



Galileo Energy Services

Unit A6, M4 Business Park, Maynooth Road, Celbridge, Co. Kildare, W23 VFY7.
Tel: 01-6274103
www.galileoenergy.ie

**STANHOPE STREET SECONDARY SCHOOL,
MANOR STREET,
STONEYBATTER,
DUBLIN 7.
D07 YP03.**

MECHANICAL SERVICES SPECIFICATION

VOLUME M1

PARTICULAR SPECIFICATION FOR THE MECHANICAL INSTALLATION

TENDER ISSUE (T2)

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GENERAL ITEMS

Introduction

The intention of this specification and the drawings issued is to describe and provide for a complete installation. The Contractor is advised that the work to be executed as described in these documents shall be complete in every detail, notwithstanding that every item involved may not be specifically mentioned or described. The Contractor shall be held to allow for all materials and labour necessary for an entire and complete installation and shall not avail of any unmentioned error or omission should such exist.

The works entails the installation of new mechanical services in the Science Rooms and Prep Room. Refer to the drawings for further information, layout of the building and services/works required. All works shall be in compliance with all relevant Building Regulations, Irish Standards, British Standards, CIBSE Guidelines and Good Engineering Practices.

The Contractor shall be required to ensure all necessary flexibilities & resources are available to the project to meet the deadlines and programmes. The Contractor shall liaise with the Main Contractor regarding the programme and order of works and any concerns he may have over the completion date should be raised prior to the awarding of the contract.

The Contractor shall take all reasonable care to ensure all site workers and visitors are not endangered by any element of their works. The Contractor must ensure that the works are completed as soon as possible and/or within the agreed program time frame.

The Contractor shall also review all Architects and Structural Engineers drawings to familiarise themselves with the proposed development and scope of works involved. It is the Contractor's responsibility to raise any concerns over the proposed works with the Engineer prior to commencement of works. Failure to inform the Engineer of any such concerns will be deemed that the contractor has accepted the design and scope of works to be fault free.

This specification will set out in general terms the design drawings and data to be used by the Contractor in order to submit a tender bid for the mechanical services installation and the works associated with the installation.

The procurement, delivery, supply, handling, erection, installation and commissioning of the services as there under described as may be seen or inferred from the enclosed drawings and documents from the Consulting Engineer.



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The Contractor shall satisfy himself that the installation is in accordance with all codes and standards. All works described shall comply with:

- i) The Safety, Health and Welfare Act, 1989.
- ii) Requirements of the Health and Safety Authority / SI 138.
- iii) Requirements of the Fire Officer.
- iv) All Irish Building Regulations including Building Control (Amendment) Regulations (BC(A)R), S.I. 9 of 2014.
- v) Factories Act / Statutory Instruments.
- vi) Client Safety Protocol.
- vii) Client Specifications.
- viii) Chartered Institute of Building Services Engineers.
- ix) The Tender Drawings.
- x) The Contract Preliminaries.
- xi) All relevant Irish, British and European Standards and Codes of Practice.

Please note that 'The Contractor' in this specification refers to the Mechanical Contractor.

The Contractor shall familiarise himself with the above and the obligations therein.

For any queries relating to this specification or related drawings, the Contractor shall contact the following:

*Ms. Joanne Martin,
Galileo Energy Services,
Unit A6,
M4 Business Park,
Celbridge,
Co. Kildare.
Tel: 01-6274103
E-mail: joanne@galileoenergy.ie
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Site visit prior to tender submission

The Contractor shall be deemed to have carried out a site visit of the site prior to the completion of his tender to ascertain for themselves the full extent and nature of the works.

The Contractor shall ensure that all factors, site conditions, and items are taken account and what items are necessary in order to complete the installation and to leave same in a complete working condition to the satisfaction of the Employer's Representative.



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No extras or variations shall be allowed for additional work that could have been ascertained by visiting the site. The Contractor shall contact the Main Contractor to arrange an appropriate appointment to visit the site during the tender period.

Tendering contractors MUST NOT arrive to site without prior appointment.

Tenderers shall note that no claim in respect of lack of knowledge of prevailing site conditions, builders work or existing services can be considered.

The tender drawings are based on the best information available at the time of preparation and by visiting the site the contractor shall satisfy himself of the exact extent and nature of works involved.

Standard and code of practice

Unless specifically stated otherwise, or approved by the Engineer, installation, materials and equipment shall be in accordance with the relevant Irish, European International and British Standards and Codes of Practice and CIBSE Guidelines, whether indicated in this Specification or not.

Where stated in this document the British Standard Reference numbers shall be compatible with the I.E.C. reference numbers or vice versa.

Acts and regulations

The installation(s) shall comply with all Acts, relevant Statutory Instruments and Regulations including any special Regulations issued by the electricity, gas and/or water authorities.

The tender shall be based on the Acts and Regulations current on the date for return of tenders. If these Acts and/or Regulations are amended or new Acts and/or Regulations are enacted after that date the Electrical Contractor shall inform the Engineer immediately.

Specified equipment

The Contractor shall refer to the rear of this document for a schedule of the specified equipment on which The Company's price is based. The Tenderer may offer an alternative manufacturer, providing the equipment offered is equal in all aspects, i.e. aesthetic appearance, classification and performance.

Alternative equipment proposed to that specified shall only be accepted/installed with the expressed approval of the Engineers in writing prior to the completion of the tender documents.



Plant warranties

Where a manufacturer's warranty applies, the warranties on plant and equipment shall commence from the date of commissioning and acceptance of plant by the Engineers.

Form of tender

The Contractor will pay particular attention to the proper completion of the Form of Tender. Completion of the Form of Tender must be as per the item numbers listed and should note that any section heading may apply to one or more of the items listed in the Summary of Prices.

The Contractor shall include in his tender under additional headings if necessary, and irrespective of the items indicated for all work specified or implied by the drawings or specification.

The tenderer shall be deemed to have full knowledge of the Specification and Drawings supplied to him and to have made himself fully acquainted with all requirements and to have obtained clarification on any matter or detail, which may be obscure to him.

Should any matter arise which in the opinion of the tenderer is obscure, he shall submit the details for clarification in writing to the Employer's Representative Engineer within 7 days of expiration of the tender period. The Employer's Representative shall circulate a reply to all Tenderers before the tender period expires.

The tender price is to be based on the works being carried out at rates of pay during working hours and under conditions of labour not less favourable than those established for the trade or industry in the district where the works are to be carried out. Any non-productive time associated with the recruitment of additional staff by the Contractor during the execution of the contract shall be deemed to be included in the tender price.

Installation and setting out of works

The Contractor shall set out the whole of the works and be responsible for the correctness of the positions, levels and dimensions of the several works. All openings, plinths, bases and holes to be cut in the structure shall be positioned and marked by the Contractor.

The tender drawings are diagrammatic only and the Contractor shall allow for a practical installation allowing for the setting around obstructions and other minor modifications which may or may not be apparent from the Architectural, Engineering, Structural, or services drawings.



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The exact courses and positions of all pipes, ducts, flues, cabling, conduit, trunking etc. and other items of equipment shall be duly laid out and marked on the job by the Contractor and approved before execution as the best possible course and position, having regard to all considerations including temperature and the proximity to other services plant.

The Contractor shall make good any incorrectly set out works and shall be liable for costs of making good any work incorrectly carried out.

The Contractor shall furnish all materials, labour and instruments necessary to enable the setting out to be checked.

Conflict between drawings and specifications

In the event of there being a conflict between drawings and specification, the tenderer shall obtain clarification before submitting his tender. Failure to do so will be deemed to imply that the most onerous requirements have been included for.

In the event that an apparent contradiction exists between any of the specification or between any of the specification and the drawings, this shall be addressed in writing to the Engineer during the tender period for clarification. If an apparent contradiction is not identified during the tender process, then it shall be at the discretion of the engineer to identify which document or clause takes precedence.

Claims raised post-tender in relation to apparent contradictions shall not be entertained and the onus shall remain with the contractor to highlight any such issues during the tendering period. This in no way over rides the order of precedence of information as defined within the contract.

Contract drawings and specifications

Refer to the 'Document Issue' sheet issued with this pack as this document highlights all the contract drawings and specifications.

Details of the complete installation are indicated on the contract drawings and described within this specification.

The exact locations of all equipment shall be agreed on site with the Consulting Engineers prior to installation where any doubt or potential conflict with other installations is perceived. Plant and equipment which is installed and which conflicts with existing work or installations will be removed and reinstalled without expense to the client by the Contractor.



Materials and workmanship

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:

- a) Bear a CE mark in accordance with the provisions of the Construction Products Directive (89/106/EEC)
- b) 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)
- c) 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. Accordingly proprietary names wherever mentioned in the Specification, schedule of Rates or on the drawings shall be deemed to mean the provision of the named product or process or an approved alternative.

Notwithstanding the above no items shall be used for the works except those as specified in the contract documents except with the permission of the Employer's Representative. Any points, which differ in the contract documents to the Contractors normal practice, may receive consideration at tender stage if referred to the Employer's Representative. If no reference is made at tender stage it will be assumed that the Contractor will proceed exactly according to this specification.



Improper materials

The Employer's Representative shall have the power to order during the progress of the works the removal from site of any material, which in his opinion is not in accordance with this contract, the substitution of proper materials, and the removal and proper re-execution of any work, which in respect of materials and workmanship is not in accordance with the contract. This condition is not withstanding any previous tests or interim payments.

Liability for defects

Works showing defects or damage, whether caused by or as a consequence of negligence on behalf of the Contractor or not and regardless of whether the defects are discovered during the progress of the works or upon completion of the works, and regardless of whether the works have been approved or fully certified, the Contractor shall make good, at his own expense, such damage or defects discovered. On refusal to do so the Employer shall be entitled to carry out the work necessary and recover the expenses associated with such work.

Allow for maintaining the works in perfect condition for 12 months after the issue of the Employer's Representative's Certificate of Substantial Completion in accordance with the Conditions of Contract.

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, his negligence or the negligence of his 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.

The Contractor shall pad ladders or similar equipment so that the building structure or finishes are not damaged in anyway. He shall also ensure that oil, grease or similar goods do not cause damage to the structure during the execution of the works.

Local authorities

The Contractor shall observe and comply with the requirements of all Statutes and Byelaws and serve notice on the Authorities or Owners of water, gas, electricity or any other items, which may be affected in any way by the execution of the works.



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Plant

The Contractor shall supply all necessary slings, tackles, scaffolding, haulage, instruments, materials, apparatus, tools and labour for delivery and erection of the works, and for the completion and testing of the works to the entire satisfaction of the Employer's Representative.

Loss, theft, damage and injury

The Employer or Employer's Representative shall not bear any responsibility for the loss, theft or damage of equipment or materials associated with the works either during delivery or at any time during the execution of the works. All plant, equipment, tools, workmanship and materials shall comply with the relevant safety standards. The Contractor shall bear responsibility for the safety of his employees and agents throughout the execution of the works.

Copyright

Copyright is reserved on the Consulting Engineers' documents, which include all drawings, specifications, sketches and the like. These documents may only be used in relation to the works as outlined in this contract. Photocopying of documents is not permitted without prior permission of the Consultant Engineer. Any copies of documents made during the execution of the works shall be returned to the Consulting Engineer prior to final payment

Contractors drawings

The Contractor shall prepare if requested by the Employer's Representative any working drawings necessary for proper completion of the Contract. Two copies of each drawing shall initially be submitted to the Employer's Representative and upon approval the Contractor shall provide 6 no. copies of said drawings for distribution.

Working drawings shall show the final arrangement of all items of plant and their associated connections, all control assemblies and panels, as well as the routing of all pipework and ductwork. The Contractor shall consult with all relevant parties and in the preparation of his working drawings so as to ensure there is no conflict between the Mechanical, Electrical and other services, Architectural or structural elements.

Variations, extras and omissions

No variation shall vitiate this Contract or save as hereinafter provided or give rise to any claim for compensation.



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Where an extra, variation, omission is required the Contractor shall submit a price for such variation, omission or extra to the Employer's Representative in writing within seven days of the request for such a price.

He shall not proceed with such alteration, variation or extra until such a time as he has received a Variation Order in writing from the Employer's Representative.

No payment shall be made whatsoever to the Contractor for any variation, alteration, addition or extra unless a Variation Order is produced. Variations shall be priced at the rates submitted by the Contractor with his tender where such are applicable.

Pricing

Un-priced items

Any item left un-priced shall be deemed to be included for in the tender and the cost of the item shall be deemed to be spread across and included in the rates generally.

Currency

All prices and rates shall be deemed to be denominated in Euros (€).

Electricity supply, electric wiring and equipment

All electrical equipment is to be suitable for the standard ESB supply of 400/230V @ 50hz AC. Where starters or controls are provided with any equipment included under the mechanical services contract, they shall be handed over to the Electrical Contractor together with their wiring diagrams, for erection and commissioning by him.

Electrical sub-systems certification

All electrical subsystems shall be certified as having been carried out in compliance with the requirements of the ETCI Wiring Regulations. Copies of the ETCI Subsystems certificates, accompanied by the relevant test results, shall be included with the ETCI Completion Certificate in the Health and Safety File for the project.

In the event of the Contractor failing to secure subsystem certificates for all items of equipment then the Contractor shall be liable for the cost of having the system tested, remedied as necessary and certified.

The tender figure shall be deemed to include for all costs incurred by the Contractor in providing the appropriate documentation.



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Proprietary names

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. If applicable, if the Contractor proposes an alternative material or equipment, this material or equipment shall be approved by the Employer's Representative prior the end of the tendering period.

Where a material or process is described by reference to its proprietary name, the name is used to indicate the standard of construction, appearance, ease of maintenance and durability acceptable to the Client / Employer's Representative.

The Client / 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. Accordingly proprietary names wherever mentioned in the Specification, Schedule of Rates or on the drawings shall be deemed to mean the provision of the named product or process or an approved alternative

'Safepass' accreditation

The Contractor shall comply with the requirements of the construction industry's safety accreditation scheme, known as the 'Safepass' scheme.

Decision of the Employers Representative

The decision of the Employer's Representative on all questions relating to the execution of the works, the meaning of the Drawings and Specification, the manner of the execution of the works or the quality of the materials, the nature, quality of the works executed or what amount was included in the Contract shall be final, conclusive and binding.

Works outside the contract

The contractor should note that claims for additional works will not be entertained unless specifically requested in writing by the Employer's Representative.

Waste management

The site shall at all times be kept as clean and tidy as possible and the contractor shall be responsible for removing debris and rubbish on a regular basis. Removal of waste from site shall comply with the statutory waste management requirements



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Damage

External:

The Contractor shall note that any damage to the existing yards, main entrance, grassed areas, access roads or paved areas that may arise during construction stage of the project and caused by the construction works or by the Contractor's vehicles or staff, is to be made good by him at no extra cost to the Client.

