Works Contract and its interpretation. If a dispute arises under this contract, either party may, by notice to the other, refer the dispute for conciliation and same should be dealt with in accordance with dispute resolution procedure as outlined in Condition 15 of the contract.

Disputes not resolved by conciliation, and where applicable are referred to the Irish courts or to arbitration under the Capital Works Management Framework (CWMF) Arbitration Rules for use with Public Works and Construction Services Contracts (AR1).

1.10. VARIATIONS

Either the engineer or the client will not entertain variations unless they are substantiated by written instructions from the engineer. Variation submissions made to the engineer based on verbal instructions only which are not substantiated by written confirmations will not be entertained. It therefore shall be the responsibility of the contractor to ensure that such written instructions and confirmation of variations are maintained. The engineer will not issue instructions unless a written cost has been submitted by the contractor in respect of the item for the engineer's approval.
It should be the responsibility of the contractor to submit costs for any such variations to the engineer for approval in a timely manner, such as will not obstruct the progress of the installation. Claims for delay or disruption arising out of untimely written confirmation regarding variations, excluding variations covering additional works or new items will not be entertained. Variations shall not violate the contract.
No payment shall be made to the contractor for any variation unless a variation order is produced by the engineer.
Variations shall be priced at the rates submitted by the contractor with their tender where applicable. Tenderers should note that it will be their responsibility to visit and properly inspect the site during the tendering period to fully acquaint themselves with the full scope, nature and intent of the works and to assess the site layout and condition generally. Post tender claims which are deemed to arise out of lack of knowledge of site conditions in this regard will not be entertained by the engineer. Any queries which arise out of such visits should be submitted to the engineer during the tender period, where upon they should be answered.

1.11. MASTER PROGRAMME

The contractor shall be required to submit a programme of work and keep up to date a progress chart during the contract. The contractor shall be required to maintain liaison with the main contractor, architects and engineers throughout the duration of the contract. The contractor must complete the work as specified within the time allowed for in the master programme.
The contractor will be expected to attend regular meetings as required by the main contractor to ensure proper co-ordination, sequencing and attendances for their work.
The contractor will be required to provide the following:

- Management chart for the project
- An equipment and labour histogram
- Delivery dates of materials and latest ordering dates

The Contractor shall provide all necessary personal superintendence during the execution of the works and shall maintain on site at least one competent general foreman approved by the engineer, and who shall be constantly on the works and who shall have power to act on the contractor's behalf during the contractor's absence from site and for all purposes be empowered to act as his general agent.

The contractor is to provide for general attendance of one trade upon another. They shall be responsible for so scheduling work that finished work will not be disturbed and they will be responsible for making good any damage to same at their own expense and to the satisfaction of the engineer. Any sub-contractors are to be approved by the engineer prior to starting on site.

1.12. GUARANTEE PERIOD

All items of equipment, apparatus or materials supplied under this contract, whether of the contractor's own make or supplied by a contractor, shall be guaranteed against faulty workmanship or materials for a period of

twelve months from the date of the engineer's certificate of virtual completion. If any equipment or part thereof shows signs of weakness owing to faulty design, materials or workmanship, or to neglect on the part of the contractor, or which, in the opinion of the engineer is unsatisfactory, the contractor shall, at his own expense, repair or remove such equipment or articles and substitute others for them if the engineer thinks fit, and the contractor shall bear all the costs thereof.
The cost of making good any defects which may arise from fair wear and tear or from want of proper care or management by the employer in the running of the plant shall be excluded from this guarantee. The engineer's decision as to what is fair wear and tear shall be final.

1.13. CONSTRUCTION PRODUCTS REGULATION

From July 2013, CE MARKING of construction products covered by harmonised European Standards (hEN) or a European Technical Assessment (ETA) is mandatory, when the product is placed on the market. Declaration of Performance (DoP) is required to be provided for all products/materials. Under the Construction Products Regulation (CPR) manufactures of construction products covered by hEN will be required to supply a DoP, and CE mark their products in accordance with the relevant harmonised technical specification in order to place their products on the market.
Upon completion the engineer will require the submission of a Certificate of Compliance (completion) along with as constructed drawings, calculations, specifications and particulars with the Building Control Authority. This final certification must be included on the Statutory Register before works or a building can be opened, occupied, or used. The specifications for products for certificates will include DoP's for materials/products. DoP's and CE marks will become the main source of information on the performance characteristics of the construction products and will be reviewed by the Engineer in establishing compliance with the Building Regulations and their duties under the Building Control Acts.

1.14. IMPROPER WORKS AND MATERIALS

Where and to the extent that materials, products and workmanship are not fully detailed or specified they are to be of a standard appropriate to the works and suitable for the functions stated on or reasonably to be inferred from the project documents, and in accordance with good building practice.
The engineer shall have the power to order during progress of the works:

- Removal from site of any materials, which in his opinion are not in accordance with the Contract.
- Substitution with proper materials.
- Removal and proper re-execution (not withstanding any previous test thereof or interim payment therefore) of any work which in respect of materials or workmanship is not in accordance with the Contract.

All materials used in the works shall be fit for the use for which they are intended and for the conditions in which they are to be used in and includes materials which:

- Bear a CE mark in accordance with the provisions of the Construction Products Directive (89/106/EEC)
- Comply with an appropriate harmonized standard, European technical approval or national technical specification as defined in article 4(2) of the Construction Products Directive (89/106/EEC)
- Comply with an appropriate Irish Standard or Irish Agreement Board Certificate or with an alternative national technical specification of any member state of the European community, which provides in use an equivalent level of safety and suitability.

