



**Volume A Works Requirements
Inver College
Carrickmacross
Co. Monaghan
A81V342
RN: 72180K**

Proposed Science Room Refurbishment Works



36 Carrick Strand
Strabane
Co. Tyrone
BT82 9RN
TEL 028 71882052
Mobile 087 7460260
Email: chris@cbec.me

**Mechanical Technical Services
Performance Specification**

**Author: Christopher Boyle
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Part 1

GENERAL ITEMS

SITE DESCRIPTION

Details of the Preliminary Safety and Health Plan for this project are included within the Contract documentation and are available on request or may be inspected at the project manager's offices by appointment.

DESCRIPTION OF THE WORKS

The following is a summary of the works proposed. Refer to sections of this Particular specification and the drawings for more specific details.

The project consists of the construction of the refurbishment of the 1 No. existing science room as described herein & as detailed on relevant drawings.

Removal of existing mechanical services – heating, domestic water, ventilation (inc fume cupboard) to point of entry

Provision of new space heating connected to existing service consisting of radiators & local controls

Provision of new domestic hot & cold water services connected to existing supplies to each room

New gas service

New fume cupboard installation inc. fume cupboard & ductwork

Testing & commissioning

NON-TECHNICAL PARTICULARS

Working Drawings

Installation

The Engineers are not obliged to produce any working drawings and the tenderer should assume that the drawings accompanying this enquiry will not be detailed further.

It is the responsibility of the successful tenderer to produce working drawings, which are detailed sufficiently to allow site operatives to install the services without the necessity for site design.

These drawings shall include the following:

- Ductwork co-ordination and plantroom layouts
- Pipework, mains, cold, hot water, hot water return, cold feed water, equipment layouts, soils and wastes
- Control drawings and schedules

The tendered figure shall include for the development and production of all of the above. Working drawings and associated back-up design data shall be submitted to the Engineers for approval in a timely manner with respect to the project timescale. Allow a minimum of 10 working days response time from the Engineers.

Builder's Work

The Main Contractor is responsible for all builders' works associated with the M&E sub-contract. The builder's work items to be carried out by the Main Contractor include such items as all opes above 32mm diameter, chases, trenches etc. The

Main Contractor is also responsible for general access scaffolding and attendance on lifting of large items of plant.

The Contractor is responsible for all opes below 32mm diameter and all opes associated with fixings for the installation. The Contractor is also responsible for all tools, plant, storage facilities and access associated with the installation. Refer to the schedule of preliminaries contained in the Form of Tender.

The main builder's works are included in the Architectural/Structural drawings. Additional builder's works shall be developed by the Contractor and submitted in drawing format to the Design Team for approval. The Contractor shall mark out all builder's work, opes, chases, trenches, etc., on site in accordance with the Contract programme. Responsibility for all aspects of builder's work lies with the Contractor.

Site Meetings

The following information must be presented in writing to the Engineers Office at least 1 full working day prior to the site meeting:

- updated programme
- cost report, including notification of all actual or potential variations
- Site manpower for previous period
- listing of information needed
- Equipment and material status

As-Installed Drawings and O & M Manuals

Four full sets of drawings and manuals in strict compliance with the Reference Specifications shall be required for this project.

Record drawings shall be required as hard copies and on disc in AutoCAD Release 2007 (or later) format.

The Contractor will be supplied with a full set of contract drawings, which shall be retained on site and marked up as the project progresses. The marked-up drawings shall be made available at site meetings for inspection.

Part 2

Mechanical Services Specification

GENERAL NOTE APPLICABLE TO ALL PLANT SELECTIONS

**ALL PLANT PROPOSED BY TENDERERS
MUST BE SELECTED FROM THE TRIPLE E
PRODUCT REGISTER AS ACCESSED AT
WWW.SEAI.IE .**

**SPECIFIED PRODUCTS CONTAINED HEREIN
ARE FOR DESIGN DEVELOPMENT
PURPOSES ONLY & ACT ONLY AS AN
INDICATION OF THE STANDARD & STYLE OF
THE EQUIPMENT REQUIRED**

MECHANICAL SERVICES & ASSOCIATED WORKS

INDEX TO PARTICULAR SPECIFICATION

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53	HOT & COLD WATER SERVICES
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	EQUIPMENT SCHEDULES

ELEMENT 01 - GENERAL DESCRIPTION OF THE WORKS

01.0 GENERAL

All sub contractors must be offered by the successful tenderer for evaluation by the Engineer to ensure minimum criteria is met. As part of these works it is an explicit responsibility on the successful tenderer to make good all damage caused during this contract.

All rubbish generated during the execution of these works shall be removed from site and disposed of in a manner which does not contravene the present Health and Safety Regulations or Local Authority Bye Laws.

Tenderers are advised to visit the site to inspect the extent of the work involved before submitting an estimate. No additions will be permitted to the contract sum because of site knowledge or conditions.

Tenderers are reminded that it is their responsibility to co-ordinate and control all trades and sub-contractors as the main contractor. No additions or variations will be permitted to the contract sum because of failure to co-ordinate works.

01.1 DESCRIPTION OF SERVICES

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

Fire Stopping of Services (Element 25)

All penetrations of floors or walls are to be fire stopped by a recognised specialist sub-contractor.

Removal of Existing Services

All existing plant in the science & prep room area is to be removed and cut back to the point of entry

Heating Centre (Element 51)

No works are proposed to the existing heating centre

Soils, Wastes And Overflows Installation (52)

Sanitaryware is to be provided as part of the main contract works. All items of sanitary ware shall be provided with connection to the above ground drainage system. The system shall be fully vented utilizing soil vent pipes and air admittance valves as necessary.

The above ground drainage system shall connect to builder's upstands at ground floor slab level.

All sanitaryware shall be in corrosion resistant vulcathene pipework

Domestic Water Installation (Element 53)

The local service shall be reconnected to serve lab sinks (cws only) and belfast sinks (hot & cold water) c/w local water heater

Space Heating (Element 56)

The existing heating services are to be removed and cut off at point of entry. The refurbished science/prep room shall be served by a connection from the existing heating service in the school. The space heating to the school will be achieved by means of a new LPHW heating circuit which will serve underfloor heating & steel panel convactor radiators sized to maintain a space temperature of 20°C at an external temperature of -5°C.

In general, mains pipework shall run in Black Iron Tubing, however copper pipework (BS 2871 table X) is deemed a suitable alternative with local branch pipework run in PEX, pipe in conduit system which will run in the floor screed via manifolds to serve steel panel radiators with local thermostatic control.

System Operating Parameters

Design Flow temperature	82°C
Design Return temperature	71°C
Radiator delta T	55°C

Space temperatures

External Design	-3 °C
Internal Design – Classrooms	20 °C

Internal Design – Circulation 18 °C
Internal Design – Toilets 18 °C

Ventilation (57)

A new semi mobile fume extract cupboard is to be provided as part of these works complete with ducted extraction in acid resistant polypropylene ducting & corrosion resistant fan plant

The chemical store will be served by a continuously running corrosion resistant extract fan

Insulation (Element 58)

Insulation of all pipework services will be provided as part of this contract.

Electrical Wiring (Element 62)

All electrical wiring associated with the mechanical services installation will be carried out under this sub-contract by a RECI approved electrical contractor.

The electrical works include all control wiring and the entire wiring of the plant rooms.

Controls (Element 65)

Heating will be controlled by a local 2 port valve & thermostat. Electric water heaters will be controlled by a timer in the local distribution board

01.2 DRAWINGS

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

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

01.3 ELECTRICITY SUPPLY & ELECTRICAL WORK

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

The cost of the electrical works associated with this contract and necessary to complete the works will be carried out by the Site Electrical Contractor.

01.4 SITE INSPECTION

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

ELEMENT 25 - FIRE STOPPING INSTALLATION

25.0 GENERAL

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

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

25.1 FIRE PROTECTION SLEEVES FOR PLASTIC PIPEWORK

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

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

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

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

The sleeve shall be equal to "Fire Sleeve" manufactured by Dufaylite Developments Ltd.