The Contractor should provide all necessary protection to existing paved, grassed and landscaped areas around the site and shall make good any damage caused by lack of such protection at no extra cost to the Client.

The work is not to interfere in any way with the public roads. In particular, the Contractor is to ensure that these areas are to be left free of all dirt and debris and builder's materials and parking of construction vehicles, etc and the roadways are to be thoroughly cleaned as and when required.

Any damage caused to the surrounding public roadways shall be made good to the satisfaction of the Local Authority at the Contractor's expense.

Any damage caused to the surrounding barracks roadways shall be made good to the satisfaction of the Client at the Contractor's expense.

Internal:

The Contractor shall note that any damage to the existing walls, windows, floor coverings, ceilings, doors, etc. that may arise during construction stage of the project and caused by the construction works or by the Contractor's plant or staff, is to be made good by him at no extra cost to the Client.

Any damage caused to the internal building as listed above shall be made good to the satisfaction of the Client at the Contractor's expense.

Interpretation of this specification and drawings

This specification has been written using simple, direct language wherever possible. Imperative terms such as 'provide' and 'submit' mean that the Electrical Contractor shall 'provide' or 'submit' the relevant samples, documentation or information.

If any discrepancies exist or there is any doubt about the interpretation of the Documents, obtain clarification from the Project Manager.



Declaration of Performance/CE markings

General:

The Contractor shall be aware of the Construction Products Regulation (CPR), which entered into force on 1 July 2013 and requires mandatory CE MARKING of construction products covered by Harmonised European Standards (HENS), when products are placed on the EU market. The purpose of the CPR and CE Marking of construction products is to facilitate the free circulation of construction products across the EU market. In doing so, the CPR has established a common technical language for declaring, specifying and setting requirements for construction products.

All CE MARKED construction products must have a Declaration of Performance (DoP), drawn up by the manufacturer. The DoP provides information on the performance of the construction product in relation to technical essential characteristics e.g. compressive strength, durability etc.

It is important that the electrical contractor uses only CE MARKED construction products within this installation and obtains a DoP for each product to ensure the product is fit for the use for which it is intended and for the conditions in which it is to be used. Furthermore, it is the Contractor's responsibility to ensure all works should be carried out using "proper materials...which are fit for the use for which they are intended and for the conditions in which they are to be used" in order to demonstrate compliance with the requirements under Building Regulations.

All materials, equipment and plant 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.
All materials, equipment and plant shall adhere to the following:

- Shall bear a CE mark in accordance with the provisions of the Construction Products Directive (89/106/EEC)
- Shall 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)
- Shall 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 Contractor shall provide a Declaration of Performances (DOP's) cert for all materials, equipment and plant used in the works.



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Evidence:

The Contractor shall provide evidence of Declaration of Performances(DOP's) and CE markings for all equipment, plant and material used in this project upon request by the Employers Representative. This is also mandatory for B(C)ar compliance sign off.

BREXIT implications for CE Marking and deployment of products for contracts with the EU member states including the Republic of Ireland:

As the UK has recently left the EU on the 31st January 2020. Contractors shall be aware of the implications and non-compliance risks for them or any of their sub specialists to install products which are CE marked under UK notified bodies. Post Brexit, UK notified bodies used for certification of conformity for 'CE' marking proposes will lose their status as EU Notified bodies and will be removed from the EU Nando website. In such instances the manufacturer of the product will need to obtain alternatives for certification of conformity for 'CE' marking.

Trade union rates and agreements

The Contractor must be in compliance with all Trade Agreements and the Contractor shall pay all employee's connected with the project to current trade union rates. If the Contractor appoints Sub-Contractor's to complete work then they too shall be compliant with current trade union agreements.

This will be monitored on site to ensure that all the Contractors employees and subsequent Sub-Contractors are in compliance with all Trade Agreements and that all are paid current union rates.

All employee's and Sub-Contractors employed by the Contractor for the duration of the works shall have their union cards on them at all times.

NZEB/BER Compliance

N/A

Timescale, working hours, payment, etc.

Refer to the Main Contractor for specific details on these requirements.



BUILDING CONTROL REGULATIONS

General:

All works shall be carried out to the new Building Control (Amendment) Regulations (BC(A)R), S.I. 9 of 2014.

Therefore, the Contractor shall allow for the following over the following stages of the contract:

Commencement Stage:

- Familiarise themselves with the drawings, specifications and documents lodged with the Commencement Notice.
- Ensure a competent person is assigned to oversee the Construction works.

During Construction:

- Install the services and construct the building in accordance with the plans and specifications.
- Ensure that the workmanship complies with the requirements of the Building Regulations.
- Ensure that materials which they select and for which they are responsible comply with the requirements of the Building Regulations.
- Co-operate with the design team, the Assigned Certifier and other certifiers.
- Co-operate with the Assigned Certifier for the implementation of the site inspection plan.

Upon Completion:

- Sign the Certificate of Compliance (completion).
- Provide to the Assigned Certifier, such documents for which they are responsible, as may assist the Assigned Certifier to collate particulars for the purposes of handover and certification, and/or for further submissions to the Building Control Authority.
- We will require Certificate of Compliance with the Building Regulations and relevant standards and manufacturers requirements at this stage.
- Ensure the coordination and provision of all test certificates and confirmations to the satisfaction of the Assigned Certifier or other designated inspectors or certifiers providing Ancillary Certificates;
- Maintain records.



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Inspections during the Construction Process:

The Contractor shall allow the following for inspections during the Construction Phase:

- Contractor to give the Engineer at least 5 days notice to carry out a necessary inspection.
- All services that are to be hidden or concealed shall be left exposed until inspected.
- Prior to closing up services in walls, ground, attics, etc., all tests shall be completed and sign off sheets shall be signed and witness signed. Test sheet to contain the name of the tested, name of the witness, type of test, duration of test and results recorded.
- No cost variations will be accepted for time delays or opening up for inspections if these procedures are not followed.

BUILDERS WORK

General:

All builders work associated with the execution of this Contract shall be carried out under the main contract by the Main Contractor.

The Contractor shall liaise with the Main Contractor on all builders work requirements relating to their installations and shall prepare detailed builders work drawings for the Main Contractor.

The Contractor shall prepare any working drawings if necessary, agree all details with the Employer's Representative, mark out and be responsible for correctness, and the cost of any unnecessary work due to the Contractor failing to comply with this condition shall be the Contractors responsibility.

The Contractor shall ensure that cutting away and general attendance is reduced to a minimum and must not impede or delay the carrying out or completion of this work. The permission of the Employer's Representative shall be secured before cutting or chasing is commenced.

The Contractor shall be responsible for the preparation of the following:

- 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.
- Ensuring that all services/installation details are completely integrated with all aspects of the building elements, to the satisfaction of the Client.



Opes through Fire Barrier Membrane:

All services through fire barriers, fire walls or floor slabs shall be sleeved either side of the fire barrier/wall/slab. All opes shall be filled in and fire proofed by the Main Contractor after services is installed and commissioned. Allow for all necessary works. Liaise with Main Contractor in ensure that all opes for services are fire-proofed.

M&E CO-ORDINATION AND M&E CO-ORDINATOR

M&E Co-ordinator:

The co-ordination of the mechanical installations and electrical installations shall be the responsibility of the Main Contractor as they shall appoint a dedicated M&E Co-Ordinator for the mechanical installations and electrical installations on site.

In addition, the co-ordination of the electrical installations shall be the responsibility of the Electrical Contractor and the co-ordination of the mechanical installations shall be the responsibility of the Mechanical Contractor but both Contractors shall allow for co-ordinating their installation with each other and the M&E Co-ordinator.

All mechanical and electrical installations shall be co-ordinated by the M&E Co-ordinator which shall be the responsibility of the Main Contractor. The Main Contractor shall appoint a suitably qualified person to complete this role. The M&E Co-ordinator shall have relevant experience on site and experience in M&E installations:

The M&E Co-ordinator shall allow for the following (non-exhaustive list):

- Oversee the installation of the M&E installations for the duration of the projects.
- Detailed co-ordination of the M&E installations.
- Completing co-ordination drawings for the M&E Contractors on site.
- Ensuring that the M&E installations are completed and installed in compliance with design documents and current regulations.
- Programming of the M&E installations with the M&E Contractors and the Main Contractor
- Shall be responsible for reporting on progress and creating procurement schedule.
- Shall be responsible for the overall progress & quality of work.
- Responsible for ensuring the clients requirements are being met



Mechanical Contractors Co-ordination:

The Mechanical Contractor shall allow for liaising with all other trades in relation to coordination. Before any works are started on site, the Mechanical Contractor shall hold a meeting with the Electrical Contractor to co-ordinate the M&E installations in the building.

The co-ordination of the mechanical installations and electrical installations shall be the responsibility of the Main Contractor as they shall appoint a dedicated M&E Co-Ordinator for the mechanical installations and electrical installations on site.

The Mechanical Contractor shall provide all information necessary and on time to the M&E Co-ordinator for the proper discharge of this responsibility. The Mechanical Contractor shall agree all methods, sequences timing and all relevant details of the works within his contract with the M&E Co-ordinator in advance and shall not deviate from this agreement unless otherwise agreed in writing with the Contractor. No adjustments will be made to the mechanical contract sum where additional work is required due to poor co-ordination or where the Employer's Representative has not been informed in good time of a co-ordination difficulty that could have been resolved by a design decision had the issue and its full implications been advised to the Employer's Representative in good time. The Mechanical Contractor shall liaise with all other trades when co-ordinating their works.

The Mechanical Contractor shall mark out opes and holes on all floor and wall surfaces as required to the satisfaction of Services Engineer, Structural Engineer and M&E Co-ordinator in sufficient time to allow the Main Contractor complete his works to programme.

METHOD STATEMENTS AND RISK ASSESSMENTS

Before any works commence in the building, the Mechanical Contractor shall submit risk assessments for the works and method statements for the works to the Main Contractor for works in the building.

The Mechanical Contractor shall allow for carrying out a risk assessment on all works and services to be installed in the building and shall highlight any risks to the Main Contractor.

Safety and Method statements must relate fully to this project only, e.g. the identification of hazards therein, and to enshrine the health & safety principles of prevention in the protection of employees and for others who may enter onto this site, or be effected by this work outside the line of site fencing etc.



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The safety statement shall include the names of authorized deputies and job titles. Commitment signed by the Managing Director of the company to uphold the health and safety principles of this project, in compliance with Regulation 12 of the 89 Act.

Method statements shall describe the method to be employed by the Contractor to ensure that hazards and risks associated with this work have been identified, and that the hazards or risks will be reduced or eliminated to an acceptable level as far as reasonable practicable.

The method statement shall also specify the plant or equipment to be used and the safety procedures to be adapted when using plant or equipment. The contractor is obliged to ensure that all works will be carried out in accordance with all relevant safety standards.

Method statements are required where a particular task involves a specific risk to people and to all other parties who may be affected by the contractor's actions.

Examples include the following:

- Working at heights
- Connecting to existing mechanical and electrical services
- Decommissioning of existing mechanical and electrical services
- Hot works in the building.



(5-) MECHANICAL WORKS

General

The Contractor shall be responsible for all mechanical works and shall ensure that the full price for this work is included in the tender price. This section of the Specification outlines the mechanical services installation and describes the particular requirements of the mechanical services to be installed. This section is intended to be read in conjunction with all other technical and non-technical sections of the specification and with the tender drawings. Where this section is at variance with any other sections of the tender documents, the tenderer shall obtain clarification from the Employers Representative before tendering. Failure to do so will be deemed to imply that the most onerous requirements have been included for.

50.0 MECHANICAL SITE SERVICES

Non applicable.

51.0 HEATING CENTRE

Non applicable.

52.0 DRAINAGE & REFUGE DISPOSAL

52.01 Decommissioning of existing waste pipework in the Science Rooms and Prep Room

The Contractor shall allow for decommissioning and removal from site of all the existing waste pipework throughout the Science Room and Prep Room (unless indicated otherwise).

The Contractor shall allow for decommissioning all existing waste pipework, traps, dilution traps, connections to sanitary ware, etc. throughout the Science Rooms and Prep Room.

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52.02 Chemical resistant waste pipework to be installed in the Science Rooms and Prep Room

General:

A system of chemical resistant waste vulcathene pipework shall be provided for under this contract by the Mechanical Contractor for the Science Rooms and Prep Room as indicated on the drawings, for the removal of waste matter from all sanitary fittings, sinks, equipment, etc. in these rooms.

The Contractor shall allow for connecting the new vulcathene waste pipework in the Science Rooms and Prep Room to the existing chemical resistance waste vulcathene stack pipes that are installed externally outside the room.

See drawings for the exact layout of the chemical resistant waste pipework installation in the building and the sizes of the pipework required.

Chemical resistant waste pipework:

All new chemical resistant waste services pipework to be installed for the Science Rooms and Prep Room shall be installed in chemical resistant vulcathene plastic pipework. Refer to drawings for waste routes and sizes.

The chemical resistant vulcathene pipework shall adhere to the following specifications:

Material and pipework:

- Pipework shall be chemical resistant vulcathene.
- Pipes and fittings to be manufactured from black co-polymer polypropylene.
- All pipe to carry 4 x violet stripes to identify the pipe as potentially carrying acid and other chemical waste (according to BS 1710).
- All fittings to be injection moulded using virgin material.
- Pipes and fittings to be manufactured in an environment which operates a Quality Assurance System assessed to ISO 9001.
- The system shall be manufactured to conform with the requirements of British Board of Agreement (BBA) certificate number 92/2805.

Method of jointing:

- The vulcathene pipework shall be jointed by mechanical joints. The mechanical system incorporates an olive located in a groove cut into the outer wall of the pipe by means of a Vulcathene grooving tool.



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Installation:

- The installation shall be carried out by competent persons who has experience in installation Vulcathene pipework and who have been trained with regards to the correct procedures.
- Pipe Fall – Horizontal waste runs should be installed to provide a natural fall to the vertical stack. Such a fall is dictated to some extent by the particular installation. 2° is an 'ideal' fall but in any event it should never be less than 1°.
- Horizontal pipe runs, where sustained temperatures in excess of 40°C (104°F) are expected, should have continuous support using lightweight galvanised metal channel.
- Vertical pipes, regardless of size, should be fixed at 1.5m centres using Vulcathene pipe clips which retain the pipe securely whilst, at the same time, allowing lateral movement of the pipe caused by fluctuations in thermal conditions.
- Repair (Clamp) Saddles - To enable easy connection of new branch pipes to Vulcathene stacks, use Vulcathene clamp saddles.



Cleaning and access points:

The chemical waste pipework shall be designed as a single stack system. Rodding points for cleansing the soils and wastes system shall be provided throughout. Access points shall be provided at low level as indicated on the drawings.

The Mechanical Contractor shall be responsible for including all access points required to safely clean and maintain the complete wastes installation without requiring destructive intrusion into the system.