The installation shall be carried out and maintained in the best and most substantial and workmanlike manner. Workmanship shall comply with British or Irish Standards and the relevant codes of practice. Only fully qualified and competent tradesman and helpers shall be employed on the works. Work shall not be sub-let or done by any other contractors without the employer's representative permission. No work shall be covered up prior to inspection by the employer's representative.

Wherever a proprietary name is used to specify a material or process it shall be deemed to have the term 'or equivalent' appended to it. Where a material or process is described by reference to its propriety name the name is used to indicate the standard of construction, appearance, ease of maintenance and durability acceptable to the employer's representative. The employer's representative will approve the use of alternatives where such alternatives are shown to equal or surpass the qualities of the product or process specified.

Notwithstanding any negotiations, which the project manager may have had with any particular manufacturer regarding items of equipment, which are specified, the mechanical contractor shall still be responsible for final negotiations to ensure that the equipment is entirely suitable and fully conforms to all requirements.

1.15. SAMPLES

The contractor if required shall supply samples and prototypes of all materials and workmanship to the employer's representative before the work is put in hand. The employer's representative may retain the sample until the main bulk of the material is delivered to the site. The employer's representative will require samples only where reasonable and where examination of quality by drawings and by description would be inadequate.

The contractor shall submit to the engineer, for approval such samples of workmanship, materials or equipment which he proposes to use in the execution of the works, as the engineer shall direct. Where in the opinion of the engineer the samples submitted are not of an acceptable standard or are unsuitable for use in the proposed circumstances, they shall have the right to instruct the contractor to obtain an alternative material or equipment from such sources as the engineer shall decide. All expenditure in connection with samples submitted for approval shall be borne by the contractor.

Samples approved by the engineer may with his permission be embodied in the works. Where special plant or equipment is required for which samples cannot be obtained, the contractor shall submit to the engineer for approval such detailed dimensioned drawings as the engineer may request. The engineer shall indicate on the drawings submitted such modifications as he may consider necessary and the contractor shall modify the said drawings accordingly and shall resubmit them for final approval. No manufacture of special plant or equipment shall be proceeded with until the detailed drawings have been approved in writing by the engineer.

1.16. TRILPLE E REGSITER

The Triple E Products Register is a benchmark register of best-in-class energy efficient products. The European Union (Energy Efficient Public Procurement) Regulations 2011, SI 151 of 2011, state "a public body shall only procure equipment or vehicles which are (a) listed on the Register or (b) satisfy the published SEAI energy efficiency criteria for the equipment or vehicle concerned, and the public body shall specify this requirement in any

documentation describing its procurement requirements".

The contractor shall ensure that all products or mechanical equipment installed in schools are listed on the Sustainable Energy Authority Ireland's (SEAI) Triple E lists of energy efficient equipment or are compatible with the criteria of the Triple E evaluation scheme.

1.17. GENERAL QUALITY OF PRODUCTS

All Products must be new unless otherwise specified.

- For products specified to an Irish, British or European Standard obtain certificates of compliance from manufacturers when requested.
- Where a choice of manufacturer or source is allowed for any particular product, the whole quantity required must be of the same type, manufacture and/or source unless otherwise approved. Produce written evidence of sources of supply when requested.
- Ensure that the whole quantity of each product required is of consistent kind, size, quality and overall appearance.
- Where consistency of appearance is desirable ensure consistency of supply from the same source. Do not use different colour batches where they can be seen together.
- If products are prone to deterioration or have a limited shelf life, order in suitable quantities to a programme and use in appropriate sequence. Do not use if there are any signs of deterioration, setting or other unsatisfactory condition.

Proprietary Products

- Handle, store, prepare and use or fix each product in accordance with its manufacturer's current printed or written recommendations. Inform Engineer if this conflict with any other specified requirement. Submit copies when requested.
- The tender will be deemed to be based on the products specified and recommendations on their use given in the manufacturers' literature current at the date of tender.
- Where British Board of Agreement certified products are used, comply with the limitations, recommendations and requirements of the relevant valid certificates.

Protection of Products

- Prevent over-stressing, distortion and other damage.
- Keep clean and free from contamination. Prevent staining, chipping, scratching or other disfigurement, particularly of products exposed to view in the finished work.
- Keep dry to prevent premature setting, moisture movement and similar defects. Where appropriate store off the ground and allow free air movement between stored products.
- Prevent excessively high or low temperatures and rapid changes of temperature in the products.
- Protect adequately from rain, damp, frost, sun and other elements as appropriate.
- Ensure that products are at a suitable temperature and moisture content at time of use.
- Ensure that sheds and covers are of ample size, in good weatherproof condition and well secured.
- Keep different types and grades of products separately and adequately Identified.
- Keep products in their original wrappings, packing's or containers until immediately before they are used. Wherever possible retain protective wrappings after fixing and until shortly before Practical Completion.
- Ensure that protective measures are fully compatible with and not prejudicial to the products/materials

1.18. CONDITIONS OF BUILDING AND SITE

The contractor shall be responsible for making good any damage caused to the fabric or decor of the building or site by, or as a result of, their negligence or the negligence of their employees or contractors or others unnamed or otherwise. All rubble and waste shall be removed as it arises. Upon completion of the works, the site and building shall be thoroughly cleaned to the satisfaction of the employer.