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

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

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

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

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

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

25.4 FLAME AND SMOKE SEALING OF GRILLES

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

The sealant is to be applied as follows:

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

25.5 CERTIFICATION

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

ELEMENT 50 - REMOVALS

51.0 GENERAL

All existing mechanical & electrical services in the space are to be removed and cut back to source for connection to new services

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

Works are summarised as follows

Removal of existing radiators & pipework

Removal of existing sanitaryware & cut back domestic water to source including removal of water heaters & above ground drainage

Removal existing fume cupboard unit & making good of redundant roof penetration

Removal of chemical store ventilation for replacement by new

ELEMENT 52 – SOILS, WASTES AND OVERFLOWS INSTALLATION

52.0 GENERAL

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

1997 Building Regulations Technical Guidance Document H, Drainage and Waste water disposal systems

BS 864 : Part 2 : 1983 Specification for capillary and compression fittings for copper tubes
BS 864 : Part 5 : 1990 Specification for compression fittings for polyethylene pipes with outside diameters to BS5556

BS 2871 : Part 1 : 1971 Copper tubes for water, gas and sanitation

BS 3943 : 1979 (1988) Specification for plastics waste traps.

BS 4514 : 1983 Specification for unplasticised P.V.C soil and ventilating pipes, fittings and accessories.

BS 5254 : 1976 Specification for polypropylene waste pipe and fittings

BS 5255 : 1989 Specification for plastic waste pipe and fittings

BS 5572 : 1994 Code of practice for sanitary pipework

BS 5627 : 1984 Specification for plastics connectors.

BS 6209 : 1982 Specification for solvent cement for non-pressure thermoplastic pipe systems

BS 8301 : 1985 Code of practice for building drainage

All pipework and fittings to be installed in accordance with B.S. 5572, 1978, Code of Practice for sanitary pipework.

The above ground soils & wastes installation shall connect to all items of sanitary ware as detailed on relevant drawings and as detailed below

- (a) All internal soil and waste pipes serving toilets, wash hand basins, sinks etc.
- (b) Final waste connections to all kitchen equipment.
- (c) Final waste connections to all sanitary ware.
- (d) All overflows from water storage tanks.
- (e) This Specialist shall include for all fire collars on soils and wastes pipework where they pass through fire compartments as detailed.

52.1 PIPEWORK AND FITTINGS

The vertical soil, waste and ventilation stacks shall be in PVC.

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

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

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

The connection of anti siphon stacks to main stacks will occur above the flood level of the highest fitting or be taken to atmosphere independently.

All waste pipework shall be Acid Corrosion proof Vulcathene pipework waste system with acid

recovery dilution traps to all laboratory sinks

52.2 PIPEWORK SUPPORTS AND BRACKETS

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

52.3 CISTERN OVERFLOWS

N/a

52.4 AIR ADMITTANCE VALVES

n/a

52.5 CONNECTIONS TO BUILDER'S FLOOR SOCKETS

The contractor shall include for making the joint at each builder's floor socket at Ground Floor Level. The contractor shall include for installing and testing all wastes, soils/vent and overflows pipework above ground floor level and for making all connections to sanitary fittings.

52.7 TESTS:

All soils and wastes, overflows and drains shall be tested in accordance with B.S. 5572, 1978. Pipework and fittings should be capable of withstanding an air test of positive pressure of at least 38mm water gauge for at least 3 minutes during which each trap should maintain a water seal of at least 25mm.

This Specialist shall provide temporary traps on each stack for the purpose of each test.

This Specialist shall supply and hand over witnessed pressure test certificates for all pipework tests. The storage of P.V.C. pipework shall be in accordance with the manufacturer's requirements.

52.8 FIRE COLLARS:

This Specialist shall include for the supply and installation of all fire collars on all soils and wastes pipework 50mm diameter and above where they pass from fire compartment to fire compartment on horizontal and vertical runs.

All fire collars shall be of Marley manufacture in accordance with B.S. 476, Part 20, 1987 and shall be installed strictly in accordance with the manufacturers requirements. All collars shall be suitable for bolting and sealing to the slab. This Specialist shall refer to the Architects Fire Certificate drawings issued with the tender documents.

52.9 CO-ORDINATION:

It shall be the responsibility of this Specialist to co-ordinate the installation of the soils and wastes pipework in conjunction with all other services. He shall ensure that all pipes line up vertically and are fully co-ordinated with drainage from manholes etc.

52.10 SANITARYWARE

As part of these works, the contractor shall connect to all sanitary ware as specified in the main contract documentation. Sanitaryware shall consist of all necessary fixtures and fittings including taps, wastes, handles. In general all sanitary ware shall be robust and fixed as part of these works including connections to services.

ELEMENT 53 – HOT, COLD AND MAINS WATER INSTALLATION

53.0 GENERAL

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

Works will include isolation of redundant services and connection to existing. All works such as drain down, cutting into existing services, refilling & sterilisation are deemed to form part of these works and therefore it is incumbent on the contractor to satisfy himself as to the exact nature of these work elements and include in his tender. No additions due to lack of site knowledge will be permitted

This Section of the Specification shall cover the following services;

- (a) DHWS generation plant and associated controls
- (b) Hot, cold, cold feed and mains water services installation.
- (c) Final connections to sinks, water stations, sanitary ware etc.

53.1 PIPEWORK AND FITTINGS

Pipework and fittings shall be as installed in PE-X multi layer rigid pipework with Oxygen barrier and 50 year guarantee

Pipework fittings will be as mapress machine compression fittings

All work associated with the hot, cold and mains water installation shall be carried out strictly in accordance with the Water Authority By-Law 1989 and the Building Regulations 1985 in Particular Section G.

The systems shall also be installed and maintained to BS 6465 Part 7:1984 and BS 6700:1987.

All double check valves stopcocks overflows (By Law 30) as required under these By Laws and Regulations shall be deemed to be part of this sub-contract, whether or not they are indicated on the drawings or specifications and they shall be supplied and fitted without additional cost to the client or his representatives.

Prior to use, the complete systems shall be flushed out completely to remove any debris and flux which is within the pipework and the systems shall then be chlorinated in accordance with BS 6700:1987 Clause 13.9.

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

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

All exposed domestic water service pipework shall be run in chromium plated copper.

53.2 VALVES

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

All individual supplies to each item of sanitary ware shall be provided with a "Ballofix" isolating valve.

53.3 PIPEWORK BRACKETS AND SUPPORTS

All pipework shall be fixed or supported and the method of works shall be similar to that detailed herein for space heating pipework.

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

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

53.4 INSULATION:

All boiler house heating and water services pipework shall be insulated throughout and aluminium cladded as per DW/144. Insulation shall comply with B.S. 5422; 2001. Refer to Insulation Section of this specification for further details.

All copper mains water services and cold feeds shall be insulated at high level in ceiling voids, dropping in vertical ducts, in floor ducts or trenches, concealed behind furniture, within partitions etc. Exposed pipework at low level need not be insulated.

Pipework insulation for MWS, CWS, cold feeds and chilled water pipework shall comply with the technical services document of the 1997 Building Regulations. The insulation shall comply with B.S. 5422; 2001 – Table 9.

The insulation shall have a thermal conductivity (λ) of 0.04 W/(mk) and the temperature of the contents is assumed to be +5°C. Where fluid temperature exceeds 5°C in any part of a chilled water system, the thickness required for 5°C in any part of a chilled water system, the thickness required for 5°C shall be maintained. Minimum thickness of insulation shall be 40mm.

Condense water pipework, cold water pipework and cold water vessels shall be provided with means of frost protection in accordance with the requirements indicated.

53.5 DRINKING WATER OUTLETS:

N/a

53.6 CONNECTION TO FIXTURES:

This Specialist shall include for the final connection of water services pipework to all sanitary fixtures and kitchen equipment. All fixtures shall be supplied and fixed in position by others.

53.7 HOT WATER GENERATOR

In positions as shown on relevant drawings and scheduled herein, the contractor shall provide a pre-insulated, packaged, undersink water heaters as Ariston Andris 10 litre – 2KW with mains water kit suitable for installation

The hot water generator shall be capable of raising the specified quantity of domestic hot water from 10°C to 65°C.

The unit shall be fitted complete with all necessary fittings, including balanced flue, combined safety & pressure relief valve with full bore discharge terminating at low level, all necessary controls for thermostatic control, gas train, and safety systems such as high limit thermostat. The unit will be linked to the local control System.