In the event that the Employer's Representative deems any part of the system to be provided with inadequate access for cleaning the Contractor shall fit additional cleaning doors without charge to the contract.



The Mechanical Contractor shall make a representative available to the Main Contractor to assist with the planning and setting out of all wastes points throughout the rooms.

Existing soil vent pipes/soil stacks:

As indicated on the drawing, there are some external waste stacks installed in vulcathene pipework outside the room. The Contractor shall allow for all works in connecting the new chemical resistant vulcathene waste pipework in the rooms to these existing soil stacks. Refer to drawings soil vent pipes routes and sizes.

52.03 Connection to sanitary ware and appliances in the Science Room and Prep Room

The Mechanical Contractor shall be responsible for the final connection of all chemical resistant vulcathene waste pipework to all sinks, fume cupboards, dishwasher, etc. in the Science Rooms and Prep Room as indicated on the drawings.

The Mechanical Contractor shall allow for connecting the new chemical resistant vulcathene waste pipework from the new sinks, dishwasher, etc. to the waste pop-ups as indicated on the drawing. The Mechanical Contractor shall allow for all final chemical resistant vulcathene waste pipework connections to all items as indicated on the drawings. All sanitary ware shall be installed by the Main Contractor.

52.04 Installation of dilution traps

Dilution trap shall be fitted on all the sinks in the Science Rooms and Prep Room. All dilution traps shall be supplied by the Main Contractor to the Mechanical Contractor for installing. There is 12no dilution traps to be installed in total. The dilution traps are 2.3litre traps.

The Mechanical Contractor shall be responsible for the final connection of all chemical resistant vulcathene waste pipework from all sinks, fume cupboards, dishwasher, etc. in the Science Rooms and Prep Room to the dilution traps. Chemical resistant Vulcathene pipework shall then be extended from the dilution traps to the nearest waste pop-up or soil vent pipe as indicated on the drawings.

The Mechanical Contractor shall allow for all final chemical resistant vulcathene waste pipework connections to all items as indicated on the drawings.

All dilution traps shall be supplied free issue to the Mechanical Contractor by the Main Contractor.



53.0 WATER SERVICES

53.01 Decommissioning of the existing water services installation in the building

The Contractor shall allow for decommissioning and removal from site of all the existing water services installation throughout the Science Rooms and Prep Room (unless indicated otherwise).

The Contractor shall allow for decommissioning all existing cold water services pipework, hot water services pipework, sanitary ware, electric water heaters, etc. in the rooms. Refer to the drawings for further information.

53.02 Cold water services pipework and installation

General:

New cold water services pipework shall be installed throughout the Science Rooms and the Prep Room as indicated on the drawings.

New cold water services pipework shall be extended from the existing cold water supply pipework entering the rooms to connect to the new appliances and sinks in the Science Rooms and Prep Room as indicated on the drawings.

New cold water services pipework shall be provided to the rooms by the Mechanical Contractor as indicated on the drawings.

Existing cold water services pipework in the rooms:

New cold water services pipework shall be extended from the existing cold water supply pipework that currently enters the rooms and this pipework shall be extended to connect to the new appliances in the Science Rooms and Prep Room as indicated on the drawings.

The Mechanical Contractor shall connect the new cold water services pipework to the existing cold water services pipework in the rooms as indicated on the drawings. Allow and for all attendances and material in completing this. See drawings for locations and routes of pipework.

The Mechanical Contractor shall allow for all works to the cold water services installation as indicated on the drawings.

All existing cold water services pipework is installed in copper.



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The Mechanical Contractor shall allow for all works in connecting the new cold water services pipework to the existing cold water services pipework in the rooms as indicated on the drawings. This shall include and allow for the following works:

- Carrying out a survey of the existing cold water supply in the existing rooms so that the routes, isolation valves, pipework, etc. are known prior to connecting into the existing cold water services pipework in the rooms.
- Isolating the existing cold water supply coming into the rooms.
- Draining down the existing cold water supply pipework installation in the existing building so that the Mechanical Contractor can connect and tap into the existing cold water services pipework where required.
- Cutting into the existing cold water services pipework and taking a new connection of this existing pipework as indicated on the drawings. New pipework shall be extended from this location to supply the necessary items in the rooms. Allow and for all attendances and material in completing this. See drawings for locations and routes of pipework.
- Allow for installing new insulation on any new cold water pipework where required.
- Once the new cold water services pipework is pressure tested, turn on the existing cold water supply to the room.
- Ensure that there are no visible leaks on the new or existing cold water services pipework.

New cold water services pipework (overground):

All new internal pipework for the cold water services pipework to be installed as indicated on the drawings shall be installed in light gauge copper to I.S. EN 1057:2006.

It shall be suitable for bronze welding. Tubes shall be to uniform thickness, smooth, clean and free from internal and external defects. All ends shall be cut clean square with the tube axis.

All new cold water services pipework shall be installed in copper.





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Copper tube for all new internal cold water services pipework installed shall be as follows:

- Irish copper tube
- CE marked
- Complaint with BS EN 1057
- Material Analysis:
 - Material Grade Phosphorus de-oxidised copper; Cu-DHP or CW024A as defined in BS EN 1976.
 - Minimum Copper Content 99.90% (including silver)
 - Phosphorus 0.015-0.040%
 - Total Impurity Maixma 0.060% (excluding phosphorus and silver)

All cold water services pipework shall be sleeved as the pass through floor slabs and internal blockwork walls.

Pipework fittings:

Pipe brackets shall be heavy G.M. screw-on type. Pipework shall be arranged neatly and shall have a clearance from finished floor level of 100mm. Any water services pipework installed in the ceiling void shall be adequately supported and braced via unstrut and clips.

Allow for a gradient of approximately 1:60 in the direction of the flow of water. 'U' bolts shall be fitted at intervals of 6m for controlling lateral movement.

Brackets shall be fitted at the following spacings:

<u>Pipe bore</u>	<u>Support centres</u>
15mm	1.2m
22mm	1.2m
28mm	1.5m
35mm	1.5m
40mm	1.8m
54mm	1.8m

Labelling:

After insulating all new cold water services pipework in the rooms, all new cold water services pipework installed in the rooms shall be labelled with appropriate colour identification bands and flow indication arrows.



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All labels must be neat, lined up with other labels, oriented for easy view, and securely fixed. Any labelling installed which does not fit this description shall be removed and replaced. Labels on pipework shall be provided at least once within the building compartment and every 10m on long runs within a single compartment such as a corridor.

Insulation:

All new cold water services pipework installed within unoccupied areas (shafts, service voids, ceiling voids, furniture, walls or false ceilings) shall be insulated. Allow for the fitting, installation and connection of cold water supply pipework to all the items as indicated on the drawings.

See Section 53.04 for further information on the insulation of the pipework. See drawings for routes, sizes, etc. of pipework.

Main Isolation valves:

Allow for the supply and installation of all the necessary isolation valves on the new cold water services pipework to the areas as indicated on the drawings. Main isolation valves shall be Crane D171 level valves, or equivalent.



Local Ballofix Valves:

Allow for the supply and local installation of ballofix isolation valves to all cold water supply pipework to the new sanitary ware fittings as indicated on the drawings so that the cold water supply to each sanitary ware fitment can be easily isolated.

Ballofix valves are to be installed on all cold water supplies to all new sanitary ware fittings so that they are capable of independent isolation. Ballofix valves shall be as follows:

- Chrome plated brass isolation valve.
- Supplied with a simple screwdriver slot operation for isolation.
- Compression ends to BS EN 1254-3





53.03 Hot water services supply pipework and installation

General:

Hot water services supply pipework shall be provided throughout the Science Room and Prep Room as indicated on the drawings.

For new sinks and wash hand basins, new undersink electrical water heaters shall be installed for hot water supply to the sink or WHB. Ensure that the adjustable thermostat is not exposed on the water heater. Wiring shall be carried out exactly to suppliers instructions.

Allow for the fitting, installation and connection of the cold water supply to all the electric water heaters as indicated on the drawings. See detail on drawing for specific piping details and sizes of all pipework.

New hot water services supply pipework:

All new internal water services pipework for the hot water services supply pipework to be installed in the new extension building shall be installed in light gauge copper to I.S. EN 1057:2006.

It shall be suitable for bronze welding. Tubes shall be to uniform thickness, smooth, clean and free from internal and external defects. All ends shall be cut clean square with the tube axis.

All new hot water services supply pipework to be installed shall be copper.



Copper tube for all internal hot water services supply pipework shall be as follows:

- Irish copper tube
- CE marked
- Complaint with BS EN 1057



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- Material Analysis:
 - Material Grade Phosphorus de-oxidised copper; Cu-DHP or CW024A as defined in BS EN 1976.
 - Minimum Copper Content 99.90% (including silver)
 - Phosphorus 0.015-0.040%
 - Total Impurity Maximum 0.060% (excluding phosphorus and silver)

All the new hot water services supply pipework from the electric water heaters to the necessary sanitary ware shall be surface mounted. The Mechanical Contractor shall ensure a neat installation and all pipework shall be installed parallel to walls, ceilings and partitions.

All hot water services supply pipework shall be sleeved as the pass through floor slabs and internal blockwork walls.

The whole of the pipework shall be bronze welded with approved filler rods and flux. The filler rod shall contain a small amount of phosphorous or silicon to prevent any oxidation in the joint when made. Compression fittings shall not be used.

The composition of phosphor bronze and filler rod shall be typically as follows:

- Brass: 60% copper, 40% zinc (with silicon or phosphorous additives)
- Phosphor Bronze: 95% Copper, 4.5% tin, 0.5% phosphorous.

Flux having a borax base shall be used in paste form, which shall be uniformly spread over the surface to be jointed. If flux powder is to be used, it shall be wetted to form a paste prior to jointing. Flux shall not be used in powder form.

Bends shall be made from the pipework. Up to 38mm shall be made with spring bending tubes and the radii shall not be less than 3 times the diameters of tube. All exposed pipework shall be thoroughly cleaned and surfaces prepared to a smooth polish finish by using emery cloth. Surfaces scored or scratched or otherwise damaged shall not be acceptable.

Pipework fittings:

Pipe brackets shall be heavy G.M. screw-on type. Pipework shall be arranged neatly and shall have a clearance from finished floor level of 100mm. Any hot and cold pipework run in the attic space shall be supported as specified for heating pipework.

Allow for a gradient of approximately 1:60 in the direction of the flow of water. 'U' bolts shall be fitted at intervals of 6m for controlling lateral movement.



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Brackets shall be fitted at the following spacings:

<u>Pipe bore</u>	<u>Support centres</u>
15mm	1.2m
22mm	1.2m
28mm	1.5m
35mm	1.5m
40mm	1.8m
54mm	1.8m

Labelling:

After insulating all new hot water services supply pipework in the rooms, all new hot water services supply pipework installed in the rooms shall be labelled with appropriate colour identification bands and flow indication arrows.

All labels must be neat, lined up with other labels, oriented for easy view, and securely fixed. Any labelling installed which does not fit this description shall be removed and replaced. Labels on pipework shall be provided at least once within the building compartment and every 10m on long runs within a single compartment such as a corridor.

Insulation:

All hot water services supply pipework within unoccupied areas (shafts, service voids, ceiling voids, furniture, walls or false ceilings) shall be insulated.

Allow for the fitting, installation and connection of hot water supply pipework to all the sanitary ware and the water heaters as indicated on the drawings. See Section 53.04 for further information on the insulation of the pipework. See drawings for routes, sizes, etc. of pipework.

Main Isolation valves:

Allow for the supply and installation of all the necessary isolation valves on the new hot water services supply pipework to the water heaters and certain areas in the building as indicated on the drawings. Main isolation valves shall be Crane D171 level valves, or equivalent.





Local Ballofix Valves:

Allow for the supply and local installation of ballofix isolation valves to all hot water supply pipework to the new sanitary ware fittings as indicated on the drawings so that the hot water supply to each sanitary ware fitting can be easily isolated. Ballofix valves are to be installed on all hot water supplies to all new sanitary ware fittings so that they are capable of independent isolation.

Ballofix valves shall be as follows:

- Chrome plated brass isolation valve.
- Supplied with a simple screwdriver slot operation for isolation.
- Compression ends to BS EN 1254-3



53.04 Insulation on water services pipework

General:

All new cold water services pipework and hot water services pipework installed in the rooms (at high level exposed, in the ceiling void, attic space, in walls, services, voids, service shafts, etc.) shall be insulated as described below.

The Mechanical Contractor shall allow for supplying and fitting insulation on the following internal water services pipework:

- All internal cold water services pipework
- All internal hot water services supply pipework

Refer to the drawings for the sizes, locations, routes, lengths, etc. of the new water services pipework in the rooms that is to be insulated.

There is not a requirement to insulate the exposed water services pipework exiting the wall at low level to the necessary sanitary ware fittings or any surface mounted pipework at low level.

Water services pipework shall be insulated as follows:

- Pipes from 15mm to 28mm: 30mm thick insulation
- Pipes from 35mm to 54mm: 40mm thick insulation
- Pipes from 76mm: 50mm thick insulation



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Generally, all insulation work shall be carried out by experienced established professional insulation contractors.

Generally, all insulation shall be accurately fitted and cut, accurately mitred, free from any damage or tears, fully bonded or otherwise secured and correctly terminated at flanges, pumps, heat exchanger, vessels or other plant items.

All unfitted insulation materials shall be stored on site in dry secure stores and all necessary measures shall be taken to ensure that no damage occurs to the insulation while unfitted in storage or fitted in situ prior to handover of the building.

The Mechanical Contractor is responsible for ensuring that all insulation fitters are fully trained and for supervising the work of fitters.

Materials, adhesives, sealants and finishes shall be suitable in all respects for continuous use without degradation throughout the range of operating temperatures and within the environment indicated. They shall be designed to provide proof against rotting, mould, fungal growth and attack by vermin and degradation through UV radiation when used externally. All materials shall be non-hygroscopic.

All insulating materials and associated products shall be applied in accordance with manufacturers recommendations and instructions. Work failing to comply with these will not be accepted by the Engineer.

Insulation:

All new water services pipework installed in the rooms shall be insulated using Isover Climpipe, Rocklap H&V, (or equivalent) foiled back mineral wool insulation, or equivalent. All insulation shall adhere to standards B.S. 5422:2009 and B.S. 5970:2012.

The Mechanical Contractor shall allow for the supply and installation of all insulation for the new water services pipework throughout the rooms. All new pipework shall be insulated with foil backed insulation and shall be insulated as described above and clad in aluminium foil.

The Mechanical Contractor shall allow for the supply and installation of all insulation for the new water services pipework.

The insulation shall be of preformed sections of rigid mineral wool incorporating an aluminium foil laminate cover and fitted in accordance with the manufacturer's instructions.