1.19. SUITABILITY OF RELATED WORK AND CONDITIONS

Provide all trades with necessary details of related types of work. Before starting each type of work, ensure that:

- Previous work is appropriately complete, in accordance with the project documents, to a suitable standard and in a suitable condition to receive the new work.
- All necessary preparatory work has been carried out, including provision for services openings, supports, fixings, damp proofing, priming and sealing.
- The environmental conditions are suitable, particularly that the building is suitably weather tight.

1.20. GENERAL QUALITY OF WORKMANSHIP

Workmanship shall conform to the highest standard of current mechanical installation practice. The project manager 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.

- Operatives must be appropriately skilled and experienced for the type and quality of work.
- Take all necessary precautions to prevent damage to the work from frost, rain and other hazards.
- Inspect components and products carefully before fixing or using and reject any which are defective.
- Fix or lay securely, accurately and in alignment.
- Provide suitable packings at screwed and bolted fixings to take up tolerances and prevent distortion. Do not over-tighten.
- Adjust location and fixing of components and products so that joints which are open to view are even and regular.
- Ensure that all moving parts operate properly and freely. Do not cut, grind or plane prefinished components and products to remedy binding or poor fit without approval.

1.21. LIABILITY FOR DEFECTS

Any work showing defects or any other damage, whether such defects or damage were caused by or consequential upon the negligence of the contractor or not and whether the discovery of such defects was made during the progress of the works or upon completion of the works, or whether payment has been fully certified or the works approved, the contractor shall make good, at his own expense, such defects or damage complained of, or in his refusal to do so the employer shall be entitled to carry out the work and recover expenses in accordance with the conditions of the client.

Notwithstanding the conditions of the contract the mechanical contractor shall be responsible for any defects which may occur, for a period of twelve months from Practical Completion unless noted otherwise in the Condition of Contract, in the entire Mechanical installation detailed in the specification.

Following notification of a defect the mechanical contractor shall rectify the item within 24 hours except as may be agreed otherwise with the project manager. The defects liability period will commence from the date of practical completion even though the electrical services are used previously.

1.22. INSPECTION OF WORK

Before proceeding with work that will cover and conceal previous work, or allowing other trades to do so, the contractor shall give early notice in writing to the engineer and shall afford them the opportunity of inspecting the work. The engineer will periodically inspect the progress of the installation as it proceeds.

If the contractor requires any special inspection, they shall be obliged to advise the engineer with two weeks' notice prior to the inspection required. Approvals given at such inspections will not relieve the contractor from full responsibility for the quality of the work throughout. Works covered in by the contractor without notice shall be exposed as directed by the engineer at the expense of the contractor.

The engineer and any person authorised by them shall at all times have access to the works and the site and to all workshops and places where work is being prepared or where materials, manufactured articles and machinery are being obtained for the works and the contractor shall afford every facility every assistance in obtaining the right to such access.
Defects in existing construction to be reported to the engineer without delay.

1.23. SUPERVISION ON SITE

The contractor shall give all necessary personal supervision during the execution of the works and shall have charge of all drawings, specification, documents as may be delivered to or for the use of the contractor. He shall be required to maintain liaison with the main contractor and the engineers and be on site during normal working hours to ensure that the works are carried out in a correct and efficient manner. The said representative shall always be present on the site during working hours and any orders or instructions which the main contractor or project manager may give to the said representative shall be deemed to have been given to the mechanical contractor. The foreman shall not be changed without the consent of the engineers, should they deem it necessary to do so.

In the event of engineers issuing such a directive the contractor shall immediately replace that person with a person of the calibre previously outlined and shall do so as often as the occasion may reasonably require.

1.24. BUILDERS WORK

The following work shall be deemed to be Builders' Work, which shall be provided by the Mechanical contractor:

- Cutting away through walls, floors and ceilings for passage of conduits etc. and making good after.
- Concrete plinths for items of plant.
- Auxiliary timber noggins and the like for supporting heaters and pipework.
- All underground pipe ducts, trenching etc.
- All painting to make good
- Removal and replacement of other parts of the building fabric as may be necessary.

The mechanical 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 mechanical 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 mechanical contractor shall be fully responsible for the levels and squareness of surface containment etc. and to this end shall ensure the accuracy of all works carried out in this connection by the main contractor.

The contractor shall be totally responsible for all associated builders works and ensure that all chases, opes etc. are located as required. The engineers will not entertain additional costs to the contract for unnecessary cutting and making good of the building fabric/structure. The contractor is responsible for making good all surfaces affected by the project. The mechanical contractor shall inform the main contractor of the location and details of any of the above listed Builders' Work required by marking out on site or, if requested, by drawings. The mechanical contractor shall submit the proposed builders works drawings to the engineer and structural engineer for approval prior to starting on site. The drawings shall include but not be restricted to the following information:

- All opes through walls greater than 65mm diameter
- Details of upstands, plinths and plant supports
- Details of weatherproofing for roof penetrations
- All trenching requirements and access manholes
- All support details for tanks
- All temporary works to provide for alteration and extension of existing services

The consulting engineers' drawings shall not be utilised as the base for sub-contractors builders work drawings. Builders work drawings shall be issued in duplicate format to the architect, quantity surveyor, services engineers and structural engineers for their comments and approval, at least three calendar weeks prior to the programmed formation on-site. Builders work drawings shall not be issued to the main contractor unless formally commented on by the design team members as indicated above. The mechanical contractor shall include for the on-going revision of co-ordination and builders work drawings for the duration of the contract.