53.8 COLD WATER STORAGE TANKS:

Not applicable

53.8 PIPEWORK INSTALLATION

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

53.9 PIPE SLEEVES:

In all cases where pipes pass through walls, floors, duct covers or ceilings, pipe sleeves shall be provided of the same material as the pipes they pass through.

These will be built in by the contractor, but it will be the responsibility of this Specialist to ensure that they are built correctly.

Sleeves shall be of one length of pipe and shall project 10mm above the finished floor level and shall be flush with the underside of the floor slab. In walls they shall project approximately 5mm on either side of the finished

53.10 DOUBLE CHECK VALVES

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

Hose Union Taps

Mainswater Bell Valves

All Locations Recommended in the Water By Law Regulations

53.11 THERMOSTATIC MIXER VALVES

Not required

53.12 TESTS:

This Specialist shall include for pressure testing all water services pipework as outlined in the general specification. He shall include for pressure testing sections of the work as required.

On completion of the installation he shall demonstrate that the system is fully balanced and that the correct flow rates are available at all outlet positions.

This Specialist shall carry out all necessary hydraulic and thermal tests including pressure testing the system to 2 ½ times the working pressure and held drop tight for 8 hours.

All pressure test certificates must be witnessed and signed by the engineer or their representative.

53.13 IDENTIFICATION OF PIPEWORK:

This Specialist shall include for providing identification to all water services pipework with circumferential coloured plastic tapes spaced at 2m internals along the entire length. The B.S ground colour shall be indicated by two tapes on either side of the identifying tapes. All colours shall comply with B.S. 1710.

53.14 CHLORINATION TEST:

All mains should be swabbed and disinfected before being put into supply. The pipelines should be disinfected with water having a minimum concentration of 20 mg/l of free available chlorine left in the main for a period of at least 24-hours. Chlorine residual tests shall be taken at the end of the main furthest from the point of injection. The sterilisation process shall be repeated if the chlorine residual is less than 10 mg/l. The chlorinated water must be discharged into a foul sewer and never into a surface water sewer or water course.

53.15 BACTERIOLOGICAL TEST:

After the main has been refilled, a sample of water must be taken for bacteriological analysis. Great care must be taken when obtaining samples for testing and only sterile containers should be used. This sampling shall be carried out in the presence of the engineer and / or his representative. A copy of the bacteriological test report must be submitted to Irish Water Main-laying Section

ELEMENT 54 – GAS SERVICE INSTALLATION

54.1 Systems Description

Remove existing gas underground sections of gas pipework in metal & make good
Remove gas services – pipework, slam shut, gas proving & gas cocks in both Home Economics & Science Room
Replace with new gas installation consisting of local twin 47kg gas tanks with dual auto changeover regulator at both Home Economics & Science room

Where ever gas pipework runs in enclosed areas such as service voids/ceiling spaces etc, the installation shall be laid pipe in pipe and the outer pipe vented to the outside.

All gas distribution pipework located above ground, within vertical ducts shall be installed strictly in accordance with Irish code of Practice ICP4; 1989 and Parts 1, 2 and 3 and Publication IM/16 Guidance Notes on the installation of gas pipework issued by British Gas.

All incoming gas services entering the building through walls and floors shall be sleeved. Sleeve sizes shall be in accordance with ICP4 / IM/16 Guidance Documents, Table 3.

All internal gas pipework shall be at a pressure of 75 mBar (30" wg).

All gas pipework supplying natural gas at 75m bar or below shall be constructed of B.S. 1387 or B.S. 3601 pipe and jointed safely by B.S. 21 threads or by welds to B.S. 2646 or B.S. 2971. Gas trac pipework shall be used in floors compliant to BS EN 15266 & appropriately CE marked

All electrical services shall be located a minimum distance of 25mm from any gas pipe or fitting.

All gas pipework shall be stored on site with plastic end caps to avoid internal corrosion.

All pipework shall be adequately supported throughout as detailed in Section7, IM/16 Publication.

All pipework up to 100mm shall be screwed or welded in accordance with Table 5, IM/16 Publication. Pipework above 100 mm must be welded.

Screwed or welded pipework shall be in accordance with notes to Table 5, IM/16 Publication.

This specialist shall include for a number of pressure test points along each gas main. Purge points to be fitted at section isolation valves and at other suitable positions

54.2 GAS DETECTION SYSTEM & GAS PROVING SYSTEMS

54.2.1 Gas detectors shall be installed in the boiler plant rooms as indicted on the drawings.

54.2.2 On activation of either gas detector the slam-shut valve shall close. The valve shall be fail safe type, i.e. shall close on loss of power.

54.2.3 The system shall be interlinked with the fire alarm system. The slam-shut valve shall close in accordance with the control strategy.

54.2.4 The gas detection system shall be as manufactured by Modern Plant or equal and approved and shall be mounted beside the MCC panel in the boiler plant room. Volt Free contacts shall be provided to allow for interface with fire alarm system.

54.3.0 Classroom gas Proving Systems

The contractor shall provide new pressure proving systems as follows

Classroom Systems

MEDEM SEC-B pressure proving panel to main incoming slam shut valve (with pressure sensing) located in teaching space. Panel to be complete with remote emergency knock off buttons as detailed

54.4 Pipework Standards

The following are the principal Standards which shall apply:

BS21	Pipe threads for tubes and fittings (metric dimensions).
BS143 & 1256	Malleable cast iron and cast copper alloy threaded pipe fittings.
BS1387	Screw and socketed steel tubes and steel tubes suitable for welding or screwing to BS21 pipe threads.
BS1965 Part 1	Butt-welding pipe fittings for pressure purposes - carbon steel.
BS4504 Section 3.1	Steel Flanges
	Section 3.2 - Cast Iron Flanges
	Section 3.3 - Copper Alloy and Composite Flanges

All work shall conform with all Government, Local Authority, Fire Officers and other Municipal Authority regulations, bye-laws and other requirements.

Where references are made to Irish or other International Standard Specifications products shall be selected to meet the system operating conditions

54.4.1 Above Ground Pipework

Pipework shall be fabricated from galvanised medium grade mild steel pipework manufactured to the requirements of B.S. 1387.

Welding fittings shall be of carbon steel, manufactured in accordance with B.S.1965: Part 1: and shall have a wall thickness to match medium grade mild steel tube.

Screwed fittings shall be of galvanised malleable iron type, beaded or banded, manufactured in accordance with B.S.143 and threaded to BS21.

Flanges shall conform to BS4504 Section 3.

Support bracketing and fixings shall consist of:

- a) Galvanised preformed channel sections as manufactured by Unistrut.
- b) Cadmium plated pipe brackets and accessories
- c) Pipe rollers, guides and anchors as manufactured by Unistrut

Pipework and fittings where installed outdoors shall be galvanised.

54.4.2 **Underground Pipework**

Pipework shall be medium density polyethylene. Fittings shall be electro fusion type tested and approved to British Gas Standard PS/PL2 Part 4 and Part 6.

54.5 **INSTALLATION - ABOVE GROUND PIPEWORK**

54.5.1 **Pipework**

The arrangement of all pipework shown on the drawings shall be agreed with the Engineer prior to installation.

All work shall conform with all Government, Local Authority, Fire Officers and other Municipal Authority regulations and bye-laws.

Pulled bends may be used for pipe sizes 50 mm and below but only on concealed pipes and where space permits. Pulled bends shall be formed on a bending machine.

All pipework shall be painted with a red oxide primer and finished with two coats of yellow paint.

Final connections to fittings shall be by means of flexible pipe fitted with a union.

56.2 **Pipe Jointing**

Pipe joints with the exception of where pipes connect to valves shall be made by means of butt welds and a sufficient number of flanges or unions shall be incorporated to facilitate dismantling.

Screwed joints may only be used on galvanised pipework installed outdoors and, with the written permission of the Engineer, internal exposed pipework.

Screwed joints shall be in accordance with the provisions of B.S.21 and shall be clean threaded, pulled up tightly and made with approved PVC tape.

Up to and including 150mm diameter pipe runs shall be welded. Up to and including 50mm connections to strainers, valves, plant and similar items shall be threaded joints. Connections 65mm to 150mm diameter to strainers, valves, plant and similar items shall be in flanged joints.

Flanged joints shall be made with Klingerite full face gaskets and assembled with mild steel, hexagonal head bolts and nuts. Flanges shall be in accordance with B.S.4504 and suitable for the operating pressure.