The insulation shall also be applied to all connections, bends, tees and valves.



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Insulation shall adhere to the following specifications:

- Type:

Reinforced foiled back mineral wool insulation with a self-adhesive overlap to ensure a strong vapour barrier as Isover Climpipe, Rocklap H&V, or equivalent.

- Thickness:

As highlighted above.

- Thermal conductivity:

- 0.033 W/mk at mean temperature of 10°C.
- 0.036 W/mk at mean temperature of 50°C.
- 0.043 W/mk at mean temperature of 100°C.

- Thermal performance:

To comply with B.S. 5422:2009.

- Fire performance:

To comply with Euroclass A2L, S1, d0 fire rating when classified with BS EN 13501-1

Class 0 compliance. The factory applied aluminium foil facing shall meet the highest standards required by BS476: Part 6 'Fire propagation' and B.S. 476: Part 7 'Surface spread of flame'.

- Service temperature:

The temperature on the aluminium facing should not exceed 80°C.



- Smoke and toxicity:

Shall achieve the criteria for smoke generation and toxicity as given in the IMO Resolution MSC 61 (67). (Smoke and Toxicity Test to Part 2, Annex 1 and 2 of the Fire Test Procedures Code)

- Certification:

CE Marked.

B.S. 5422:2009.

B.S. 476: Part 7

B.S. 5970:2012

CE 0402-CPD-SC0408-10.

'Part L' Compliance.

53.05 Thermostatic mixing valves

Thermostatic mixing valves (TMV's) shall be fitted at all new wash hand basins and sinks throughout the rooms to prevent scalding as indicated on the drawings.

The Mechanical Contractor shall allow for the supply and installation of all TMV's.

All TMV's shall be located such that a maximum dead leg of 200mm only is achievable on the blended water supply. All TMV's must adhere to the following specifications:

- Must be 'TMV 3' and WRAS approved.
- Supplied with ½" flat faced union connectors terminating in 15mm compression connections.
- Suitable for a minimum dynamic supply pressure of 0.15 bar.
- TMV's must give a flow rate of least 0.1 litres/second at an inlet head of 1.5 metres.
- Limited to a maximum temperature of 43°C to prevent scalding.
- Valve body shall be D7R brass and feature a locked temperature shroud with preset maximum temperature stop facility.
- Comply with BS EN 1111 and BS EN 1287 and be suitable for use with low pressure systems.
- Be suitable for under basin installation.
- Provide safe thermostatic shutdown.
- Be complete with isolation valves, check valves, easily removable strainers and service free cartridges.
- Shall be suitable for low-pressure loss systems.



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- TMVs must never be connected to the mains water supply. They must only be connected to the hot water distribution services and cold water distribution services.
- The body shall be DXR brass nickel plated with a white plastic locking shroud.

Suitable valves as Rada (low-pressure loss) 215-t3dk, or equivalent.



53.06 Control valves and ballofix valves

See sections 53.01, 53.02 and 53.03 for information on control valves and ballofix valves.

53.07 Electric undersink water heaters

General:

For new sinks and wash hand basins, new undersink electrical water heaters shall be installed for hot water supply to the sink or WHB. Ensure that the adjustable thermostat is not exposed on the water heater.

The Mechanical Contractor shall allow for the supply and installation of all undersink electric water heaters as indicated on the drawings. See drawings for locations and quantities.

Ensure that the adjustable thermostat is not exposed on the water heater.

Electric undersink water heater:

The Mechanical Contractor shall allow for the supply and installation of all undersink electric water heaters in the rooms as indicated on the drawings. See drawings for locations and quantities.

In total there are 5no undersink electric water heaters to be supplied and installed.



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Each water heater shall adhere to the following specifications:

- Undersink electric water heater as Ariston Lux Eco, or equivalent.
- High density polyurethane foam insulation around tank.
- Titanium enamelled tank.
- Eco display.
- ABS safety system with a set of functions, including anti-overheating, anti-freezing and dry heating self-diagnosis, which protect the unit in case of energy or water failures.
- Anti-legionella function where the water heater will automatically increase the water temperature up to 65°C, in order to eliminate the risk of legionella bacteria developing.
- Fitted with magnesium anode rod for protection.
- Fitted with limiting overheating device.
- Supplied with expansion relief valve calibrated at 6 bar.
- Supplied with 2litre expansion vessel and non-return valve. Non-return valve stops any backflow of hot water into the cold water main.
- 10 litre capacity.
- 2500 watts power (230v)
- 230 volts.
- Max pressure of 6 bar.
- Electronic thermostat.
- IPX3 protection
- ErP Class A
- Max working temperature of 65 degrees.
- Dimensions of heater is 360mm high by 360mm wide by 294mm deep
- WRAS approved.
- CE approved.
- 1 year warranty



Piping of SRV (Safety Release Valve) and expansion vessel:

The Mechanical Contractor shall ensure that each water heater has a dedicated expansion vessel and safety release valve installed. Allow for piping the expansion valve/safety release valve for the heater to the nearest drain or to the external. Refer to the detail on drawing 53(M001) for further information.



Control of undersink electric water heater:

The new electric water heater shall be controlled via an electro-mechanical timeclock which shall be located in the new electrical board for the rooms.

The timeclock in the new electrical board shall be supplied and fitted by the Electrical Contractor. The Mechanical Contractor shall discuss the time setting of the water heaters with the Electrical Contractor at the time of commission.

53.08 Pressure test

The Mechanical Contractor shall hydraulic pressure test all new water services pipework that is installed in the rooms. Pipework shall be tested prior to final connection to the sanitary ware items.

The pipework shall be pressure tested to 7 bar and shall remain drop tight for a period of at least 12 hours.

If pressure has dropped at all from noted mark, the installation cannot be regarded as sound and shall not be commissioned until the escape is repaired and the installation re-tested. If pressure remains stable, then installation can be deemed sound.

Comply with procedures given in the HVCA Guide to Good Practice for Site Pressure Testing of Pipework. Ensure safety precautions detailed in HSE Guidance Note GS4 Safety in Pressure Testing are adopted. Advise appropriate personnel, in advance, of the time pressure tests may be witnessed. Keep record of pressure tests and issue them to the Employer's Representative, and include them within the handover documentation.

53.09 Connection to sanitary ware and appliances in the Science Rooms and Prep Room

The Mechanical Contractor shall be responsible for the connections of all water services pipework to the necessary sanitary fitments, sinks, etc., in the rooms as indicated on the drawings. All sanitary ware and appliances shall be supplied and installed by others.

The Mechanical Contractor shall allow for connecting the new water services pipework to all the new sanitary fitments, sinks, etc. in the building as indicated on the drawing. Refer to the drawings for locations, sizes of pipework, types of pipework, etc.

All sanitary ware shall be supplied installed by the Main Contractor.



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53.10 Sanitary ware

All sanitary ware shall be supplied and installed by the Main Contractor. The Mechanical Contractor shall be responsible for the connection of all new water services pipework to the sanitary ware, sinks, fume cupboards, etc. as indicated on the drawings.



54.0 GAS SERVICES

54.01 Decommissioning of existing gas services installation in the Science Rooms and Prep Room

The Contractor shall allow for decommissioning and removal from site of all the existing gas services installation throughout the Science Rooms and Prep Room (unless indicated otherwise).

The Contractor shall allow for decommissioning all existing gas services pipework, gas valves, gas pressure proving system, etc. in the room. Refer to the drawings for further information.

54.02 Internal gas pipework in the Science Rooms and Prep Room

General:

New gas services pipework shall be installed throughout the Science Rooms and the Prep Room as indicated on the drawings.

New gas services pipework shall be extended from the existing gas supply pipework entering the room to connect to the new appliances in the Science Rooms and Prep Room as indicated on the drawings.

New gas services pipework shall be provided to the rooms by the Mechanical Contractor as indicated on the drawings.

Existing gas services pipework in the rooms:

New gas services pipework shall be extended from the existing gas supply pipework that currently enters the room and this pipework shall be extended to connect to the new appliances in the Science Rooms and Prep Room as indicated on the drawings.

The Mechanical Contractor shall connect the new gas services pipework to the existing gas services pipework in the rooms as indicated on the drawings. Allow and for all attendances and material in completing this. See drawings for locations and routes of pipework.

The Mechanical Contractor shall allow for all works to the gas services installation as indicated on the drawings.

All existing gas services pipework is installed in gun barrel steel.



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The Mechanical Contractor shall allow for all works in connecting the new gas services pipework to the existing gas services pipework in the room as indicated on the drawings. This shall include and allow for the following works:

- Carrying out a survey of the existing gas supply in the existing rooms so that the routes, isolation valves, pipework, etc. are known prior to connecting into the existing gas services pipework in the rooms.
- Isolating the existing gas supply coming into the rooms.
- Purging the existing gas supply pipework installation in the existing building so that the Mechanical Contractor can connect and tap into the existing gas services pipework where required.
- Cutting into the existing gas services pipework and taking a new connection of this existing pipework as indicated on the drawings. New pipework shall be extended from this location to supply the necessary items in the rooms. Allow and for all attendances and material in completing this. See drawings for locations and routes of pipework.
- Once the new gas services pipework is pressure tested, turn on the existing gas supply to the room.
- Ensure that there are no leaks on the new or existing gas services pipework.

Internal gas pipework in the Science Rooms and Prep Room:

As indicated on the drawings, new gas pipework shall be installed throughout the Science Rooms and Prep Room as indicated on the drawings. Allow for the supply and installation of new internal gas pipework as indicated on the drawings. Sizes, routes and locations of all gas pipework are as indicated on the drawings.

No gas pipework shall be run through unvented voids. All pipework must be sleeved when passing through structural walls.

All internal gas pipework shall be carried in mild steel. All new internal gas pipework internally in the building shall be installed in black steel pipe Class B seamless medium gauge, Blue band to B.S. 1387 with all joints welded, steel butt welding to B.S. 1965 to match pipe.

Fitting material shall be steel butt welding B.S. 1965 to match pipe or steel welding to B.S. 10 table E. No joints are to be installed on the pipework and all pipework shall be welded throughout to be in accordance with I.S. 820:2019.

All new internal gas pipework installed in the building shall have all joints welded throughout its run. Jointing by means of threaded joints will only be tolerated where this is necessary for connection to items of plant. Where this is necessary the joint shall only be made using an approved jointing tape as PTFE as per BS 3212.



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The Mechanical Contractor shall supply and install pipework, brackets and supports as required for the gas installation as indicated on the drawings.

The gas pipework installation in the building shall comply fully with I.S. 820:2019 Non-Domestic Gas Installations.

Welding:

All new internal gas pipework installed in the rooms shall have all joints welded throughout its run.

All pipework welding shall be in accordance with the relevant BS specification or where BS does not apply shall be of the highest standard of workmanship and shall be subjected successfully to any test required by the Engineer.

All gas services pipework shall be welded in accordance with the requirements of BS 2640 and 2971, copies of which shall be retained on site during course of installation.

The Mechanical Contractor shall ensure that all operatives engaged on welding are familiar with the requirements of this BS Specification and are normally capable of welding to the standards therein laid down.

Bracketing and supports for gas pipework

All new gas pipework shall be adequately bracketed and supported. Pipework shall be run on suitable unistrut brackets that are either supported off the floor or the wall. Exceptional care shall be exercised when supporting and bracing the gas pipework. Supports shall be arranged to be as near as possible to changes in direction and joints.

The following are the bracket intervals for the steel gas pipework:

BORE (mm)	HORIZONTAL (m)	VERTICAL (m)
15	2.0	2.5
20	2.5	3.0
25	2.5	3.0
32	2.7	3.0
40	3.0	3.5
50	3.0	3.5
65	3.0	3.5
80	3.0	3.5
100	3.0	3.5
125	4.0	4.0



Painting of gas pipework:

All new internal gas pipework in the rooms shall be painted with two coats of yellow paint by the Mechanical Contractor.

The Mechanical Contractor shall allow to make good all surfaces before painting the gas pipework. The Contractor shall allow for the following to paint the gas pipework.

- Step 1: Thoroughly clean the pipework and prepare for painting.
- Step 2: Apply a good primer to the internal pipework.
- Step 3: Paint the internal gas pipework with two coats of Yellow Gas Paint (Ochre paint) to highlight that it is gas pipework.

Pressure testing of pipework:

General:

The Mechanical Contractor shall allow for carrying out a strength and soundness test on all the internal gas pipework installed. In the event of a failure of a test, the defect shall be repaired, defective part replaced, and the pipe replaced. After rectification works have been completed, the test shall be completed.

The test shall be carried out using air, nitrogen or another inert gas. Water shall not be used as a test fluid. Oxygen or distribution fuel gas shall also not be used

Test equipment:

The test equipment used for the test shall be capable of being read in graduations of at least 1% of the required test pressure.

- For pressures $\leq 100\text{mbar}$, a water gauge (manometer) with a millimetre scale should be used.
- For pressures $\leq 300\text{mbar}$, a mercury or High Specific Gravity manometer should be used.
- For pressures $\geq 300\text{mbar}$, a verified gauge should also be used

Test pressure:

The test pressure chosen for a strength and soundness test to be carried out on any pipework shall be a function of its intended maximum operating pressure (MOP) as indicated below.



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The applied test pressure shall not exceed the pressure that any component of the pipework is capable of withstanding. Test pressure and stabilisation periods for gas pipework shall be as follows:

Maximum operating pressure (MOP)	Test pressure (for NG)	Test pressure (for LPG)	Temperature stabilisation min
greater than 2 bar and less than or equal to 5 bar	$1,40 \times \text{MOP}$	$1,40 \times \text{MOP}$	15 ^a
greater than 100 mbar and less than or equal to 2 bar	$1,75 \times \text{MOP}$	$1,75 \times \text{MOP}$	10
greater than 40 mbar and less than or equal to 100 mbar	$2,5 \times \text{MOP}$	$2,5 \times \text{MOP}$ (minimum 150 mbar)	5
less than or equal to 40 mbar	100 mbar	150 mbar	5

^a For test pressures greater than 2 bar it is necessary to condition the pipework before the test commences to allow for the elastic qualities of PE (creep).

Maintain this pressure without pumping for at least 1 hour without any drop in pressure. Repeat test as directed until system is proven gas tight. Comply with all supplier's requirements.

Upon completion of pressure testing, each system shall be purged with its own gas. The entire installation shall comply with I.S. 820:2019 Non-Domestic Gas Installations.

Testing and commissioning:

Once the strength and soundness test has been successfully completed, the Mechanical Contractor shall provide a declaration commissioning cert of successful completion of the test.

This shall be completed by the person responsible for the test and shall include the following information:

- Date and time of test
- Description of 'Strength and Soundness Test'
- The diameter of pipework tested
- The duration of the test
- The pressure of the test
- Type and sensitivity of the gauge used
- Result of test
- Confirmation that the gas pipework installation is installed in compliance with I.S. 820:2019
- Name and signature of the competent person that completed the test.