The contractor shall provide for all associated scaffolding, platforms, ladders, tools, tackle, hoists, machinery, rods, stakes, properly constructed wooden boxes as measures and everything else of the nature of plant that is required for the proper and safe execution of works. The contractor shall also pay all freightage charges, costs, charges and expenses, incidental to the complete performance of works, unless special exemption shall have been granted to them by the engineer. The contractor shall provide all necessary barricades, screens etc. required.

1.25. GENERAL HOUSEKEEPING

On completion of the project, the contractor shall ensure the site is returned to the client clean and uncluttered equivalent to the condition of the site before work commenced. The contractor shall provide visual before and after images to negate any possible disputes. The contractor shall employ contract cleaners as required to ensure the building is returned fit for purpose. The contractor should inform the engineer before undertaking any

works which could potentially cause damage to the building's property. The contractor should not proceed with the works until they receive written confirmation from the engineer to proceed.

1.26. RECORD DRAWINGS AND INSTRUCTION

During the progress of works the Contractor shall record on drawings in an approved manner, the information necessary for preparing the installation record drawings. The marked-up drawings shall be made available to the consulting engineer for inspection and checking upon request.
Prior to the issue of the Practical Completion Certificate for the Works, comprehensive Record Drawings finalised 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 Record Drawings. 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.

The contractor' s attention is drawn to the fact that it is illegal, under Health and Safety at
Work legislation, for a building owner to operate his building unless he is in possession of
record drawings and operating instructions. These documents MUST, therefore, be checked and approved PRIOR to handover and the contractors will automatically assume 24-hour responsibility for the services they have installed until the documentation is acceptable and handed over to the employer or his representative

1.27. SITE MEETINGS

When so requested by the client, the architect or the engineer, the contractor shall attend site meetings which shall be held at regular intervals. He shall also attend the engineer on site when so requested.
Periodical meetings will be held at the site as and when required by the project manager or the main contractor. The mechanical contractor shall arrange to have an accredited representative present at each of these meetings. The main contractor shall have previously communicated the name of the mechanical contractor's representative in writing to the project manager.

1.28. MANTAINABILITY

The mechanical contractor shall demonstrate that all plant and equipment incorporated into the works can be safely accessed and maintained in compliance with Health and Safety legislation and can also be safely removed for replacement. All new installations shall comply with ETCI Rules, NSAI and DMG 08 M&E Spatial Requirements (Defence Works Functional Standard). All plant shall be installed in compliance with the maintenance requirements as set out in CIBSE Guide M 2023.

1.29. INTERIM CLAIMS

All interim claims for payment shall be dealt with by the main contractor.

1.30. FINAL ACCOUNT

Final account shall be dealt with by the Main Contractor.

1.31. DEFINITIONS

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

Throughout this document the term "Project Manager", shall be deemed to refer to:

EnerJ building Services Engineering and Building Performance Ltd.
86 Springfort Meadows
Nenagh,
Co. Tipperary
E45 NC80

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

EnerJ building Services Engineering and Building Performance Ltd.
86 Springfort Meadows
Nenagh,
Co. Tipperary
E45 NC80

1.32. ELECTRICAL REGULATIONS, STANDARDS AND REQUIREMENTS

Prior to the installation of any measure the property shall be assessed to ensure that it is suitable for the measure proposed. In addition, the installation of any measure shall not have any detrimental effect upon the integrity and condition of the building. The installation of the recommended measure is likely to achieve the desired effect in terms of energy efficiency.
The proposed installation shall comply with the following regulations, standards and requirements insofar as they are applicable:

- The General Conditions of the Contract and the Standard and Particular Specification of the Consulting Engineer.
- Building Regulations Technical Guidance Documents Current Edition.
- CIBSE Guides – Volumes A, B, C, D, E, F, H, K & M
- Local Authorities Guidelines.
- Local and National Health and Safety Regulations.
- Electrical Installation to be carried out in compliance with 'National Rules for Electrical Installation, I.S. 10101:2020+AC2:2025 - National Rules for Electrical Installations
- Health, Safety and Welfare at works Act 2005 and relevant S.I. No.

- Health, Safety and Welfare at Work (Construction) Regulations 2006 (S.I. No. 504)
- Regulations for the Electrical Equipment of Buildings' of the Institute of Electrical Engineers, current edition.
- Requirements for earthing in mechanical installations of the Electricity Supply Board.
- The Factory (Electrical) Regulations 1972, Statutory Instrument No. 3 of 1972.
- ESB National Code of Practice for Customer Interface, Version 6.2**,** effective 26 June 2025
- Code of Practice for Emergency Lighting, I.S. 3217:2023
- Code of Practice for Fire Detection and Alarm Systems for Buildings, I.S. 3218:2024
- I.S. EN 50525 Polyvinyl Chloride (PVC) Insulated cable and flexible cords of rated voltage up to including 450/750V.
- I.S. EN 50525 Rubber Insulated Cables and Flexible Chords of rated voltage up to and including 450/750V
- I.S. EN 50525 Cables with Polyvinyl Chloride (PVC) or cross linked Polyethylene insulation 600/1000 and1900/3300V with and without Steel Wire Armour (SWA)
- I.S. EN IEC 61084-2-1:2024/A11:2024 Cable Trunking Systems and Cable Ducting Systems for Electrical Installations
- BS EN 50086 Specification for Conduit Systems
- I.S. EN 50200:2015 Method of Test for Resistance to Fire of Unprotected Small Cables for use in Emergency Circuits and BS 8491:2008 Method of Assessment of Fire Integrity of Large Diameter Power Cables for use as Components for Smoke and Heat Control Systems and Certain Other Active Fire Safety Systems
- TGD B 2024 - Fire Safety, Volume 1 Buildings other than Dwelling Houses
- All relevant Irish, British and European Standards and Codes of Practice
- All other relevant legislation, Health & Safety, Employment, Environmental, Fire Safety, Building Regulations and Road Traffic Documentation as acted by the Irish Government
- The System Supplier/ Product Manufacturer Guidelines
- NSAI Agreement certificates