54.6 **Pipe Supports**

All pipework shall be supported by means of clips, supports or hangers at the following centres:-

TABLE OF PIPEWORK SUPPORT CENTRES		
Nominal Pipe Size mm	Steel Pipe	
	Vertical metres	Horizontal metres
15	2.4	2.1
20	2.4	2.4
25	3.0	3.0
32	3.0	3.0
40	4.5	3.6
50	4.5	4.5
80	6.0	4.5
100	6.0	6.0
125	6.0	6.0
150	6.0	6.0
200	6.0	6.0

Where piping is installed at low level, i.e., 2.5m, or less, above floor level, 15 mm and 20mm diameter shall be supported at 1200 mm intervals and all other sizes up to 75mm diameter at 1800 mm centres.

All supports for mild steel pipes and fittings shall be ferrous.

All supports for copper pipes shall be of polished brass where exposed and rough finish elsewhere. Ferrous supports will be permitted on non-ferrous pipes only where patented systems with inert inserts are used.

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

Pipework shall be adequately supported in a manner as to permit free longitudinal movement between anchors due to expansion and contraction. Pipe rollers shall be truly concentric and turn without either binding upon or rolling clear of the pipe.

Working drawings showing details of all special supports shall be submitted to the Engineer for written approval prior to manufacture.

Supports shall be arranged as close as possible to joints and bends. Each support shall carry a due proportion of the pipe weight. Vertical pipes shall be supported adequately at the base in order to withstand the total operating weight of the riser.

Multiple riser pipes shall not be secured individually to the structure, but shall be supported from multiple assemblies fabricated from Unistrut components and suitable for building in or otherwise securing to the structure.

Multiple horizontal pipe runs shall not be secured individually to the structure, but shall be supported from multiple assemblies fabricated from Unistrut components and suitable for building in or otherwise securing to the structure, together with adjustable mild steel hangers with swivel joints. Pipe rings shall be Flamco or equal and approved.

Where multiple supports are used the spacing of the support frames shall be arranged to suit construction of the building. Where the spacing of multiple supports is greater than that specified above for any of the pipes supported, additional single supports shall be provided so that the spacing of all supports for each pipe is not greater than that specified in above.

Full provision shall be made in the installation of pipework to allow for pipes to be lagged separately with a minimum of 25mm clearance between finished surfaces.

Where pipework is supported below concrete slabs, patented concrete inserts shall be used to accept cadmium plated threaded rod. Where piping is supported below steelwork Lindaptors or other patented clamping system, approved in writing by the Engineer, shall be used.

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

Pipework shall be buried at least 600mm below the surface. After positioning in a trench, the trench shall be filled with sand or soil which is free from large stones or rocks that could damage the pipework. The filling material shall be packed tightly and tamped down. Where the quality of the soil is corrosive, preventative measures shall be taken to protect the pipework.

All pipe supports shall be supplied and fixed by the Contractor.

54.7 Pipe Sleeves

Where pipes pass through walls, floors, footings and waterproofed membranes, the Contractor shall provide sleeves. The Contractor shall be responsible for the correct building in of all sleeves.

The inside diameter of sleeves shall be at least 15mm larger than the outside diameter of the pipe, except where the pipes pass through bearing walls or footings where sleeves shall be 100 mm larger than the outside diameter of the pipe. Sleeves in bearing walls or footings shall be cast iron pipe.

Sleeves in walls, floors, ceilings and partitions shall be of the same metal as the pipe.

Sleeves of other materials will be permitted provided that they are inert and approved by the

Engineer.

Sleeves shall protrude not less than 1 mm and not more than 3 mm proud of the finished surface.

Flashing sleeves shall be provided where pipes pass through waterproofing membranes. Flashing sleeves shall be provided with an integral flange to which a flashing shield can be clamped or welded. The shields shall be in zinc and shall extend not less than 200 mm from the sleeve in all directions. The Contractor shall make the shield into the membrane and shall fill the space between the sleeve and pipe with waterproof material and mastic compound.

Where exposed pipes pass through wall, floors and ceilings they shall be fitted with chromium plated wall and floor plates, Crane Fig. 582 or equal and approved.

54.8 **Ventilation Sleeves**

Gas pipework run in locations indicated on the drawings, false ceilings, builders work ducts and any unventilated spaces shall be fitted with a pipe sleeve ventilated to atmosphere. The sleeve shall consist of a mild steel pipe to BS 1387 jointed by welding and tested to 2 bar gauge pressure independently from the gas pipe. The gas pipe shall be supported within the vent pipe by means of purpose made support lugs welded to the gas pipe. The support lugs should present minimum obstruction to airflow. The sleeves shall be supported by standard supporting methods for mild steel pipework as specified herein.

54.9 **INSTALLATION - UNDERGROUND PIPEWORK**

The arrangements of all pipework on the drawings shall be agreed with the Engineer prior to installation.

Services laid in the ground shall be installed with care and in such a manner that pipework and fittings shall not be damaged due to movement of the ground. Where pipes pass under roadways carrying vehicles they shall be fitted inside sleeves or conduits.

Underground pipework shall be buried at least 450mm below the surface on a 150mm thick bed of fine sand. After positioning in a trench, the trench shall be filled with sand to a depth of 150mm above the pipe. Filling of the trench shall be completed with soil which is free from large stones or rocks that could damage the pipework. The filling material shall be packed tightly and tamped down. Where the quality of the soil is corrosive, preventative measures shall be taken to protect the pipework.

It shall be the Contractor's responsibility to ensure that trenches, bedding and backfilling for the pipe is carried out in accordance with the pipe manufacturers' recommendations.

Where the gas pipework is connecting to above ground pipework the above ground mild steel pipe shall be carried to below the surface to at least 450mm and connected to the polyethylene with a suitable adaptor. The mild steel pipe shall be protected by wrapping with two layers of Denso tape.

ELEMENT 56 - SPACE HEATING INSTALLATION

56.0 GENERAL

The installations are generally as outlined on the drawings and as specified herein. It shall be the responsibility of the Mechanical Services Sub-Contractor to co-ordinate his services with those of other trades to avoid clashes. Any abortive work, which occurs as a result of a clash due to lack of co-ordination shall be resolved without cost to the client or his representatives.

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

The scope of works is as follows

- New dedicated heating zone serving 2 storey extension
- Extension of existing service to serve music room
- Diversions of redundant heating services
- Flushing of ext. heating system circuit
- Treatment with corrosion inhibitor

56.1 PIPEWORK AND FITTINGS

LTHW heating pipework shall be fabricated from black MS tubing medium grade to BS 1387. Cold feed and open vent pipework shall be fabricated from galvanised MS medium grade tubing to BS 1387 with screwed and socketed ends. Drain pipes from automatic air pipes, pumps, safety valves etc shall be fabricated from copper piping to BS 2871 Table X.

Pipes shall be new, clean, and free from defects, of even bore throughout, shall be delivered with the manufacturer's protective coating undamaged and shall have plain chamfered ends for welded joints or screwed and socketed ends as detailed in the Particular Specification.

All mains shall be graded to ensure that no air locking occurs.

The cold feed and the open vent pipes shall be fabricated from galvanised MS medium grade tube to BS 1387 with screwed and socketed ends.

Drain pipes from automatic air vents, pumps, safety valves etc. shall be fabricated from light gauge copper piping to BS 2871 Table X.

Piping to valves and equipment shall be connected with either flanges or unions to facilitate the removal of the equipment.

a	Pipework within ceiling voids and exposed to view up to and including 50 mm ID	Screwed BSP
	65 mm dia and above	Welded
b	Pipework within ducts	Welded

All joints on concealed pipework shall be formed using proprietary fittings be of the seamless steel 'medium' butt welding type to BS 1965 Part 1. All branches shall be arranged to sweep in the direction of flow. Stab-in branch welds or swagged reducers and or branches shall not be accepted. All branches shall be by a tee piece. All reducers shall be eccentric where the pipework is on the horizontal and concentric on the vertical. The flat side of eccentric reducers shall be positioned to allow venting to the high point in the run or system. Pulled bends may be used on all exposed pipework up to 25 mm bore and up to 40 mm bore for concealed pipes. For pipes over 25 mm bore on exposed pipework and over 40 mm bore on

concealed pipework long radius welding bends shall be used. If the cross-sectional area of any pulled bend is altered or if the throat of any bend is rippled it will be rejected.