54.03 Isolation valves

New gas isolation valves shall be installed on the new gas pipework as indicated on the drawings. New gas valves in new pipe work up to and including 50mm nom. bore shall be full bore ball type lever valves without transition couplings. Valves in pipe work over 50mm nom. bore shall be angle disc lugged butterfly type between steel flanges.

Certified gas lever valves shall be installed on all gas pipework. Valves shall be suitable for natural gas and LPG. Gas lever valves shall be EN331 approved valves. Valve shall have a lever handle, brass body with a nickle coated finish. The level shall be a plated steel lever with yellow plastic coating.

The isolation valve shall clearly indicated via permanent markings, stating its purpose and indicated its 'ON' and 'OFF' positions.



54.04 Existing gas pressure proving system for the Science Rooms and Prep room

There is existing gas pressure proving systems in place for the existing Science Rooms.

This existing gas pressure proving systems shall be decommissioned and removed.

The Contractor shall allow for decommissioning and removing the following items for the gas pressure proving system:

- The gas pressure proving panel.
- All associated detectors.
- The gas pressure proving valve.
- Any other items.



54.05 New gas pressure proving system for the Science Rooms and prep room

General:

The Contractor shall include for the supply and installation of a new gas pressure proving systems for the appliances in the Science Room and Prep Room as indicated on the drawings.

In total, there will be 3no gas pressure proving systems required as indicated on the drawings.

The new system shall have the following features:

- Gas pressure proving
- Gas detection
- CO2 detection

The gas pressure proving panel and associated gas pressure proving valve shall be located as indicated on the drawings. The gas pressure proving valve shall be installed on the gas line entering the Science Rooms at an accessible level. The gas pressure proving valve shall be visible at all times.

The gas pressure proving system shall be designed to provide a failsafe start control for the gas supply to the room by proving there are no leaks in the pipework or appliances open etc.

The gas pressure proving systems shall also be linked to a CO2 sensor in the rooms which shall monitor the CO2 levels in the rooms.

Specification:

The gas pressure proving systems is designed for use with low and high pressure isolation. Low voltage sensors for the detection of carbon monoxide shall be connected to the panel that will alarm and close the electric control valve in the event of dangerous carbon monoxide levels being detected.

Suitable combined gas pressure proving system shall be as 'Medem 'GPPS-Evo v4'' (or equivalent). The 'Medem GPPS-Evo v4'' (or equivalent) system is a gas pressure proving systems that ensures that there are no gas leaks in the pipework before the control valve is opened after a closer for any reason.



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The Contractor shall allow for the following with the combined gas detection system and gas pressure proving system:

- Control panel.
- Gas solenoid valve.
- All required carbon monoxide detectors.
- All other accessories as required.

The system shall comprise of the following:

- The system shall comprise a key operated control panel, a 230v gas solenoid valve (size to match size of pipe as indicated on drawings), carbon monoxide sensors that shall shut the solenoid valve on the detection of high carbon monoxide levels.
- The system shall also comprise an electronic pressure sender unit which measures the true differential gas pressure across the solenoid valve.
- The system shall check the gas pipe work and appliances for gas leaks. It also monitors for low pressure and over pressure without opening the solenoid valve, making it the only truly safe method of proving available.
- A secondary remote emergency gas knock-off button shall be located in the room and shall be wired back and connected to the control panel.
- The system shall provide a means of isolating the gas during an emergency or in the event of a failure of the ventilation system and shall have the following functions:
 - Gas pressure proving system.
 - Carbon monoxide detection.
 - LCD display to communicate status of the system.
 - Remote emergency knock-off button.
- Control panel to be wall mounted with integral emergency knock-off button, on/off switch and LED indication for power, gas on and alert.
- Control panel to have clear LCD display and be self-diagnosing, showing the current status of the system and offering clear solutions and advice to rectify an alert instead of traditional flashing LEDs.
- Panel to have potential free relay outputs for a BMS system and terminals to allow the connection of additional emergency stops.
- Panel to have terminals for the acceptance of a fire panel alarm signal in order to close the gas valve served by that panel during a fire alarm.
- The control panel housing is an ABS enclosure, rated IP65.
- The pressure sender unit and the gas solenoid valve to be supplied with a fixing kit for connection on site.
- The systems shall ensure that gas is not available unless all appliances are shut off.
- The system shall monitor CO2 levels in the room.
- The system shall be supplied with the following ancillaries:



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- Gas solenoid valve (line sized to suit).
 - Gas detectors (2no)
 - Carbon monoxide detector (2no)
 - Emergency knock-off buttons (2no)
- The gas solenoid valve shall be connected to and controlled off the control panel in the room.
 - The 230volt mains supply to the panel should be from a 3amp fused switch.
 - The solenoid valve is connected to the terminals marked "Valve" on the panel connections.
 - System shall have a 5-year warranty.

Main control panel:

The main control panel shall adhere to the following:

- Control panel to be wall mounted with integral emergency knock-off button, on/off removable key switch, LED indication for detectors status, mute LED button.
- Panel shall have an OLED display for displaying system status during both installation and normal use, also for displaying diagnostics.
- Panel to have potential free relay outputs for a BMS system and terminals to allow the connection of additional emergency stops.
- Panel to have terminals for the acceptance of a fire panel alarm signal in order to close the gas valve served by that panel during a fire alarm.
- The control panel housing is an ABS enclosure, rated IP65.





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Gas pressure proving valve:

The Contractor shall allow for the supply and installation of a 50mm gas pressure proving valve on the incoming gas supply pipework in the room.

Accessories:

The system shall be provide with the following accessories:

- 3no Main control panel as the 'Medem 'GPPS-Evo v4' panel.
- 3no Gas pressure proving valve (line sized to suit).
- 6no gas detectors (natural gas) which shall be located at high level on the ceiling (150mm below the ceiling)
- 6no CO2 detectors (natural gas) which shall be located at high level on the ceiling (150mm below the ceiling)
- 3no remote emergency knock-off button.

Remote emergency gas knock-off button:

Secondary remote emergency gas knock-off buttons shall be located in the rooms for the isolation of the gas supply to all gas appliances in the rooms in the event of an emergency.

This emergency knock-off buttons shall be wired back and connected to the main gas pressure proving control panel in each room. See drawings for quantities.

The buttons shall have a red mushroom head that shall be mounted on a yellow control box. Buttons as manufactured by EAO, Saia-Burgess or equivalent.

Commissioning:

The Contractor shall include for a Medem Engineer to attend site for as long as is necessary to commission the system and to familiarise the Client's representative with the operation of the panel.

The Contractor shall include for the testing and commissioning of the system by the equipment supplier.

A commissioning certificate shall be issued on completion with full instructions on the operation of the system.

Interface to the fire alarm system:

The new gas pressure proving system shall be connected and interfaced to the fire alarm system for the building.





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The appliances that gas pipework is to be connected to in the rooms are gas taps and fume cupboards.

55.0 SPACE COOLING SERVICES

See section 57.0 for further information.



56.0 SPACE HEATING SERVICES

56.01 Decommissioning of the existing space heating installation throughout the areas being refurbished

The Contractor shall allow for decommissioning and removal from site of all the existing space heating services installation throughout the Science Rooms and Prep Room (unless indicated otherwise).

The Contractor shall allow for decommissioning all existing heating services pipework, radiators, radiant panels, controls, etc. in the rooms. Refer to the drawings for further information.

56.02 New LPHW Pipework and fittings to be installed in the building

General:

New LPHW heating services pipework shall be installed throughout the Science Rooms and the Prep Room as indicated on the drawings.

New heating services pipework shall be extended from the existing heating services pipework entering the room to connect to the new radiators in the Science Rooms and Prep Room as indicated on the drawings.

New heating services pipework shall be provided to the radiators in the rooms by the Mechanical Contractor as indicated on the drawings.

Existing heating services pipework in the rooms:

New heating services pipework shall be extended from the existing heating services pipework that currently enters the room and this pipework shall be extended to connect to the new radiant panels in the Science Rooms and Prep Room as indicated on the drawings.

The Mechanical Contractor shall connect the new heating services pipework to the existing heating services pipework in the rooms as indicated on the drawings. Allow for all attendances and material in completing this. See drawings for locations and routes of pipework.

The Mechanical Contractor shall allow for all works to the heating services installation as indicated on the drawings.

All existing heating services pipework is installed in gun barrel steel.



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The Mechanical Contractor shall allow for all works in connecting the new heating services pipework to the existing heating services pipework in the rooms as indicated on the drawings. This shall include and allow for the following works:

- Carrying out a survey of the existing heating services pipework in the existing rooms so that the routes, isolation valves, pipework, etc. are known prior to connecting into the existing heating services pipework in the rooms.
- Isolating the existing heating services pipework coming into the rooms.
- Draining down the existing heating services pipework installation in the existing building so that the Mechanical Contractor can connect and tap into the existing heating services pipework where required.
- Cutting into the existing heating services pipework and taking a new connection of this existing pipework as indicated on the drawings. New pipework shall be extended from this location to supply the necessary radiators and radiant panels in the rooms. Allow for all attendances and material in completing this. See drawings for locations and routes of pipework.
- Allow for installing new insulation on any new heating services pipework where required.
- Once the new heating services pipework is pressure tested, turn on the existing heating services pipework to the room.
- Ensure that there are no visible leaks on the new or existing heating services pipework.

Existing LPHW heating services pipework in the building:

As indicated in 56.01, all the existing exposed LPHW flow and return heating services pipework and radiators/radiant panels throughout the rooms shall be completely decommissioned, removed and replaced with a new installation.

All existing space heating services pipework in the building is installed in mild steel tube piping.

New LPHW flow and new LPHW return pipework:

New LPHW (Low Pressure Hot Water) heating flow and return pipework shall be installed throughout the rooms to all the new radiators in the building as indicated on the drawings.

All new LPHW (Low Pressure Hot Water) flow and return heating services pipework to be installed throughout the rooms shall be installed in black mild steel tube piping.



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All new LPHW (Low Pressure Hot Water) heating flow and return pipework to be installed throughout the building shall be black steel pipe Class B seamless medium gauge, Blue band to BS EN 10255.

Refer to the drawings for location, routes and sizes.

All mild steel pipe and tube shall be dual certified to BS EN 10217-1:2002, fully traceable back to the manufacturer and shall be supplied with 3.1 mill test certification. All of our BS EN 10255:2004 steel pipe shall be compliant with the European Pressure Equipment Directive (PED) 2014/68/EU.

New LPHW flow and return pipework shall be supplied throughout the rooms to all the new heat emitters in the room. Pipework shall be as specified above.

All new LPHW flow and return heating services pipework shall be supplied, installed, tested and commissioned by the Contractor.

LPHW pipework installed above the ceiling:

All new mild steel LPHW flow and return pipework installed above the ceiling shall be jointed as highlighted below.

- Pipework in ceiling voids up to & including 50 mm ID: ***Threaded joints***
- Pipework 65 mm dia and above: ***Welded joints***

Steel butt welding to B.S. 1965 to match pipe. Specification of pipework as highlighted above.

LPHW pipework installed below the ceiling:

All new mild steel LPHW flow and return pipework installed below the ceiling shall be jointed as highlighted below.

- Pipework in ceiling voids up to & including 50 mm ID: ***Threaded joints***
- Pipework 65 mm dia and above: ***Welded joints***

Steel butt welding to B.S. 1965 to match pipe. Specification of pipework as highlighted above.

Welding:

All pipeline welding shall be in accordance with the relevant BS specification or where BS does not apply shall be of the highest standard of workmanship and shall be subjected successfully to any test required by the Engineer.



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All pipework shall be welded in accordance with the requirements of BS 2640 and 2971, copies of which shall be retained on site during course of installation. The Contractor shall ensure that all operatives engaged on welding are familiar with the requirements of this BS Specification and are normally capable of welding to the standards therein laid down.

Threading Fittings:

Where threaded fittings are specified they shall be in black malleable iron, banded type, individually tested to BS 143 and 1256: 1986 and screwed to BS 21: 1985. All bends used shall be of the long radius type, elbows will not be allowed.

Jointing of threaded fittings for water carrying pipework shall be by means of carefully stranded flax evenly covered in jointing compound and wound on to the male thread so as to bind around the thread during the screwing of the fitting. Care should be taken to clean off all loose strands of flax after the joint is completed.

Painting of LPHW Flow and LPHW Return Heating Services Pipework:

Insulation is only to be installed on heating services pipework installed in the ceiling void, in box-outs or exposed at high level in some rooms. All pipework that is to be insulated in the rooms is highlighted on the drawings.

All new LPHW (Low Pressure Hot Water) flow and return heating services heating distribution pipework that is to be insulated in the rooms shall be provided with one coat of red oxide paintwork prior to fitting insulation. Failure to provide this paintwork prior to insulation will result in the removal of insulation for painting.

The Mechanical Contractor shall allow to make good all surfaces before painting the heating services flow and heating services return pipework. The Mechanical Contractor shall allow for the following to paint the heating services pipework:

- Step 1: Thoroughly clean the pipework and prepare for painting.
- Step 2: Prior to installing the insulation, paint the heating services pipework with one coat of red oxide paint.

All tubing fittings and supports shall be coated with application of lacquer or rust-inhibiting priming paint. Pipe-work which penetrates fire walls or floors shall be painted with one coat of rust inhibiting priming paint before fire stopping is applied.

The Mechanical Contractor shall ensure that fire stopping will not proceed prior to the piping being treated.



Bracketing and supports

All new LPHW flow and return pipework in the rooms shall be adequately bracketed and supported.

Exposed pipework in rooms shall be supported on allowable iron or brass split pattern screw-to-wall school board type brackets, depending on the service. The Mechanical Contractor shall allow for lining up the brackets, fixing the brackets and drilling and plugging the walls. Brass screws to be used with brass brackets and screws to have a minimum length of 50mm. Plastic type wall plugs to suit the screw size shall be used.

Pipework run above suspended ceiling shall be fixed by adjustable hanger or brackets as BOSS Flamco or similar approved.

Pipework run below the ceiling at high level or at high level shall be run on suitable unistrut brackets that are either supported off the wall or off the ceiling.

Exceptional care shall be exercised when supporting and bracing pipework to ensure that no hammering or vibration takes place and that the complete system operates in a quiet manner even when valves are closed off quickly against full pressure.

Where pipework is installed, brackets shall be dimensioned and mounted so as to accommodate the insulation 15mm clear of the surface wall. Brackets shall allow for thermal expansion and ample clearance to be allowed when setting out brackets for large pipes. Supports shall be arranged to be as near as possible to changes in direction and joints.

Where pipework is exposed the Employers Representative approval shall be obtained as to the location and method of fixing of pipe supports before putting the work in hand, to ensure the required standard of neatness is achieved.