- NSAI Agreement recognised certificates within the EOTA network. Irish, British or European Standards and Guides Sustainable Energy Authority of Ireland.

- The UK Energy Saving Trust

- The UK Building Research Establishment (www.bre.co.uk)

In each case, the Irish Standard or NSAI Agreement Certification shall be considered the primary certification and preferred guidance.
Where Building Regulations are referred to within this document, it is the most recent amendment to and version of those Regulations which shall be adhered to by the Contractor at all times.
In all instances where the manufacturer, supplier or system supplier supplies a Good Practice Guide, Installation Guidance Notes or a Technical Guidance Document, the works shall be installed in accordance with those guidance documents.

2. SCOPE OF PROJECT WORKS

2.1 Summary

The Mechanical Contractor shall supply, install, test, commission and certify the complete boiler plant upgrade at Coláiste Mhuire, including all demolition, new boiler plant, pumps, controls, gas services, flue systems, pipework alterations, valves, insulation, electrical interfaces, builders work, commissioning and handover requirements shown on the tender drawings and described in this specification.
The installation shall be complete, safe, maintainable and fully operational. The Contractor shall include all labour, materials, access equipment, lifting, temporary works, supports, brackets, fixings, consumables and ancillary items necessary for a complete installation, whether or not every minor component is expressly identified.

2.2 Project Description

The works comprise the replacement of the existing boiler plant with a modular gas-fired condensing boiler cascade, together with associated boiler pumps, heating circuit pumps, hydraulic connections, gas supply alterations, flue system, pressurisation and expansion equipment, controls and electrical interfaces. Existing distribution circuits shall be retained and reconnected as indicated on the tender drawings.

2.3 Tender Drawings and Coordination

The Contractor shall read this specification in conjunction with all mechanical, electrical and builders work tender drawings. Each drawing and discipline shall be fully coordinated before manufacture or installation. The Contractor shall verify all dimensions, existing pipe sizes, levels, routes, access restrictions and connection points on site. Drawings shall not be scaled.
Any discrepancy, omission, inaccessible connection, conflict with existing services or condition differing from the tender information shall be reported to the Engineer before the affected work proceeds.

2.4 Applicable Standards

The works shall comply with the current editions of the Building Regulations, relevant Irish and European Standards, statutory requirements, gas safety requirements, electrical regulations, pressure equipment requirements, manufacturer installation instructions and recognised good practice. Where standards are revised during the contract, the edition current at the tender date shall apply unless otherwise instructed.

Building Regulations Technical Guidance Documents, including Parts B, D, F, J and L as applicable.

I.S. 820 for non-domestic gas installations and associated gas safety requirements.

I.S. 10101 for electrical installations.

Relevant EN standards for gas-fired condensing boilers, heating systems, pumps, controls, flues, pressure equipment and water treatment.

CIBSE guidance for heating system design, commissioning, controls, energy efficiency and maintainability.

Current water treatment guidance for closed heating systems.

All requirements of the gas network operator, local authority, fire authority and other statutory bodies.

3. EXISTING INSTALLATION, DEMOLITION AND TEMPORARY WORKS

3.1 Site Survey and Verification

Before commencing work, the Contractor shall carry out a detailed survey of the existing boiler room and connected systems. The survey shall confirm the condition, size, material, route and function of all pipework, valves, pumps, controls, electrical supplies, gas services, flues, drains and supports affected by the works.

3.2 Isolation and Drain Down

All shutdowns shall be agreed in advance with the Employer's Representative. The Contractor shall isolate, drain, vent and make safe all affected heating, gas, electrical, condensate and control services. Temporary blanking, capping and warning notices shall be provided as required. Existing systems not included in the works shall remain operational wherever practicable.

3.3 Removal of Existing Plant

The Contractor shall decommission, disconnect, remove from site and lawfully dispose of the existing boilers, boiler shunt pumps, redundant pipework, flue system, condensate connections, controls, sensors, gas pipework sections, oil services and associated redundant equipment indicated on the tender drawings.
Existing heating flow and return headers and distribution connections identified for retention shall be protected. Pipework shall be stripped back only to the points necessary to accommodate the new installation. Open pipe ends shall be securely capped immediately after disconnection.

3.4 Temporary Protection and Making Good

The Contractor shall protect all retained services, finishes and building fabric. Any damage caused by the works shall be made good. All redundant brackets, fixings and supports shall be removed where no longer required. Penetrations shall be sealed and fire-stopped to maintain the rating of the affected construction.