To provide for drain points on welded pipework an internally screwed MS socket shall be welded into the main with the base of the socket shaped to the contour of the main pipe. Air venting points on pipes 32 mm bore and above shall be provided by welding a plain pipe 150 mm long x 32 mm dia. to the top of the main with the end of the branch swaged down and fitted with a MA screwed socket to connect to the automatic air eliminator. For pipes below 32 mm dia the bore of the air collecting branch shall be equal to the bore of the pipe being vented.

Flanges used on welded pipelines shall be in steel of the slip-on welding type to BS 4504 and shall be drilled and faced for a nominal working pressure of 10 bar.

Fittings for use with screwed pipework shall be in black malleable iron to BS 1256 with connections to heating surface made with sweep type fittings. Where two mains connect or divide sweep or twin elbow branch fittings as may be appropriate shall be used.

If a tee piece has to reduce on the run and a reducing fitting is not available the reduction shall be made by using a hexagon nipple and an eccentric reducing socket. The use of bushings will not be permitted.

Pulled bends may be used as described for welded pipework otherwise long radius screwed bends must be fitted. Short radius elbows may only be used with the permission of the Engineer.

Drain or air venting branches shall be provided as described for welded pipework only screwed pipe fittings with square branches shall be used.

Flanges used on screwed pipelines shall be of steel to BS 4504 threaded to BS 21 and drilled and faced for a nominal pressure of 10 bar.

Malleable iron unions shall have gun-metal ground seats and the use of connectors and backnuts will not be permitted. During the progress of the work any surplus flux and jointing paste visible at joints shall be carefully removed. The amount of jointing materials used shall be the minimum required to complete the joint. Care shall be taken that fittings are not excessively tool-marked and when pipes are cut they shall be carefully reamed out to restore the bore.

Sufficient flanges or unions shall be used to ensure that any part of the installation can be easily removed. Fittings for use on cold feed and open vent lines shall be in galvanised malleable iron to BS 1256. Square tees can be used on this pipework.

All pipework shall be painted with two coats of corrosion resistant paint and insulated in accordance with the specification.

All pipework shown in floor ducts shall be fully welded, painted with two coats of corrosion resistant paint and insulated in accordance with the specification. All new pipework in floor ducts shall be inspected by the Consulting Engineer prior to back filling. There shall be no joints on underground pipework.

In addition to that noted above, all exposed pipework to be painted with 2 coats heat resistant undercoat and 2 coats gloss to match surroundings as colour specification to be advised by the engineer.

56.2 PIPEWORK SUPPORTS AND BRACKETS

The complete heating installation shall be supported from the building structure other than the roof purlins generally in accordance with the General Specification.

The contractor shall be responsible for the overall design and installation of all supports and brackets necessary for the installation as contained within this specification and on the associated drawings.

Pipework shall be supported in a manner which will allow for free movement due to expansion and contraction with supports arranged as near as possible to joints and changes in direction.

In the boilerhouse or plant rooms pipework shall be supported from the walls or floors on purpose made MS brackets and in overhead ducts, MS wall brackets shall be attached to the walls using rawl-bolts, hilti-bolts or similar. The erection of these brackets shall be the responsibility of this contractor.

All pipework shall be set on cast iron or bronze rollers and chairs fixed to the angle framework, or alternatively adjustable suspension type rods and pipe rollers may be used. Pipework in floor ducts shall also be set on rollers and chairs fixed to angle framework, bolted to the sides of the duct. Alternatively, rollers placed in MS channel attached to the duct floor may be used.

The erection and fitting of the angle iron framework or mild steel channel is the responsibility of this contractor. Care will be taken to ensure that the correct support is applied to MS and copper piping and that dissimilar metals are not in contact. Provision shall be made to ensure that pipework does not leave the roller by providing inverted 'U' guides fabricated from 9 mm Dia. round iron at 12.0 m centres. All brackets and supports shall be thoroughly cleaned and painted one coat of red oxide of lead paint.

Before manufacture the design of brackets and supports must be agreed in writing with the Engineer and where necessary this contractor shall submit drawings to the Engineer for approval.

Exposed pipework in rooms shall be supported on malleable iron or brass split pattern screw-to-wall school board brackets depending on the pipe service. This contractor shall include for lining up the brackets, drilling and plugging the walls and fixing the brackets. Screws shall have a minimum length of 50 mm with brass screws being used with brass brackets. Plastic type wall plugs to suit the screw size shall be used.

Where floor level pipes are subject to abuse additional floor type brackets comprising a split pipe ring, pipe nipple and back-plate secured to the floor shall be fitted in locations decided by the Engineer. Brackets which have to be secured to structural steelwork shall be fixed with special girder clips; welding or drilling the steelwork may not be carried out without special permission.

Supports shall be spaced in metres according to the following table.

STEEL PIPE			LG COPPER PIPE		
BORE	HORIZONTAL	VERTICAL	BORE	HORIZONTAL	VERTICAL
15 mm	1.5	1.8	15 mm	0.9	1.2
20 mm	1.5	2.1	22 mm	1.2	1.5
25 mm	1.8	3.0	28 mm	1.5	1.5
32 mm	1.8	3.0	35 mm	1.5	2.0
40 mm	2.4	3.0	42 mm	1.8	2.4
50 mm	2.4	3.5	54 mm	1.8	3.0
65 mm	2.7	4.0	65 mm	2.4	3.7
80 mm	3.0	4.0	76 mm	2.4	3.7
100 mm	3.0	4.6	108 mm	2.4	3.7
125 mm	3.7	5.5	133 mm	3.0	3.7
150 mm	4.5	5.5	159 mm	3.7	3.7

LTHW VALVES

In the boilerhouse and plant rooms all valves 65 mm bore and above shall be cast iron flanged gate valves with a bronze trim disc wedge, rising stem and outside screw and yoke. They shall comply with BS 5150 with flanges drilled and faced to BS 4504 for a nominal pressure of 10 bar and shall be similar to Crane Fig. FM 82 or equal to approval.

Boilerhouse and plant room valves fitted in pipes with a bore from 25 mm up and including 50 mm shall be bronze flanged full way gate valves with a solid gun-metal wedge and non-rising stem. They shall comply with BS 5154/B drilled and faced to BS 4504 for a nominal pressure of 10 bar and shall be similar to Pegler Fig. 1071 PN 16 or equal to approval.

Valves 20 mm bore and below shall be in bronze of the full way gate type with internally screwed ends to BS 5154/B SIMILAR TO Pegler Fig. 1070 M-PM 25 or equal to approval.

Outside the boilerhouse isolating or circuit valves up to 100 mm bore shall be in bronze of the full way gate type with internally screwed ends and shall comply with BS 5154/B similar to Pegler Fig. 1070 PN 32 or equal to approval. Valves fitted to pipework over 100 mm bore shall be of the cast iron flanged type similar to Crane FM 82 or equal to approval.

Flanged valves shall be provided with suitable steel mating flanges and where the mating flange and the flanged valve are of dissimilar materials the joint shall be made with a suitable rubber composition insertion joint which shall be the full free diameter of the flange. Flanged valves in the boilerhouse and plant rooms shall be fitted with an 'open and shut' indicator.

Union type valves shall be fitted to the flow and return connections to each radiator, natural or fan assisted convector unit heater or pipe coil. These valves shall conform in all respects to BS 2767-10 manufactured in forged brass with a chromium plated finish similar to Pegler Fig. 2063 or Fig. 2076 or equal to approval. A wheel valve shall be fitted to the flow inlet to the

appliance with a lock shield valve on the return outlet the valves being of the angle or straight pattern as necessary.

On single or two pipe circuits up to and including 32 mm bore the circuit isolating valves shall be of the union type in forged brass to BS 2767-10 similar to Pegler Fig 2076 WH on the flow and Pegler Fig. 2076 LS on the return or equal to approval.