Where floor level pipes are likely to be subjected to abuse additional floor type brackets shall be used in locations to be decided by the Employers Representative. They shall comprise a split pipe ring, pipe nipple and backplate secured to the floor.

All adjacent pipework following the same route shall be bracketed at the intervals specified for the smallest pipe in the run.



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The following are the bracket intervals depending on the material of pipework:

BORE (mm)	HORIZONTAL (m)	VERTICAL (m)
15	1.5	1.8
20	1.5	2.1
25	1.8	3.0
32	1.8	3.0
40	2.4	3.0
50	2.4	3.5
65	2.7	4.0
80	3.0	4.0
100	3.0	4.6
125	3.7	5.5
150	4.5	5.5

Pipework sleeves

Pipe sleeves of appropriate diameter and of the same material as the pipe shall be fitted where pipes are installed through walls, duct covers, ceilings and floors. Sleeves shall be round out and free from burrs and project 5mm on either side of finished wall surfaces.

Adequate allowance shall be made for thermal expansion. Pipes passing through sleeves shall be positioned to allow for this movement. The sleeves shall be arranged to finish flush with the plaster or other wall finish and be of one length. The following table shall be used as a guide for the size of sleeves.

PIPE BORE (mm)	BORE OF SLEEVE (mm)
15	25
22	32
28	38
35	51
42	51
54	63

Automatic Air Vents

The Contractor shall allow for the supply and installation of automatic air vents at all high points on the new heating pipes at high level in the rooms as indicated on the drawings.

Fit automatic air-vents on the highest point of the flow and return pipework in the building as indicated on the drawings.



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The Contractor shall ensure that pipes are laid with the correct gradient to eliminate air locks and to allow for adequate venting. Automatic air-vent shall be as Honeywell Vent EA122, or equivalent.



The valve shall have the following features:

- Integral stop valve. Enables seat to be cleaned without draining the system
- Vacuum break ensures air collection
- 3/8" BSP connections
- Expanding disc under cap.
- 1/8" to 1/2" adaptor

Isolation Valves:

The Contractor shall allow for the supply and installation of isolation valves on the new flow and return LPHW pipework to allow isolation of the LPHW heating flow and LPHW heating return pipework in the rooms.

Valves shall be full-way pattern with gland surfacing boxes complete with iron hand wheels screwed or flanged as necessary with cast iron bodies, gunmetal wearing parts and bronze seatings.

Valves shall be as Crane D151 isolation valves for gate valves or Crane F611 for butterfly valves, or equivalent.



Commissioning Valves:

The Contractor shall allow for the supply and installation of fixed orifice double regulating valve commissioning sets on the new heating circuit pipework to the 2-port valve arrangement in the rooms.



The number and size of valves shall be as indicated on the drawings and where required for satisfactory commissioning, operation and maintenance.

The Contractor shall ensure that the valves are installed as indicated on the drawings. Valves shall not be mounted with the test plugs pointing in a downward direction; otherwise they may act as dirt pockets.

Measuring devices must provide flow measurement accuracy to within $\pm 5\%$ under the design service conditions and must be suitable for the application such that the differential pressure produced is consistent with achieving measurement accuracy.

Fixed orifice double regulating valves shall be as Crane D931/D933/D934 and shall adhere to the following:

- Fixed orifice performance.
- Hand wheel and pressure tapplings oriented for maximum convenience.
- Insertion test points for quick connection.
- PN25 pressure rating.
- Adaptor kit for use with copper tube.



56.03 Insulation on internal heating services pipework

General:

All new LPHW flow and return heating services pipework installed in ceiling voids, in box-outs, at high level exposed in some rooms, etc. shall be insulated. Refer to the drawings for details on what pipework is to be insulated in the building.

Any pipework that requires insulation shall be highlighted on the drawings.

All new LPHW flow and return heating services pipework shall be insulated as highlighted on the drawings.



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All new LPHW (Low Pressure Hot Water) heating services flow and return pipework to be installed throughout the rooms shall installed be black mild steel tube piping.

All new LPHW heating flow and LPHW heating return pipework to be insulated in the rooms and externally shall be insulated as follows:

- Pipes from 15mm to 20mm: *30mm thick insulation*
- Pipes from 25mm to 80mm: *40mm thick insulation*
- Pipes from 100mm to 300mm: *50mm thick insulation*

Generally, all insulation work shall be carried out by experienced established professional insulation contractors.

Generally, all insulation shall be accurately fitted and cut, accurately mitred, free from any damage or tears, fully bonded or otherwise secured and correctly terminated at flanges, pumps, heat exchanger, vessels or other plant items.

All unfitted insulation materials shall be stored on site in dry secure stores and all necessary measures shall be taken to ensure that no damage occurs to the insulation while unfitted in storage or fitted in situ prior to handover of the building.

The Contractor is responsible for ensuring that all insulation fitters are fully trained and for supervising the work of fitters.

Materials, adhesives, sealants and finishes shall be suitable in all respects for continuous use without degradation throughout the range of operating temperatures and within the environment indicated. They shall be designed to provide proof against rotting, mould, fungal growth and attack by vermin and degradation through UV radiation when used externally. All materials shall be non-hygroscopic.

All insulating materials and associated products shall be applied in accordance with manufacturers recommendations and instructions.

Work failing to comply with these will not be accepted by the Engineer.

Insulation:

The insulation to be installed on all the new LPHW (Low Pressure Hot Water) heating supply pipework and all new LPHW heating services return pipework installed in the rooms (where applicable) shall be Isover Climpipe, Rockwool Rocklap H&V, (or equivalent) foiled back mineral wool insulation, or equivalent.



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Supports shall be so arranged as to prevent the ingress of moisture to the insulation. The supports shall be insulated from the pipeline by lining the supports with insulation of sufficient density and thermal conductivity appropriate to the duty.

All insulation shall adhere to standards B.S. 5422:2009 and B.S. 5970:2012. The Contractor shall allow for the supply and installation of all insulation required on the new LPHW (Low Pressure Hot Water) heating supply pipework and all new LPHW heating services return pipework installed in the building as indicated on the drawings.

The insulation shall be of preformed sections of rigid mineral wool incorporating an aluminium foil laminate cover and fitted in accordance with the manufacturer's instructions.

Clearances shall be sufficient between each pipe/service to allow for the thickness of insulation as indicated in this Specification.

The insulation shall also be applied to all connections, bends, tees and valves.



Insulation shall adhere to the following specifications:

- Type:

Reinforced foiled back mineral wool insulation with a self-adhesive overlap to ensure a strong vapour barrier as Isover Climpipe, Rocklap H&V, or equivalent.

- Thickness:

As highlighted above.

- Thermal conductivity:

- 0.033 W/mk at mean temperature of 10°C.
- 0.036 W/mk at mean temperature of 50°C.
- 0.043 W/mk at mean temperature of 100°C.



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- Thermal performance:

To comply with B.S. 5422:2009.

- Fire performance:

To comply with Euroclass A2L, S1, d0 fire rating when classified with BS EN 13501-1 Class O compliance. The factory applied aluminium foil facing shall meet the highest standards required by BS476: Part 6 'Fire propagation' and B.S. 476: Part 7 'Surface spread of flame'.

- Service temperature:

The temperature on the aluminium facing should not exceed 80°C.

- Smoke and toxicity:

Shall achieve the criteria for smoke generation and toxicity as given in the IMO Resolution MSC 61 (67). (Smoke and Toxicity Test to Part 2, Annex 1 and 2 of the Fire Test Procedures Code)

- Certification:

CE Marked.
B.S. 5422:2009.
B.S. 476: Part 7
B.S. 5970:2012
CE 0402-CPD-SC0408-10.

Painting of Pipework prior to insulating:

All new LPHW (Low Pressure Hot Water) flow and return heating services heating distribution pipework that is to be insulated in the rooms shall be provided with one coat of red oxide paintwork prior to fitting insulation. Failure to provide this paintwork prior to insulation will result in the removal of insulation for painting.

The Contractor shall allow to make good all surfaces before painting the heating services flow and heating services return pipework. The Contractor shall allow for the following to paint the heating services pipework:

- Step 1: Thoroughly clean the pipework and prepare for painting.
- Step 2: Prior to installing the insulation, paint the heating services pipework with one coat of red oxide paint.



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All tubing fittings and supports shall be coated with application of lacquer or rust-inhibiting priming paint. Pipe-work which penetrates fire walls or floors shall be painted with one coat of rust inhibiting priming paint before fire stopping is applied. The Contractor shall ensure that fire stopping will not proceed prior to the piping being treated.

56.04 Radiators

Existing radiators in the rooms:

All the existing radiators throughout the rooms shall be decommissioned and removed. New radiators shall be installed throughout the rooms as indicated on the drawings.

New LPHW radiators in Science Rooms and Prep Room:

New steel panel radiators shall be supplied and installed by the contractor in the rooms as indicated on the drawings.

Supply, install and fit LPHW radiators as specified in the schedule as indicated on the drawings and highlighted below.

RADIATOR & RADIANT PANEL SCHEDULE FOR THE EXISTING SCHOOL BUILDING										
Reference		Qty	Location	Design Output (Watts)	Output Per Rad (Watts)	Casing Length (mm)	Casing Height (mm)	Casing Width (mm)	Low Water Content Radiator Type	How heating of rads are controlled
R-01 - R-03	3	3no	Science Room 1	7071	2658	1650	500	170	Merriott Optima - WTG150T	Two-port valve
R-04 - R-06	3	3no	Science Room 2	7004	2658	1650	500	170	Merriott Optima - WTG150T	Two-port valve
R-07	1	1no	Prep Room	1525	1539	1050	500	170	Merriott Optima - WTG150T	N/A

The Contractor shall measure up on site and confirm to the Employer's Representative that the LPHW radiant panels scheduled are suitable in all respects for the locations indicated.

Final locations of all LPHW radiant panel to be agreed on site. Radiant panels shall not be ordered until all locations and sizes have been agreed with the Employers Representative on site.

Site visit by the Contractors LPHW radiator supplier:

The Contractor shall allow for a site visit by the LPHW radiator supplier to the building to measure up on site to ensure that all necessary items have been included for the successful supply and installation of the radiant panels.

The Contractors supplier shall measure up on site and confirm to the Employer's Representative that the radiators scheduled are suitable in all respects for the locations indicated.



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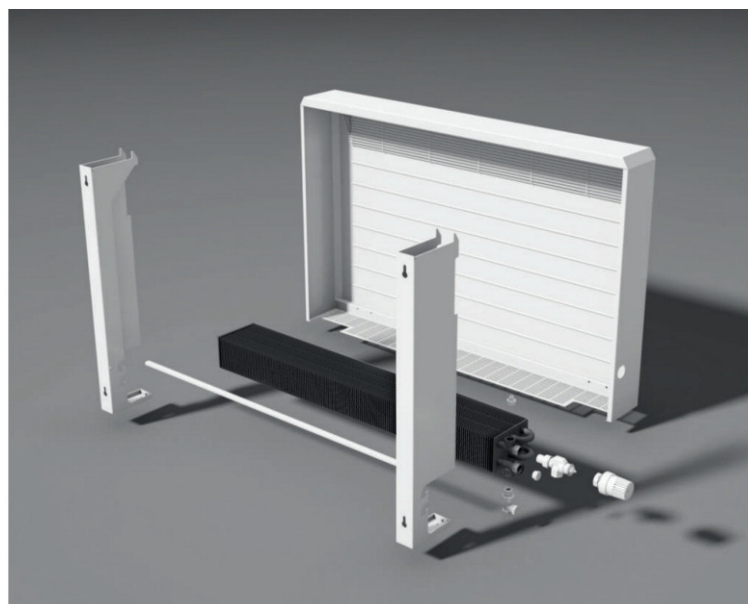
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Radiators shall not be order until the Contractors supplier has visited the site to measure up and until the Contractors supplier confirms that that there are no issues in installing the specified panels.

Radiator Specification:

All new radiators shall be Low-H2O technology (low-water content) radiators. New radiators shall adhere to the following:





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General:

In general the radiators shall be as follows:

- Radiator shall be low surface temperature (Low-H2O technology)
- Outputs of radiators tested and manufactured in accordance with BS EN442 independently by BSRIA.
- Conforms to NHS DN4 which confirms to an average of 43°C.
- Radiators shall be as manufactured by Merriott (or equivalent).
- Surface temperatures independently tested by BSRIA.

Casing:

The casing shall adhere to the following:

- Scratch resistant epoxy polyester powder coat finish in satin white to RAL9016.
- High UV resistance to ASTM G53.
- Anti-bacterial coating standard on brackets and casing.
- Unit to come with rounder corners to avoid injury.
- Low surface temperature NHS DN4 compliant at 50 ΔT, maximum flow temperature 80°C. Surface temperatures independently tested by BSRIA.
- Strong single piece profiled casing in 1.6mm steel with 3mm deep rib detail.
- Easy wipe clean, soft bevelled design to prevent accidental injury.
- No joints in the casing to gather dirt, dust and potential bacteria .



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- Pencil proof bar grilles maximum aperture 7.1mm
- Integral bottom grille on wall mounted casings to prevent emitter access.
- Security screw locking system to prevent unauthorised access.
- CE marked to BS EN442 and manufactured under a BS EN ISO 9001: 2008 quality system accepted by BSI.
- Ten year warranty.

The Low-H2O emitter specification:

The emitter shall adhere to the following:

- Low H2O, high output fin coil heat exchanger.
- Low water content from 0.75 litres per metre.
- Non-corrosive 0.2mm aluminium fins & 15mm diameter copper tubes.
- Corrugated aluminium fins to maximise convective surface area.
- Single pipe reverse flow heat exchanger, continuous mass flow for optimum output efficiency.
- Same end connections, reversible heat exchanger can be connected left or right with standard valve, TRV or remote sensor.
- Dual quick-fit bracket system for emitter & casing, supplied with bracket spacing bar.
- Standard connections of 4 x 1/2" with 1/2" blank plug and vent.
- Dirt and dust repellent epoxy polyester powder coat finish in matt graphite grey to RAL7024.
- Working pressure 10 bar, test pressure 13 bar
- Maximum operating temperature 120 °C.
- Thirty year warranty.
- Outputs tested in accordance with BS EN442 independently by BSRIA.

56.05 Radiator valves

The Contractor shall allow for all necessary radiator control valves for all radiators. Control valves for radiators shall be of the easy clean pattern chromium plated with grey grip moulded hand wheels on the flow and lock shield chromium plated valves on the return.

Radiator lockshield valves shall be as Herz type 3723/3724 or equal and approved.

56.06 Thermostatic radiator valves (TRV's)

The Contractor shall allow for the supply and fitting of all thermostatic radiator control valves (TRV's) on the radiators in the Prep Room as indicated on the



drawings. In total, the Contractor shall allow for the supply and installation of 2no TRV valve on radiators (RD-09 and RD-10) as indicated on the drawings.