4. GAS-FIRED CONDENSING BOILERS

4.1 General

Provide three modular, floor-standing or frame-mounted gas-fired condensing boilers arranged as a cascade, with the combined output and operating duty indicated on the tender drawings. Boilers shall be purpose-designed for low-temperature hot-water heating and suitable for continuous modulation under automatic cascade control.

4.2 Performance Requirements

High-efficiency condensing operation across the normal operating range.
Fully modulating premix burner operation with stable low-load performance.
Automatic ignition, flame supervision and lockout protection.
Low NOx emissions suitable for current regulatory and planning requirements.
Suitable for the stated design flow and return temperatures and system operating pressure.
Integral high-limit protection, water pressure monitoring and frost protection where required.
Individual boiler status, run, fault and lockout indication.
Capability for external enable, common flow temperature control, cascade sequencing and alarm output.
Corrosion-resistant heat exchanger and condensate management suitable for the proposed system water quality.

4.3 Boiler Arrangement and Accessories

Each boiler shall be provided complete with all necessary valves, flexible or demountable connections, isolation, non-return protection, drain points, temperature and pressure monitoring, safety devices, condensate trap, support frame or plinth interface, local controls and all manufacturer-required ancillary components.
The installation shall permit safe removal of individual boilers and service components without dismantling adjacent plant. Clearances shall meet the equipment manufacturer’s requirements and shall not be less than those necessary for safe access, inspection, cleaning and replacement.

4.4 Condensate Drainage

Boiler condensate shall discharge through corrosion-resistant pipework with continuous fall to a suitable trapped drain connection. Where required by the equipment manufacturer, condensate neutralisation shall be provided. Condensate pipework shall be accessible for inspection and cleaning and shall be protected against freezing.

4.5 Boiler Safety and Interlocks

The boiler cascade shall be interlocked with the gas safety system, ventilation provisions, circulation proof, system pressure and emergency shutdown arrangements. Failure of any safety-critical condition shall prevent burner operation and generate a common alarm. Reset of safety lockouts shall require deliberate manual intervention where required by the applicable standards.

5. FLUE AND COMBUSTION AIR SYSTEM

5.1 General

Provide a complete purpose-designed flue system suitable for the proposed condensing boiler cascade. The system shall be designed and certified by the boiler/flue system supplier for the installed configuration, duty, equivalent length, terminal position, condensate production and operating pressure.

5.2 Flue Construction and Installation

Corrosion-resistant, pressure-tight construction suitable for wet condensing operation.
Correct diameter and configuration based on verified calculations.
Adequate falls, condensate collection and drainage.
Access points for inspection and cleaning.
Independent supports preventing loads being transferred to boiler connections.
Fire stopping and weather sealing at all penetrations.
Terminal location compliant with gas safety, building regulation and manufacturer clearance requirements.
Permanent identification and warning labels where the flue passes through concealed or shared areas.

5.3 Boiler Room Ventilation

The Contractor shall verify the boiler room ventilation requirements for the final selected boiler arrangement and gas installation. Existing and proposed ventilation openings shall be checked for free area, location, resistance and obstruction. Any shortfall shall be reported before equipment is ordered. Ventilation grilles shall remain permanently open unless specifically designed as part of an approved interlocked mechanical ventilation system.

6. GAS SERVICES

6.1 General

Modify and extend the existing gas installation to serve the new boiler cascade. The final pipe size shall be verified by calculation using the connected load, available inlet pressure, route length, fittings and permitted pressure drop. The gas installation shall be completed and certified by a competent registered gas installer authorised for non-domestic work.

6.2 Components and Arrangement

Common isolation valve at the boiler plant connection.
Individual lockable isolation valve to each boiler.
Appropriate unions or demountable connections.
Test points and pressure measurement provisions.
Pipe supports, sleeves, identification and corrosion protection.
Emergency gas isolation valve and clearly labelled emergency stop arrangement.

Gas proving and automatic shut-off arrangement where required by the applicable standards and risk assessment.
All redundant gas branches shall be removed or capped as close as practicable to the live main. The completed system shall be strength-tested, tightness-tested, purged and commissioned in accordance with current requirements.

7. HEATING PIPEWORK, HEADERS AND VALVES

7.1 General

Provide all new and modified low-temperature hot-water pipework necessary to connect the boiler cascade to the retained heating distribution system. Pipe sizes and materials shall be as indicated on the drawings or selected to satisfy the design flow, velocity and pressure-loss criteria.

7.2 Existing Headers

Retain and modify the existing main flow and return headers where indicated. Install new branch connections, isolation valves, commissioning valves, non-return valves, drain points, air vents, thermometers, pressure gauges, sensor pockets and fittings required for the new boiler and pump arrangement. Existing headers shall be cleaned internally where practicable and inspected for corrosion, leakage and suitability for continued service.

7.3 Valves and Fittings

Full-bore isolation valves at each item of plant and each distribution circuit.
Commissioning or differential-pressure control valves where required for balancing.
Non-return valves where necessary to prevent reverse circulation through inactive boilers or pumps.
Automatic air vents at high points with isolation facilities.
Drain valves at all low points and equipment connections.
Thermometer and pressure gauge pockets arranged for safe inspection.
Flexible connectors only where necessary for vibration isolation and suitable for the system conditions.