Valve Type	Gun-Metal Hattersley Crane	Cast Iron Hattersley Crane
Gate Lockshield	Fig 33X D151/9 Fig 33XLS D235/7	Fig 549 F52/F51
Valve Type	Manufacturer	Reference
Globe	Crane Hattersley	F366 73/E or Flanges to BS4504
Double Regulating	Bailey Crane Hattersley	2707/2705/2504 - DM 900/910/920/930 CV2432/4733DR/CV2733/4733DR
Automatic Air Vents	Winns	Type 1680
3-Way Vent Cocks	Winns NABIC	Type 1680 Fig 503
Drain Cocks	Hattersley Crane	To comply with BS2789 Type 2
Check Valves	Crane	FM 492
Needle Valves	Crane	D71

Any valves necessary for isolation and/or regulating the system shall be provided and installed so that they are accessible for operation and maintenance.

56.4 RADIATORS

The radiators & radiant panels shall be generally as scheduled herein and indicated on the drawings. They shall be manufactured and tested to BS 417 and all radiators shall be BS Kite marked. All radiators shall be factory tested to 7 bar gauge for a working pressure of 4.66 bar Gauge.

Radiators shall be manufactured with a minimum plate thickness of 1.5mm. Each radiator shall be provided with a manual air vent and the Mechanical Sub-Contractor shall give 6 No keys to the client prior to handover of the building.

ALL units shall be painted with 2 coats of heat resistant primer/undercoat and 2 coats gloss paint to Engineers colour specification.

The Contractor shall allow for erecting the radiator, removal for painting and re-erecting each radiator to suit the Main Contractor.

Each radiator shall have its brackets fixed to the wall by 50 mm No 10 brass wood screws and plastic rawlplugs.

The mechanical services contractor shall measure all radiators prior to ordering and ensure no clashes occur with electrical services

56.5 MANUAL & AUTOMATIC AIR VENTS

Automatic air vents shall be provided on all high points in the system and they shall be as Spirax Sarco Fig No AE 31 CV. Each air vent shall be fitted with a Lockshield isolating valve and 10 mm table x copper pipe to BS 2871, to drain outside.

In addition, manual air vents consisting of air collection bottles & needle valve shall be provided as required at all system high points.

56.6 BALANCING/COMMISSIONING VALVES

Balancing/commissioning valves shall be provided as a minimum as indicated on the drawings or more as necessary to complete the balancing of the heating installation.

The water flow rate through each circuit, sub-circuit and heater battery shall be declared and proved to the Engineer's satisfaction.

If additional valves are found to be necessary in the estimation of the Mechanical Sub-Contractor, then he shall make due allowance for any difference in pressure loss in the final selection of pump duties. Any difference in cost shall be borne by the Sub-Contractor and any claim to the Employer in this respect shall not be entertained.

56.7 INSULATION:

All boiler house heating and water services pipework shall be insulated throughout. Insulation shall comply with B.S. 5422; 2001. Refer to Insulation Section of this specification for further details.

All heating pipework shall be insulated at high level in ceiling voids, dropping in vertical ducts, in floor ducts or trenches, concealed behind furniture, within partitions etc. Exposed pipework at low level need not be insulated. All pipework dropping to low level to serve outlets located in asd rooms must be fully concealed and hence insulated.

Pipework insulation for space heating pipework shall comply with the technical services document of the 1997 Building Regulations. The insulation shall comply with B.S. 5422; 2009 refer to relevant tables for minimum insulation thicknesses

The insulation shall have a thermal conductivity of 0.04 W/mK. Minimum thickness of insulation shall be 40mm.

56.8 TESTS:

This Specialist shall pressure test, to 7.0 bar, all heating pipework, with radiators disconnected and pipework tails blanked off. The test to hold without loss for four hours and to be witnessed. He shall include for pressure testing in sections, or stages. On completion of the works, he shall include for balancing to ensure the systems are in full thermal balance.

56.9 THERMOSTATIC RADIATOR VALVES:

Not required

56.10 REMOVAL OF EQUIPMENT:

Works will include isolation of redundant services and connection to existing. All works such as drain down, cutting into existing services, refilling & chemical dosing are deemed to form part of these works and therefore it is incumbent on the contractor to satisfy himself as to the exact nature of these work elements and include in his tender. No additions due to lack of site knowledge will be permitted. This Specialist shall include for taking down each radiator once for convenience of other trades and for draining down and for refilling and venting.

56.11 IDENTIFICATION OF PIPEWORK:

This Specialist shall include for providing identification to all pipework with circumferential coloured plastic tapes spaced at 2m intervals along the entire length. The B.S. ground colour shall be indicated by two tapes on either side of the identifying tapes. All colours shall comply with B.S. 1710.

56.12 FLOOR AND WALL PLATES:

This Specialist shall supply and fit chromium plated, clip-on floor and wall plates, where all heating pipework passes through floors and walls. Plates shall be fully sized and pipework shall be arranged to suit full sized plates.

56.13 INSPECTIONS:

This Specialist shall include for the inspection of all pipework prior to insulation.

No pipework is to be insulated until it has been inspected and signed off by the clients representative. This Specialist shall prepare a set of drawings and sign off sheets for this purpose. These documents are to be included in the handover documentation.

56.14 FLUSHING:

This Specialist shall include for the full flushing of all pipework systems in accordance with B.R.S.I.A and C.I.B.S.E recommendations. This Specialist shall include for employing the services of a specialist firm of contractors to provide for and advise on all requirements for system implications and additives. This Specialist shall present their proposals to the clients representative for approval to commencing works.

ELEMENT 57 - VENTILATION INSTALLATION

57.0 GENERAL

The ventilation installation shall be provided as indicated on the drawings. The minimum standard in relation to the supply, installation and testing of ductwork shall be DW144 and DW143 as issued by the HVCA. Where differences occur between the General Specification and DW144/DW143, the higher standard shall apply. All design drawings are diagrammatic and co ordination with other services shall be required, detail drawings completed and approved (from design intent viewpoint) prior to manufacture and installation.

57.1 DUCTWORK:

This Specialist shall supply and erect galvanised steel metal ductwork as indicated on the drawings. Under no circumstances shall asbestos based gaskets or jointing materials be used in any section of the ductwork or equipment, directly or indirectly in contact with the air supply or extract systems.

All ductwork systems shall be carried out by approved Contractors regularly engaged in similar work. This Specialist must specify the sub-contractors to provide ductwork services prior to commencement on site, for the approval of the clients representative.

All ductwork shall comply with the detailed requirements of the C.I.B.S.E. requirements and HVAC DW 154, CLEAPSS G9 guidance and British Standard BS EN 14175

All extraction pipework shall be installed in polypropylene ducting with associated fittings

57.2 SEALANTS

Only sealant s manufactured by 3M or an equivalent, which has been certified as complying with DW144, may be used.

57.3 BENDS AND FITTINGS

Bends and tees shall be constructed as DW144 so that they have a maximum 'k' factor of 0.35 as published by the CIBSE.

57.4 BRACKETS AND SUPPORTS

Proprietary supports may be used; however their construction shall be approved by the Engineer prior to manufacture.

All steel required to span the roof steels shall be provided by the Mechanical Sub Contractor.

57.5 FLEXIBLE DUCTWORK

All flexible ductwork shall be thermally insulated and fire rates to that of the mild steel ductwork (minimum half hour) and fixed by worm drive clips to each end. All individual flexible ductwork pieces shall be such that its maximum extended length is 1.5 metres maximum.

Flexible ductwork shall be as manufactured by Zest, SAME or equal.

57.6 GRILLES AND DIFFUSERS

Specialist shall supply and install supply air, return air, extract grilles and door and transfer grilles in the locations as detailed on the drawings and scheduled.

Prior to ordering this Specialist shall submit details of all diffusers and grilles giving manufacturers name, model, number and size to the Engineers for approval. All grilles and diffusers shall be secured with fasteners and subframes, to allow for quick and regular removal for cleaning.

This Specialist shall include for painting of grilles to a specified RAL or B.S. colour.

57.7 AIR HANDLING UNITS:

NOT APPLICABLE

57.8 MOTORISED DAMPERS:

NOT APPLICABLE

57.9 EXTRACT FANS

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

Each fan shall be mounted on vibration isolators and suspended or fixed to the main structure of the building by purpose made frames or supports. Flexible inlet and/or outlet connectors shall be provided on each fan set. Extract fans and specified accessories shall be as manufactured by Vent Axia Limited or equal & approved.