The Contractor shall allow for supplying and installing the TRV in conjunction with the new radiator. See drawing for quantities and locations.

TRV's shall conform to the following:

- Conforms to BS EN215-1.
- Maximum operating pressure 10 Bar.
- Maximum water temperature 120°C.
- Maximum differential pressure 0.6 Bar.
- Differential Pressure Influence: 0.5K.
- Water Temperature Influence: 0.5K.
- Response Time: 26 minutes.
- Liquid Filled Sensing Element.
- Supplied in Chrome finish.
- Hysteresis at nominal flow rate: 0.5K.
- Frost setting 8°C.
- Two way flow engineering
- Sizes shall be as final size of pipework to radiators.

TRVs shall be Herz TS 90 with Herz Thermostatic Head or equal and approved.

56.07 Two-port valve & associated thermostat for radiators in the Science Rooms

General:

As indicated on the drawings, the new radiators in the Science Rooms shall be provided with individual room temperature control by means of two-port motorised valve that is fed from a digital room temperature stat. Quantities as indicated on the drawings.

Digital Room Stat:

All rooms stats as indicated that are to be installed in conjunction with the two-port valve to control the heating within the specified rooms shall be digital stats as specified and indicated below. See drawing for quantities and locations.

These digital room stats shall provide the following functions

1. Clearly display the room temperature.
2. Clearly display the room set point temperature.
3. Allow the user to easily adjust the set point temperature.
4. Operate on a 230V mains power supply (battery stats are not acceptable)



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5. Provide a 230V power control to a two-port motorized valve.
6. If alternative makes are proposed, they must run on mains power and be as robust as the above. If an alternative is proposed, provide a sample.

The stats shall adhere to the following specifications:

- Temperature range: 5°C - 35°C
- Mounting type: Surface
- Digital display: Yes
- Keypad lock: Yes
- Backlight: White
- Built-in sensor: Yes (NTC 100K)
- Accuracy: +/- 1.0°C
- Electrical supply: 230VAC
- Electrical rating: 3amp
- Contacts: Volt free
- Power consumption: 1.1watt
- IP rating: IP20
- Dimensions (approx.): 91mm high x 91mm wide x 26mm deep.
- Guarantee: 2years



The Contractor shall hand over all necessary items to the Electrician for wiring complete with any wiring diagrams or instructions as supplied by the specialist supplier.

Wall mounted digital/electronic room thermostats shall be as EPH CDT2, or equivalent. The Contractor shall include for the supply and fitting of these valves and thermostats.

Two-port Valves:

Two-port valves shall be installed on the pipework for the radiators in the Science Rooms to control the heating within the room. See drawing for quantities, locations and piping arrangements.

Two-port valves shall have the following specifications:

- Motor Supply Voltage: 230 V AC
- Frequency: 50 Hz



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- Power Consumption: 6 W
- Motor Insulation Rating: Class 'F'
- Maximum Working Pressure: 10 Bar
- Maximum Water Temperature: 95° C
- Maximum Ambient Temperature: 52° C
- KV value: 7.3
- Switch Rating: 3(0.5) A
- High Temperature Silicon Cable: 1100mm
- Actuator head: Yes. Supplied with valve.
- Valve Body: Brass with spring loaded
Mica filled PTFE shoes
- Actuator: Power to Open
Spring to Close
- Approvals: Valve to be VDE approved, ISO
9002 compliant.

Two-port valves shall be as Myson, Honeywell, EPH, (or equivalent). Valve shall be 15mm/22mm Zone Valve and shall be supplied with and actuator head.

The Contractor shall include for the supply and fitting of these valves as indicated on the drawings.



56.08 Flush out and pressure test

Flush out of new pipework:

Upon completion of the LPHW flow and return pipework installation in the rooms but before fitting any radiant panels; all pipework shall be thoroughly flushed out with clean water until water flows clear from the system. Once that is completed, all new pipework shall then be pressure tested as highlighted below.

Pressure testing of new pipework:

Before any radiant panels are installed, the Contractor shall hydraulic pressure test all new flow and return LPHW pipework in the rooms to 7 bar and shall remain drop tight for a period of at least 12 hours.



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If pressure has dropped at all from noted mark, the installation cannot be regarded as sound and shall not be commissioned until the escape is repaired and the installation re-tested. If pressure remains stable, then installation can be deemed sound.

Comply with procedures given in the HVCA Guide to Good Practice for Site Pressure Testing of Pipework. Ensure safety precautions detailed in HSE Guidance Note GS4 Safety in Pressure Testing are adopted.

Advise appropriate personnel, in advance, of the time pressure tests may be witnessed. Keep record of pressure tests and issue them to the Employer's Representative, and include them within the handover documentation.

Test certificates for the testing of all pipework shall be provided by the Contractor for the testing of the pipework.



57.0 AIR-CONDITIONING AND VENTILATION WORKS

57.01 Decommissioning of existing ventilation installation in the building

The Contractor shall allow for decommissioning and removal from site of all the existing ventilation services installation throughout the room (unless indicated otherwise).

57.02 Galvanised sheet metal ductwork

All new ventilation ductwork to be installed throughout the building shall be of the best quality galvanized sheet steel fabricated in accordance with good practice in a neat and workmanlike manner, true to size and internally free from sharp edges and obstructions.

It shall comply with the provisions of DW/ 144 - Specification for Sheet Metal Ductwork - published by the HVCA in 1982, and when erected be free from vibration and damping, rigid and truly air tight under operating conditions.

Standards:

- | | |
|---|---|
| a) Pressure Classification: | Class B medium pressure |
| b) Leakage Classification: | Class B medium pressure |
| c) Positive and Negative Pressures: | 1,000Pa Positive. 500Pa Negative. |
| d) Materials: | Galvanised ductwork shall be made from continuously hot-dipped zinc coated wide strip sheet/plate and slit wide strip to BS.EN10142. GradeDX51D+Z, coating type Z275. The material shall be suitable for profiling and bending. |
| e) Negative Pressure Classification: | Class B medium pressure. |

Special Requirements:

Air Leakage Testing:

All low pressure supply and extract ductwork is to be leakage tested in accordance with DW/143 and the leakage limits in table B16.15 of the CIBSE Guide and DW/144.

Air leakage limits shall be $0.009 \times p^{0.65}$ litres / m² of duct surface area.



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Protective Finishes:

Where galvanised ductwork is located outdoors and un-insulated, or where the galvanising is broken during the manufacturing process and installation, it shall be treated in accordance with Clause 2.20 of Section 2. All steel ductwork supporting members and flanges shall also be protected in accordance with Clause 2.20.

Outdoor ductwork must be protected, whether insulation or any other covering is applied or not, with two coats of chlorinated rubber paint. The surface must be properly de-greased and prepared for the paint. Colour of paint to be selected.

Installation of ductwork in the ceiling void

In order to install the new ductwork, the Mechanical Contractor shall allow for all brackets and bracing for the ductwork. The Mechanical Contractor shall allow for hanging the containment for the ductwork from the thrushes at high level in the ceiling void and installing suitable supports in order for the unistrut to be installed from the thrushes in the ceiling void.

In order to install the ductwork at high level in the ceiling void, the Mechanical Contractor shall allow for the following:

- Dropping 10mm threaded rod from the thrushes at 500mm distances over the length of the ductwork run. Allow for a drop of approximately 600mm.
- The threaded rod shall be hung from the thrushes in the ceiling void via 10mm G-Clamps or supports shall be drilled into the ceiling for supports.
- The base supports for the ductwork shall be single channel unistrut. Supports shall be placed at 500mm distances over the length of the ductwork run. Allow for a drop of approximately 600mm.
- Allow for connecting the threaded rods to the single-channel unistrut.

57.03 New ductwork to and from the new heat recovery units

General:

As indicated on the drawings and specified in 57.04 below, the Contractor shall allow for the supply and installation of 2no new semi recessed heat recovery units in the Science rooms for the supply of fresh air to some rooms and also for the extract of stale air from those rooms.

The new heat recovery units and all associated ductwork from and to the heat recovery unit shall be installed by the Mechanical Contractor as indicated on the drawings.



The Mechanical Contractor shall allow for all ductwork to and from the new semi recessed heat recovery units as indicated on drawings. As indicated on the drawings, the following ductwork shall be supplied to and from each new heat recovery unit:

- Fresh air supply ductwork to the exposed heat recovery unit from the outside.
- Stale air return ductwork from the exposed heat recovery unit to the outside.

All ductwork to and from the new heat recovery unit as highlighted above shall be installed in galvanised steel ductwork. See below for specification on galvanised steel ductwork. See section 57.01 above for specification below on ductwork required for heat recovery units.

Routes and sizes of all ductwork are as indicated on the drawings.

All new ductwork from the new semi recessed heat recovery units shall be installed in circular ductwork. Allow for all necessary connections in order to connect the ductwork from the semi recessed heat recovery units to the relevant internal grilles as indicated on the drawings.

The Contractor shall also allow for the complete supply, installation, testing and commissioning of the ductwork to and from the heat recovery units as indicated on the drawings.

All new ductwork to and from the semi recessed heat recovery units shall be insulated where boxed out as described below. Refer to 57.04 for further information on insulation.

Allow for all necessary works and materials in connecting the necessary ductwork to all the relevant supply grilles in the ceiling, roof termination cowls on the roof and external louvres in the external walls as indicated on the drawings.

Allow for all necessary, materials, ductwork, ductwork drops, bracing, etc. for installing the ductwork to and from the semi recessed heat recovery units. Allow for all necessary, materials, ductwork, ductwork drops, bracing, etc. for installing all new ductwork to and from the semi recessed heat recovery units as indicated on the drawings.

The Contractor shall liaise with all other trades on site during installation and also for briefing staff on the correct operation of all aspects of the installation.



Insulation on ductwork:

All the new ductwork to and from the semi recessed heat recovery units shall be thoroughly insulated where boxed out over the length of their run as described in 57.02.

Galvanised steel ductwork:

All new ventilation ductwork installed throughout each of the Science rooms shall be of the best quality galvanized steel sheet fabricated in accordance with good practice in a neat and workmanlike manner, true to size and internally free from sharp edges and obstructions. See section 57.01 above for specification below on ductwork required for semi recessed heat recovery units.

57.04 Insulation to be installed on new ductwork

The Mechanical Contractor shall allow for insulating all the ductwork to and from each semi recessed heat recovery units in the relevant rooms as specified below and as highlighted on the drawings:

- All new fresh air supply ductwork to each semi recessed heat recovery unit from the outside.
- All new stale air return ductwork from each semi recessed heat recovery unit to the outside.

Contractor shall include for 8 meters of insulation for each of the semi recessed heat recovery units in their tender as part of the works.

All new ductwork as highlighted above shall be insulated using ISOVER (or equivalent) foiled back mineral wool compressed insulation or equivalent. All insulation shall be 50mm uncompressed insulation.

The insulation shall be of preformed sections of rigid mineral wool incorporating an aluminium foil laminate cover and fitted in accordance with the manufacturer's instructions. The insulation shall also be applied to all connections, bends, tees and valves. Insulation shall be applied by experienced pipe and duct coverers, as per best trade practice and manufacturer's printed installation directions. Insulation shall not be applied before surfaces are cleaned and systems tested. All insulation and finishes shall be class 'O' fire rated.

The entire installation shall be strictly in accordance with BS 5422: 2009, BS 5970, IS EN 13166:2012, BS 3958, B.S. 476 & BS 5608 as appropriate and manufacturer's recommended procedures. Thermal insulation of buried services must comply with BS 4508.



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The Contractor shall include for the supply and installation of insulation to all new ductwork to and from the semi recessed new heat recovery units as indicated on the drawings. All ductwork shall be thermally insulated and incorporate a vapour barrier.

The insulation shall be pinned and bonded to the ductwork whether in rigid sheets or flexible rolls. All insulation shall have an aluminium foil laminate on the outside. All joints and penetrations of the vapour barrier shall be carefully sealed with sealant and finished in an approved adhesive tape.

The finished insulation on the ductwork shall have a fine galvanised wire mesh fitted over the entire ductwork for additional support and to prevent it from falling away due to self- weight. Joints in the wire mesh shall be on the top of the ductwork.

Insulation shall be 50mm thick on internal ductwork and have a thermal conductivity of 0.038W/MK at a mean temperature of 10° C. The Contractor shall employ the services of a specialist firm to carry out all ductwork thermal insulation.

Generally, all insulation work shall be carried out by experienced established professional insulation contractors.

Generally, all insulation shall be accurately fitted and cut, accurately mitred, free from any damage or tears, fully bonded or otherwise secured and correctly terminated.

All unfitted insulation materials shall be stored on site in dry secure stores and all necessary measures shall be taken to ensure that no damage occurs to the insulation while unfitted in storage or fitted in situ prior to handover of the building.

The Contractor is responsible for ensuring that all insulation fitters are fully trained and for supervising the work of fitters.

Materials, adhesives, sealants and finishes shall be suitable in all respects for continuous use without degradation throughout the range of operating temperatures and within the environment indicated.

They shall be designed to provide proof against rotting, mould, fungal growth and attack by vermin and degradation through UV radiation when used externally. All materials shall be non-hygroscopic.

All insulating materials and associated products shall be applied in accordance with manufacturers recommendations and instructions. Work failing to comply with these will not be accepted by the Engineer.



Supports shall be so arranged as to prevent the ingress of moisture to the insulation. The supports shall be insulated from the ductwork by lining the supports with insulation of sufficient density and thermal conductivity appropriate to the duty.

57.05 Flexible ducting

Flexible ducting shall be used to connect the circular ductwork to each grille, fan and any other ventilation unit.

Flexible ducting shall be of the acoustic type, SONADEC 25 AA3 (or equivalent) as supplied by 'Ventac'. Lengths of flexible ducting to grilles shall not exceed 1000mm.

57.06 New semi recessed heat recovery units

General:

The Mechanical Contractor shall allow for the supply and installation of new semi recessed Heat Recovery Units (HRU) and associated ductwork to and from the HRU in each of the following rooms as indicated on the drawings.

In total there shall be 2no semi recessed heat recovery units c/w associated ducting, controls, etc. installed in the Science rooms.

Each new HRU shall be installed at high level in the room shall be semi recessed in each space in the Science rooms. All new ductwork to and from each heat recovery unit shall also be installed in the ceiling void and shall be hidden from view within a box out where possible as a result. Refer to section 57.02 for further information on the ductwork installation to and from each new semi recessed heat recovery unit.

The Mechanical Contractor shall allow for the supply, installation, testing and commissioning of the 2no new semi recessed heat recovery units in the rooms as indicated on the drawings. This includes the heat recovery unit (HRU), associated controls, associated works, ductwork, etc. Refer to the drawings for locations.

The new semi recessed heat recovery units and all accessories shall be supplied, installed and commissioned by the Mechanical Contractor as part of this contract.