7.4 Supports and Expansion

Pipework shall be independently supported and shall not impose loads on boilers, pumps or existing services. Provide guides, anchors, expansion provisions and flexible connections as necessary. Supports shall be suitable for the pipe material, operating temperature, insulation thickness and imposed loads.

8. CIRCULATION PUMPS

8.1 General

Provide new high-efficiency variable-speed circulation pumps for the boiler circuit and retained heating distribution circuits as indicated on the pump schedule and tender drawings. Pump selection shall be based on the verified design flow, total system resistance, control philosophy, available electrical supply and required duty/standby arrangement.

8.2 Pump Performance

Electronically commutated motor or equivalent high-efficiency variable-speed drive.
Automatic differential-pressure control with adjustable proportional and constant-pressure modes where applicable.
Suitable for the system operating temperature, pressure and treated water quality.
Integral display of operating status, speed, power, flow estimate and alarms where available.
External enable and fault output suitable for the controls system.
Automatic restart following restoration of power, subject to safety interlocks.
Energy performance compliant with current ecodesign requirements and public-sector energy procurement criteria.

8.3 Twin and Single Pump Arrangements

Where twin-head or duty/standby pumps are indicated, the controls shall provide automatic changeover, equal run-hour rotation and automatic transfer on failure. Both pump heads shall be individually isolatable and removable without draining the complete system. Where a single pump is indicated, provide isolation valves and a demountable arrangement to facilitate replacement.

8.4 Installation

Pumps shall be installed in the correct orientation with adequate straight pipe lengths, isolation valves, non-return valves where required, drain points and pressure test points. Pump weight shall be independently supported. Pipe strain shall not be transmitted to pump casings. Pump sets shall be commissioned against the design duty and the final settings recorded.

9. PRESSURISATION, EXPANSION AND WATER TREATMENT

9.1 Pressurisation Unit

Provide or modify the system pressurisation arrangement as indicated on the drawings. The unit shall maintain the required cold fill pressure, provide low-pressure protection and include local isolation, non-return protection, pressure indication and fault output to the controls system. Any connection to potable water shall incorporate backflow protection appropriate to the assessed fluid category.

9.2 Expansion Vessel

Provide a replaceable-membrane expansion vessel or vessel bank sized by calculation for the total connected system volume, operating temperatures, static height, fill pressure, relief valve setting and permissible acceptance factor. Submit the sizing calculation before ordering. The vessel shall be provided with an isolation and drain arrangement that does not permit accidental isolation during normal operation.

9.3 Safety Relief

Provide safety relief protection sized and set to protect all boilers and connected components. Relief discharge pipework shall terminate safely and visibly, without risk to occupants or equipment, and shall be continuously graded with no isolating valve between the protected system and relief device.

9.4 Cleaning and Water Treatment

The complete affected heating system shall be flushed, cleaned and chemically treated before the new boilers are placed into service. The Contractor shall obtain representative water samples and confirm that water quality, inhibitor concentration, pH, hardness, conductivity and suspended solids are within the boiler and treatment specialist’s requirements.
Provide side-stream filtration, magnetic separation, dirt separation and air separation where indicated. The final treated-water test results shall be included in the handover documentation. The Contractor shall remain responsible for boiler damage arising from inadequate cleaning or water treatment.

10. AUTOMATIC CONTROLS

10.1 General

Provide a complete automatic controls system for the boiler cascade, boiler pumps, heating circuit pumps, safety interlocks and associated plant. Controls shall be fully coordinated with the boiler package, pump interfaces and electrical installation. The system shall operate automatically while permitting authorised manual override for testing and maintenance.

10.2 Boiler Cascade Control

The cascade controller shall sequence the boilers to match the active heating demand while maximising condensing efficiency and balancing plant run hours. The lead boiler shall rotate automatically based on run hours or an adjustable time schedule. Additional boilers shall be enabled only when the operating boiler cannot satisfy the required flow temperature or load within adjustable time and temperature thresholds.
Weather-compensated common flow temperature setpoint with adjustable heating curve.
Minimum and maximum flow temperature limits.
Automatic lead/lag rotation and equalisation of boiler run hours.
Stage-up and stage-down delays to prevent short cycling.
Modulation of enabled boilers to maintain the common flow setpoint.
Automatic isolation of a failed boiler from the control sequence while maintaining service from available boilers.
Common alarm and individual boiler fault indication.
Anti-cycle, frost protection and pump overrun functions.
Configurable optimum start/stop and holiday schedules where time control is included.

10.3 Pump Control

Boiler circulation pumps shall operate in coordination with the associated boiler enable signal and shall continue for an adjustable overrun period after burner shutdown. Heating circuit pumps shall operate in response to the relevant time schedule and heating demand. Duty/standby pairs shall rotate automatically and change over on failure.
Pump proving shall be by differential pressure switch, flow switch, current monitoring or verified pump status signal as appropriate. Boiler firing shall be inhibited where required circulation is not proven.

10.4 Sensors and Field Devices

Common boiler flow temperature sensor.
Common boiler return temperature sensor.
Outdoor air temperature sensor mounted in a representative shaded location.
System pressure monitoring and low-pressure alarm.
Pump run and fault status interfaces.
Gas safety and emergency stop interfaces.
Any additional sensors required by the final control strategy and equipment manufacturer.