57.10 VOLUME CONTROL DAMPERS:

This Specialist shall provide multi-blade or iris type volume control dampers with calibrated locking devices. The dampers shall be sized to suit the extent of control required to balance systems. Dampers shall be air diffusion manufactured, or equal and prior approved.

57.11 TURNING VALVES / SPLITTERS:

This Specialist shall include for turning valves and splitters in all bends, tees, etc., as detailed in Section 11.5, 11.4 of DW144

57.12 FIRE AND SMOKE DAMPERS:

The Specialist shall supply and fit automatic fire dampers to ductwork in the locations shown on the drawings. Fire dampers shall be spring loaded type, have a two hour fire rating and be flanged to match up to the ductwork sizes to which they are fitted. All materials necessary to fit the dampers shall be included in the tender. Fire dampers shall be to B.S. 417 built into the structural fire compartment wall / floors. The Specialists shall obtain the Local Chief Fire Officer's approval of fire dampers before ordering. Under no circumstances shall purpose-made dampers made up by the Specialist be allowed.

This Contractor shall undertake a review of the fire certificate drawings, prior to installation to ensure that all ductwork passing through fire rated walls or structures is fitted with fire dampers as detailed above to the fire rating of that structure.

Dampers shall be air diffusion manufactured, or equal and prior approved.

57.13 TESTING AND COMMISSIONING:

This Specialist shall include for testing and commissioning the entire ventilation and air conditioning system as specified. This Specialist shall submit to the clients representative a documented commissioning report containing the following items:-

- Volume flow rate of each extract fan.
- Resistance of each supply and extract fan.
- Running current and overload setting of each fan.
- Speeds of each fan.

On completion of the works all dirt, dust, etc. shall be removed from the plant and equipment. The installation shall be completed to the satisfaction of the Engineers.

57.14 IDENTIFICATION:

This Specialist shall include for identifying and labelling ductwork, and all equipment in accordance with B.S. 4800 including colour bands and directional arrows as necessary.

57.15 THERMAL INSULATION:

NOT REQUIRED

57.16 EXTERNAL LOUVRES / ROOF COWLS:

This Specialist shall include for the supply and installation of all external Louvres / roof cowls as detailed on relevant drawings and as scheduled in this specification.

57.17 FUME CUPBOARD

The following describes the acceptable solution of supply of a semi mobile fume cupboard. Alternative manufacturers are acceptable as long as they meet all performance & quality criteria subject to approval. This Specialist shall include for the supply and installation of a semi mobile ducted fume cupboard installation as manufactured by SafeLab model Airone 1000DS as scheduled herein c/w with matched docking station & acid resistant fume extract fan with duty of 0.175 m³/s against 50Pa.

ELEMENT 58 - THERMAL INSULATION

58.0 GENERAL

In deference to the Engineer normally specifying the preferred Insulation Specialist, it is expected that Tenderers will have better local knowledge of Insulation Specialist available. The requirements of this specification shall be taken into consideration so as to provide a neat workmanlike and efficient installation, normally expected of a first class installation.

The Specialist appointed will be deemed to be competent in the Air Conditioning and Heating Industry and will be responsible for the complete insulation installation and conversant with the services applicable ie proper vapour sealing procedures and protection of hot surfaces for thermal retention and protection of against burning should the surfaces be touched.

The Engineer will closely inspect the insulation applied during installation and finally, if insulation below the standards is applied, without question it shall be removed and reinsulated to the satisfaction of the Engineer.

If the insulation work continues to be unsatisfactory, alternative arrangements shall be made to complete the installation to the satisfaction of the Engineer.

Allowing for the freedom of choice of a specialist, the works must be maintained on programme to the satisfaction of the main contractor. The management of the insulation works shall not be regarded as a separate issue.

At the time of tendering, the name of the firm who will be carrying out the insulation work shall be stated in the appropriate appendix.

The Specialist shall be acquainted with the hours of work and with all the site conditions, storage facilities provided and any other salient facts, which effect the insulation installation, including expected programme, features of inaccessibility and access to works installed.

The insulation specialist shall confirm to the Engineer the type and thickness of insulation to be applied before commencement of the work.

58.1 BOILERHOUSE, TANK AND PLANTROOMS (INC. HWS CALORIFIER)

In these locations pipework and fittings shall be insulated with Class 'O' faced finish to BS 3958 Part 4 rigid fibreglass pipe sections similar to fibreglass crown preformed pipe sections or equal to approval. Pipe sections shall be split along one side only and shall have a plain finish and shall be secured to the pipework with copper wire at 150 mm centres.

The finish to this insulation shall be Class 'O' faced finish to BS 3958 Part 4 secured with tape, fitted so as to shed water in accordance with the manufacturer's recommendation.

Calorifiers to be supplied pre insulated.

Boilers shall be provided with fitted insulation jackets by the boiler manufacturers unless detailed otherwise in the particular specification.

All valves of sizes 32 mm and above will be insulated with proprietary jackets with Velcro fittings of the same thermal insulation value as the pipework insulation.

Bends will be neatly and accurately mitred to provide a smooth surface to the insulation and shall be of the same insulation value and finish as the pipework insulation.

All flanges will be insulated as with valves. At flanges and flanged valves the pipe insulation should be neatly cut back at each side of the fitting and provided with plastic end caps to

prevent deterioration to the insulation and access to the fitting. Removal of the preformed sections around the fitting must not disturb the pipe insulation.

58.2 INTERNAL PIPEWORK INSULATION

Pipework and fittings which is concealed in floor ducts, vertical service ducts, false ceilings, roofspaces, wall chases, behind or below built-in furniture or where shown on the drawing and which is not subject to dampness shall be insulated using:-

Preformed sections of rigid mineral wool incorporating an aluminium foil laminate cover shall be provided to the pipework. All bends, tees, valves and connections shall be insulated. These sections shall be split along one side only, shall be provided in 1200 mm lengths and the longitudinal joints of the canvas shall be pasted down neatly with a suitable adhesive as recommended by the manufacturers. Butt joints shall be sealed with 100 mm wide self adhesive white lacquered dead soft aluminium foil tape. When the adhesive is dry aluminium bands shall be fitted at 300 mm centres.

Flexible glass wool or rock wool sections to BS 3958 Part 3 Flexible section shall be faced on one side with 25 mm mesh x 0.711 mm galvanised wire netting and shall be secured to the pipework and fittings with continuous wire stitching.

Exposed internal insulated pipework and fittings as called for in the particular specification shall be insulated as 2.5.1 above only that the sections shall incorporate a white PVC finish. The longitudinal joints of the finish is to be sealed as recommended by the manufacturers with 100 mm wide PVC self-adhesive tape being fitted at butt joints, bends and tees.

58.3 COLD WATER STORAGE TANK INSULATION

The cold water storage tank will be pre insulated

58.4 THICKNESS OF INSULATION ON PIPEWORK

A required thickness of insulation will be applied to the various service pipes in accordance with section 5 of BS 5422 as detailed in the tables following. The thickness refers to the insulation only and does not include any hard setting compound or finish to the insulation.

These tables are based on insulating material with a nominal density of 72 Kg/m³ and a thermal conductivity of 0.041 W/mK at 100°C.

RECOMMENDED THICKNESS OF INSULATION FOR CENTRAL HEATING AND DOMESTIC HOT WATER SERVICE INSTALLATIONS SERVED BY OIL FIRED OR GAS FIRED BOILER PLANT

OUTSIDE OF PIPE (mm)	HOT FACE TEMPERATURE °C (with still ambient air at 20°C)			
	DOMESTIC HOT WATER		CENTRAL HEATING	
	60	75	100	150
17.2	25	19	25	32
21.3	25	19	25	32
26.9	25	25	25	32
33.7	32	25	32	32
42.4	32	25	32	32
48.3	32	32	32	32
60.3	32	32	32	38
76.1	32	32	32	38
88.9	32	32	32	50
114.3	38	32	38	63
139.7	50	32	50	63
168.3	50	32	50	63
219.1	50	50	50	75
273.0	50	50	50	75
323.9	50	50	50	75
and above	Mm	mm	mm	mm

58.5 PAINTING AND IDENTIFICATION OF PIPEWORK

All steel pipework shall be wire brushed and given two coats of red oxide paint prior to insulation. Where exposed to view, one primer coat, one undercoat and two gloss coats of gloss oil based paint suitable for the temperature application to the engineers colour specification.