Bracing and supports for the heat recovery units:

The new HRU's shall be semi recessed from the ceiling in each room as indicated on the drawings and the Mechanical Contractor shall allow for the supply and installation of all necessary supports for the installation of each semi recessed heat recovery units at high level in the room.

Each new semi recessed heat recovery unit shall be installed at high level in the room and the Mechanical Contractor shall liaise with the Main Contractor on the installation of each of the new semi recessed heat recovery units.

The Mechanical Contractor shall allow for all attendances in supplying and installing each of the 2no heat recovery units.

Specification of the new heat recovery unit:

The Contractor shall allow for the supply, installation and testing of the following heat recovery unit in each of the rooms as indicated on the drawings.

Please note that there are 2no HRU's to be supplied and installed in the Science rooms. The specification of each unit shall be as follows:

Quantity:

- Number of units: 2no
- Reference: HRU-01 and HRU-02.

Make and construction of the unit:

- Model: Sanus '900' School Ventilation, or equivalent.
- Airflow range: 100-1100m³/h
- Dimensions: 1985mm x 900mm x 510mm
- Ducting diameter: 315mm
- Motor fan power: 4 x 169
- IP motor: IP54/B
- Voltage: 230/1/50
- Protection Intensity: 5.3

Accessories to be supplied for each unit:

- Controller: Allow for the supply of a TAC 5 remote controller as CID37 2096 with each unit. The controller shall be installed in the room as indicated.
- CO2 sensor: Allow for the supply of a CO2 sensor with



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the unit. The wiring for this unit shall be discussed with the Electrical Contractor on site.

- Control Module: Allow for the supply and installation of IQnomic Plus Module as part of the unit.
- Connectivity: Allow for the ability for connection to the BMS controls panel

Hanging and supports for the semi recessed heat recovery unit:

The Contractor shall allow for the supply and installation of the necessary ductwork for the semi recessed heat recovery units in the Science rooms. All ductwork shall be installed on suitably sized galvanised steel tray.

Allow for all necessary, materials, pipework, containment, cable tray, bracing, etc. for installing the pipework.

In order to hang the pipework, the Contractor shall allow for the following:

- Dropping 10mm threaded rod at 500mm distances over the length of the containment run. Allow for a drop of approximately 600mm.
- The base supports for the unistrut shall be 41mm double channel unistrut. Supports shall be placed at 500mm distances over the length of the containment run. Allow for a drop of approximately 500mm.
- Allow for connecting the threaded rods to the double-channel unistrut.

Interconnecting to the gas pressure proving system in the Science room:

The semi recessed heat recovery unit shall be linked to the gas pressure proving system in each Science room. This is to ensure that the heat recovery unit will ramp up to maximum capacity for a period of time to purge the gas system in each science room.

Image of the proposed semi recessed heat recovery unit:





57.07 Internal grilles

Supply and install all internal grilles, diffusers and disc valves as indicated on the drawings.

Passive grilles:

The Mechanical Contractor shall allow for the supply and installation of the following internal extract air grilles:

EXTRACT GRILLES (TYPE 'PG')					
Ref No.	Qty	Type	Volume (m ³ /s)	Neck Size (mm)	Overall Size (mm)
PG.01	no	Disc valve as KSU 100 exhaust valve	-	100mm diameter	130mm diameter
Notes: ○ Grilles shall have RAL 9010 colour finish. ○ Samples of all grille / diffuser types to be provided on request ○ All grilles shall be manufactured from sheet metal with a stove enamelled white finish. 					

57.08 External louvres

A passive supply of air shall be provided to the Prep Room as indicated on the drawings via louvres in the wall at low level.

The Mechanical Contractor shall allow for the supply and installation of the following external louvres:

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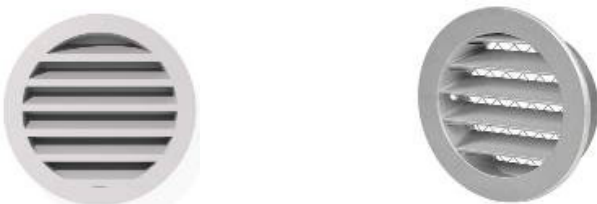


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EXTERNAL EXTRACT AND SUPPLY LOURVES (TYPES 'PG' AND 'EPG')					
Ref No.	Qty	Type	Ductwork connection to louvre (mm)	Size of neck connection on grill (mm)	Overall size of grill (mm)
EPG.01	1no	CL-100 from the Series CL circular cast external louveres	100mm diameter	125mm diameter	145mm diameter
Notes: ○ Louvres shall have a metal aluminium finish. ○ Louvres shall have a stainless steel bird mesh. ○ Include for plenum on back of louvere for ductwork connection. ○ Suitable for external use. ○ Samples of all grille / diffuser types to be provided on request ○ All louveres shall be spray painted to a RAL colour to match the external cladding on the building. The grilles shall be finished with a polyester powder coating to RAL colour to match the external cladding on the building. Therefore, the Contractor shall allow for the powder coating of the grilles to the selected RAL colour which is to be approved by the architect/client. Include for spray painting the grilles. ○ Samples of all grille / diffuser types to be provided on request 					

57.09 Roof termination cowls

The Mechanical Contractor shall allow for the supply and installation of some roof mounted termination cowls on the slanted roof for some ductwork.

The Mechanical Contractor shall allow for the supply and installation of these roof termination cowls.

In total there are 2no roof termination cowls to be supplied and installed on the roof which shall be as follows:

- 2no Roof termination cowls for ductwork with a diameter of 315mm



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The roof termination cowls shall adhere to the following specifications for the 315mm ductwork (2no in total):

- Cowl shall be as 'Roof Termination Set 315mm - (Ref number 10555315)' as supplied by Vent Axia, or equivalent.
- Shall be suitable for a 315mm diameter duct connection.
- Standard low profile horizontal discharge.
- Samples of all cowls to be provided prior to installation.
- Dimensions of cowl is 171mm high by 500mm wide by 337mm long.
- Roof termination set shall consist of the following:
 - Direct mount spigot
 - Adaptor kit
 - Roof cowl
 - Deflector and all screws

See image below of the proposed roof termination cowl.





57.10 Chemical resistant ductwork from the fume cupboard

General:

A new fume cupboard shall be installed in the Science Room as indicated on the drawings. The fume cupboard shall be supplied and installed by others but the Mechanical Contractor shall allow for the supply and installation of the chemical resistant polypropylene ductwork and associated extract fan from the fume cupboard as indicated on the drawings.

The Mechanical Contractor shall allow for the supply, installation, testing and commissioning of the complete extract ventilation system for the fume cupboard in the Science Room as indicated on the drawings. The extract system for the fume cupboard shall comprise of chemical resistant polypropylene ductwork from the fume cupboard and an in-line extract fan to be fitted on the ductwork above the roof as indicated on the drawings.

Ductwork:



The extract ductwork from the fume cupboard shall be installed in chemical resistant polypropylene ductwork as indicated on the drawings. Routes and sizes as indicated on the drawings.

The ductwork shall adhere to the following:

- Polypropylene
- Shall be fabricated of PVC Type I, Grade I (dark grey) and/or PVC Type II, Grade I (light grey) material.
- Chemical resistance (especially to solvents and alcohols),
- High resistance to corrosion, hot water and water vapour
- Operating temperature from 0 to 80°C.
- Thermoplastic chemical and corrosion resistant.
- Plastic ductwork shall comply with DIN Standards required for DW154.
- All plastic ductwork shall be joined via solvent cement welding.



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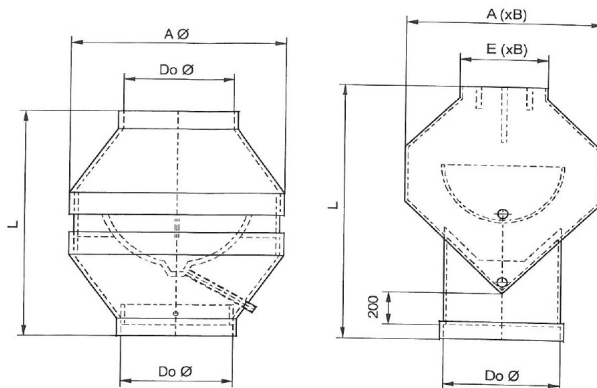
Allow for the necessary materials, ductwork, labour, bends and works required for the installation of the ductwork.

In total the Contractor shall allow for the following for the installation of the ductwork:

- 15metres of 250mm diameter chemical resistant polypropylene ductwork as specified above.
- 4no 250mm diameter 90° bends in chemical resistant polypropylene ductwork.
- 2no 250mm diameter 45° bends in chemical resistant polypropylene ductwork.
- 1no 250mm diameter condensate deflector for installation on the external ductwork. See below for further information.
- 1no manual duct damper on the ductwork from the fume cupboard.
- All necessary stay wires for the installation on the roof.
- Allow for the necessary materials, ductwork, labour, bends and works required for the installation of the ductwork.

Condensate deflector:

The Contractor shall allow for the supply and installation of a condensate deflector on the top of the external ductwork. The condensate deflector shall be a 250mm diameter and shall be manufactured from chemical resistant polypropylene.



Installation:

The chemical resistant polypropylene ductwork shall rise from the fume cupboard to enter the ceiling void of the Science Room. From there it shall rise vertically to exit through the roof.

The chemical resistant extract ductwork from the fume cupboard shall exit the building vertically through the roof as indicated on the drawings. Routes and sizes as indicated on the drawings.



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Once the extract ductwork from fume cupboard exits the roof, it shall extend a further 3000mm above this point. As a result, the ductwork will need to be braced to the roof via stay-wires. Grounds shall be required in the roof in order to connect the stay wired to. The Mechanical Contractor shall liaise with the Main Contractor on the installation of these grounds for the stay wires.

The Mechanical Contractor shall allow for the bracing of the ductwork internally and also bracing of the ductwork externally. Allow for all unistrut, brackets, stay-wires, etc. in installing the ductwork.

The Mechanical Contractor shall liaise with all other trades on site during installation and also for briefing staff on the correct operation of all aspects of the installation.





57.11 Extract fan for the fume cupboard

General:

An extract fan for the fume cupboard shall be required to vent fumes from the fume cupboard when in operation. This fan shall be supplied and installed by the Mechanical Contractor under the provision of this contract.

The Mechanical Contractor shall allow for all necessary accessories and connections. Supply & fit the extract fan for the cupboard as indicated in the drawings.

The Mechanical Contractor shall liaise with the Electrical Contractor for extract fan power supply locations and wiring details.

The extract fan for the fume cupboard shall be located on the roof above the prep room. The extract fan shall be controlled from the fume cupboard so allow for all control wiring and power wiring to the fan. Also allow for the supply and installation of the control wiring between the fume cupboard and the extract fan for the fume cupboard.

Extract fans for fume cupboard:

The Mechanical Contractor shall allow for the supply and installation of the following extract fan for the fume cupboard:

Ref No.	Location	Type	Duty	CAT No.	Control
EF.10	On the roof above the Science room	Inline Centrifugal fan	792m ³ /hr @ 300Pa	CSC 250 @300Pa, speed 1000 rpm	Shall be linked and controlled from the controller in the fume cupboard

The new fume cupboard is to be supplied by others but the Mechanical Contractor shall allow for the extract fan and ductwork from the fume cupboard.

The extract fan shall be installed on the new 250mm diameter plastic polypropylene ducting for the new fume cupboard. The fan shall be located on the roof above the Prep Room.

Allow for the necessary supports and unistrut for mounting the fan and ductwork in the ceiling void.



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The fan and shall have the following specifications:

Fan casing materials:

- Polypropylene
- Fire Retardant Polypropylene
- uPVC
- uPVC/GRP

Impeller materials

- Polypropylene

Motor Plate Support:

- Polypropylene
- uPVC

Fixings

- A2 stainless steel minimum

Performance data

- In accordance with BS EN ISO 5801
- Category D test. Ducted inlet, ducted outlet
- Max Sound Output @ Full Speed 57dB(A) @ 1m (Ducted)
- Warranty 2 year
- Fan shall be connected to the air flow sensor on the fume cupboard. Allow for liaising with the Electrical Contractor and the Fume Cupboard supplier to ensure that all works are completed in linking the extract fan to the fume cupboard.

Control of fan:

The extract fan shall be interlinked and connected to the controller on the fume cupboard which shall control the fan. This controller is integral to the fume cupboard and the fume cupboard shall be provided by others.

Commissioning and certification:

The fume cupboard extract shall be commissioned in accordance with EN 14175 on site test methods and to all manufacturers requirements. Contractor shall supply certification stating all commissioning has been complete to the relevant standards prior to handover.



58.0 PROTECTIVE SERVICES

58.01 Fire extinguishers and fire blankets

General:

The Mechanical Contractor shall allow for the supply and installation of all the fire extinguishers and fire blankets in the rooms as indicated on the drawings.

Exact locations to be decided on site in conjunction with the Employer's Representative. All fire extinguishers shall conform to the relevant standards. Allow for supplying the suitable and relevant wall signage for each fire extinguisher which indicates what type of extinguisher it is.

Fire extinguishers and fire blankets shall be as follows (refer to drawings for quantities and locations):

Types of fire extinguishers are as follows:

- **Type A:** 2kg Carbon Dioxide
- **Type B:** 2kg Dry Powder
- **Fire Blanket:** 1metre fire blanket to BS 6575

The Mechanical Contractor shall also allow for the supply and installation of the following items with the fire extinguishers:

- Providing wall brackets for all extinguishers and allow for mounting all extinguishers
- Providing and install wall mounted signage above all fire extinguishers identifying fire point, and extinguisher usage.
- Providing a fire assembly appoint sign and mount externally in the location indicated by the clients representative
- Agreeing exact locations and mounting heights with client's representative prior to mounting extinguishers.

The Mechanical Contractor shall also allow for the supply and installation of the following items with the fire blankets:

- A hook and loop resealable closure.
- A brass hanging point.
- Wall bracket for the hanging of the fire blanket.



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Signage:

Allow for supplying the suitable and relevant wall signage for each fire extinguisher which indicates what type of extinguisher it is.

Fire extinguishers:

CO2 fire extinguishers shall adhere to the following specification:

- 2kg capacity.
- Suitable for situations involving flammable liquids and electrical hazards.
- Harmless to delicate equipment and materials.
- High quality, lightweight aluminium cylinder.
- Fully certified to EN3 with kitemark/LPCB.
- High quality valve and discharge horn.
- 5 year guarantee.

Dry powder extinguishers shall adhere to the following specification:

- 2kg capacity
- Can be used on Class A, Class B, and Class C type fires
- Corrosion resistant finish.
- Rechargeable.
- Fully certified to EN3 with Kitemark/LPCB.
- Valve material shall be high quality heavy duty brass
- 5 year guarantee.