Sensors shall be installed in accessible locations and shall be provided with pockets, isolation or removal facilities as appropriate. Strap-on sensors shall not be used for primary control unless specifically approved.

10.5 User Interface and Alarms

Provide a local control interface displaying plant status, temperatures, setpoints, boiler sequence, pump status, run hours and active alarms. Controls shall provide clearly labelled manual/auto/off selection where required. Alarm history and adjustable setpoints shall be password protected at appropriate access levels.
At minimum, alarms shall include boiler lockout, common boiler fault, pump failure, low system pressure, high system temperature, gas safety shutdown, control panel fault and sensor failure. Volt-free common alarm contacts shall be provided for connection to any existing remote monitoring system where indicated.

10.6 Controls Panel and Wiring

Provide a purpose-built controls panel incorporating protective devices, relays, terminals, controller, power supplies, isolator, labels and wiring diagrams. The panel shall be factory assembled and tested. All control cabling, containment, field wiring and final connections shall be included. Low-voltage and mains wiring shall be segregated.

10.7 Controls Commissioning

The controls specialist shall commission all points, sequences, interlocks, alarms, schedules, setpoints and safeties. A point-to-point test and witnessed functional performance test shall be completed. Final control parameters, passwords, software backups, wiring diagrams and a plain-English description of operation shall be included in the O&M manuals.

11. THERMAL INSULATION AND IDENTIFICATION

11.1 Pipework Insulation

Insulate all new and disturbed heating pipework, valves, flanges and fittings with non-combustible or limited-combustibility insulation having thicknesses appropriate to the pipe size and operating temperature and compliant with current energy-efficiency requirements. Finishes within the boiler room shall be robust, wipe-clean and suitable for the environment.

11.2 Identification

Identify all pipework, valves, pumps, boilers, controls, isolation points and electrical interfaces using permanent engraved labels, valve tags and directional flow arrows. Provide a framed plant schematic and valve chart within the boiler room.

12. ELECTRICAL INTERFACES

Electrical supplies, local isolators, containment, wiring, protective devices, earthing, control interfaces and testing shall be provided in accordance with the electrical tender documentation. The Mechanical Contractor shall provide complete electrical load data and connection requirements for all selected plant before equipment is ordered.
All boiler, pump, controls and safety circuits shall be coordinated so that emergency shutdown removes burner enable and closes automatic gas isolation devices while retaining any power required for safe alarm indication or controlled shutdown.

13. TESTING, COMMISSIONING AND HANDOVER

13.1 Pressure Testing

New and modified heating pipework shall be pressure-tested before insulation or concealment. Existing retained sections affected by the works shall be leak-tested. Test pressures, durations and acceptance criteria shall comply with the relevant standards and the pressure rating of the system components. Signed test certificates shall be provided.

13.2 Gas and Flue Commissioning

The gas installation shall be strength-tested, tightness-tested, purged and certified. Each boiler shall be combustion-tested across its operating range. Flue integrity, draft/pressure, condensate drainage and terminal operation shall be verified. Final combustion readings shall be recorded for each boiler.

13.3 Hydraulic Balancing

Set all pumps, commissioning valves and control valves to achieve the design flow rates. Record pump duty points, speed settings, differential pressures, circuit flow rates and final valve positions. The Contractor shall demonstrate stable operation under full and part-load conditions.

13.4 Functional Performance Testing

Demonstrate the complete installation under automatic control, including boiler staging, lead rotation, pump operation, duty/standby changeover, weather compensation, safety shutdowns, alarm generation, recovery from power interruption and operation with one boiler unavailable.

13.5 Documentation

As-installed mechanical and controls drawings.
Boiler, pump, flue and controls technical data.
Pressure-test, gas-test and electrical certificates.
Combustion commissioning records for each boiler.
Pump commissioning and balancing records.
Water treatment and water quality test results.

Controls point schedules, wiring diagrams, software backups and description of operation.
Valve schedule and framed plant schematic.
Equipment warranties and maintenance requirements.
Photographic record of concealed works and fire stopping.
Training attendance record and completed handover checklist.

13.6 Training and Demonstration

Provide on-site training to the Employer's nominated personnel covering normal operation, adjustment of time schedules and temperatures, alarm response, safe isolation, boiler reset, pump changeover, pressurisation, water treatment checks and routine maintenance. Training shall be delivered after final commissioning using the completed O&M documentation.

14. EQUIPMENT SUBMISSION PROCEDURE

The Mechanical Contractor shall submit technical data for all proposed plant and materials before ordering. No make or model is prescribed by this specification; however, every submission shall demonstrate full compliance with the specified duties, dimensions, efficiencies, materials, controls interfaces, emissions, maintenance access and statutory requirements.
Separate technical submissions shall be provided for the following:
Boiler cascade and accessories.
Flue system and flue sizing calculations.
Gas train and gas pipe sizing calculations.
Boiler and heating circuit pumps, including selection curves and duty points.
Pressurisation equipment and expansion vessel sizing calculations.
Air, dirt and magnetic separation equipment.
Valves, gauges, strainers and pipework materials.
Water treatment and flushing procedure.
Controls panel, controller, sensors, point schedule and description of operation.
Thermal insulation and identification system.
Commissioning programme and handover documentation schedule.
Review or comment by the Engineer shall not relieve the Contractor of responsibility for compliance with the contract documents, coordination, performance or suitability. Equipment shall not be ordered until the relevant submission has been returned with an acceptable review status.