58.6 VALVE LABELS AND VALVE CHARTS

All valves supplied and fitted by the contractor, excluding heating surface control valves, shall be provided with circular traffolite labels with black lettering on a white background. The contractor shall also supply in triplicate and mounted on hardboard, a schedule of all valves indicating their function and the service each valve controls. The schedules shall be heat sealed and one of these schedules shall be fitted in a hardwood frame with a glass front and mounted in the boilerhouse. The other two schedules will be handed to the Engineers for the Client's use.

ELEMENT 62 - ELECTRICAL INSTALLATION

62.0 GENERAL

All electrical wiring in connection with the mechanical installation shall be carried out as part of these works. All wiring shall be carried out by RECI contractor and when complete shall be tested to the requirements as indicated in IS 10101. Refer also to electrical installation specification.

62.1 MECHANICAL WIRING

All power wiring and controls wiring associated with the works shall be carried out by a registered Electrical contractor under this sub-contract irrespective of individual items being listed below or shown on relevant drawings. It is the express responsibility of the contractor to ensure all electrically connected items are wired in accordance with manufacturers & controls specialist requirements and no additions will be entertained due to failure of the contractor to communicate correctly

Wiring shall be carried out in PVC/SWA/PVC cables plus 16 mm² CPC as indicated on the drawing from a SP&N switchfuse on the main switchboard terminating in a TP&N isolator located adjacent to the boilerhouse control panel. Isolators or equal & approved, to be as manufactured by Simplex from their Century Range. The electrical sub-contractor shall allow for all alterations to the existing switchboard to accommodate the new switchfuse. Sub-mains cable shall be concealed where possible, if this is not possible, it should be clipped at high level.

- Sensors. Wiring shall be carried out in 2 x 2.5 mm² FP200 cables on cable tray terminating in a 13 amp spur unit located adjacent sensor. Final connection shall be from the spur unit to the connection point on the sensor.
- Motorised valves controlled from room sensors. Wiring shall be carried out in 2 x 2.5 mm² FP200 cables on cable tray terminating in a spur unit located adjacent valve. Final connection shall be from the spur unit to the connection point on the valve.

All electrical wiring needs shall be communicated to the electrical contractor by the mechanical contractor

62.2 SENSORS

The electrical sub-contractor shall wire and connect a number of sensors as indicated on the drawing. Wiring shall be carried out in 3 x 2.5 mm² PVC cables in conduit from a 10 amp SP&N way in the distribution board terminating in a 13 amp SP&N connection unit located adjacent sensor. Final connection shall be from the connection unit to the connection point on the sensor.

62.3 BONDING EARTHING AND TESTING

All bonding, earthing and testing to be carried out to sections 5 and 6 of the National Rules for Electrical Installations, Second Edition.

ELEMENT 65 - CONTROLS INSTALLATION

65.0 GENERAL

Existing central controls are to be retained

The extent of the controls installation shall be a single 2 port 25mm valve linked to a digital thermostat in the science room to allow temperature adjustment within the room

The controls installation is generally outlined on the drawings and as scheduled herein.

All electrical cabling associated with the heating plant shall form part of the contract. All other cabling e.g. ventilation shall be completed as part of the electrical services sub-contract.

It shall be the responsibility of the contractor to ensure the correct information is given to the Electrical Sub-Contractor in time for the work to be completed as programmed by the Main Contractor.

ELEMENT CT - INSPECTION, TESTING AND COMMISSIONING INSTALLATION

CT1.0 INTRODUCTION

The purpose of this Section of the Specification is to ensure that all Materials and Equipment are in 'As New' Condition on completion of the Contract and operate to the entire satisfaction of the Consulting Engineer when commissioned.

- (a) All materials and equipment to be checked on delivery to ensure that they have not been damaged during transportation.
- (b) All materials and equipment are to be fully protected, both during storage and after installation.
- (c) Tests are to be carried out as described in this Specification, in accordance with the Manufacturer's recommendations or to the requirements of the relevant British Standards where test parameters are not specified.
- (d) Before commissioning all materials and equipment are to be thoroughly cleaned of all foreign matter.
- (e) The completed installations are to be fully commissioned to ensure that they operate to the satisfaction of the Consulting Engineer.

All individual items of Plant are to be commissioned in accordance with the Manufacturer's recommendations.

All specialist items of equipment are to be commissioned by the Manufacturer's Engineers or their appointed representatives.

- (f) All necessary equipment and instrumentation for the complete Testing and Commissioning of All Systems, Plant and Equipment is to be provided by the Contractor.

The following equipment to be available during Commissioning and where necessary during the Defects Liability Period for further tests or adjustments which may be found necessary.

All instruments must have current calibration certificates authenticated by BSRIA.

- (i) Manometers for setting balancing valves, as detailed elsewhere in the Specification.
- (ii) Electronic Digital Readout Thermometer suitable for space, air, water and surface temperatures.
- (iii) Thermograph Recorders (2 off)
- (iv) Sound meter with a range of 20 - 100 dB across the frequency range
- (v) Hydraulic test pump
- (vi) Pressure gauges
- (vii) Tachometer

Tests shall not proceed and the systems shall not be deemed to be complete unless the

above equipment has been produced at least 3 weeks prior to commencement of the tests and that each instrument has a current calibration certificate.

CT1.1 INSPECTION

All materials and equipment are to be tested immediately they are received on site to ensure they have not been damaged during transportation.

- (a) Any materials and equipment found to be damaged or unsuitable in any way for inclusion in the installation are to be returned to the manufacturers and replacements obtained.
- (b) If the condition of any materials or equipment is doubtful they are to be inspected by the Consulting Engineer and, if in his opinion they are unsuitable, they are to be replaced.
- (c) Any materials installed by the Contractor and subsequently found to be unsuitable are to be removed and replaced at the Contractor's expense.

CT1.2 PROTECTION

All materials and equipment whether in storage or installed to be fully protected as follows:

- (a) Protection is to be provided to prevent any form of mechanical damage.
- (b) All equipment is to be protected against the ingress of dust and other foreign matter.
- (c) Where applicable, materials and equipment to be protected to ensure there is no deterioration due to corrosion.
- (d) All iron pipework is to be painted either before or immediately after erection with two coats of Red Oxide or other approved protection paint.

Painting or other materials and equipment is to be carried out as specified elsewhere in the Specification.

- (e) During erection of pipework all open ends are to be fitted with blank plugs or flanges on the cessation of work for periods in excess of 24 hours.

Paper, wooden or plugs made of other waste material are unacceptable.

- (f) Fragile equipment, the casing of Plant Items, such as boilers, etc metal cladding or insulation and any other materials subject to damage are to be fitted as late as possible during the Contract.

CT1.3 CLEANING

All materials, equipment, plant, etc to be thoroughly cleaned before commissioning as follows:

Pipework

All water carrying pipework to be completely flushed out as described in the following clauses and where specified elsewhere to be chemically treated to prevent scaling, corrosion and microbiological fouling.

Heating distribution pipework to be flushed out as follows:

- (i) Fill system with water and allow to stand for as long as possible, but for a minimum period of 48 hours for water to soften inclusions and O to attack mill scale.
- (ii) Open all circuits, with 3-way valves, by passing heat exchangers of small bore and run pumps for a minimum period of 24 hours. Clean all strainers frequently, initially every 30 minutes.
- (iii) Stop pumps, open drain cocks, clean strainers thoroughly and, if necessary, remove heavy foreign bodies from plant via manholes.
- (iv) Operate controls so that all heaters are in circuit, run pumps and note discharge pressures. Stop the pump and close (temporarily) all feed and open vents.
- (v) Re-start pump and crack open the discharge flushing valves. Restore the pump discharge pressure by opening the inlet flushing valve. Continue opening both flushing valves successively until discharge valve is fully open and pump discharge head is at original level.
- (vi) Continue flushing until discharge water is clear. Operate controls between extreme positions to ensure that no pockets of dirty water remain.
- (vii) Dose system with a chemical corrosion inhibitor similar to Fernox or equal to approval to the appropriate concentration as advised by the manufacturer. The contractor shall provide documentary evidence that the system has been dosed.

Plant and Equipment

All dust, dirt, rubble and other foreign matter is to be removed from the exterior and interior of all Plant and Equipment.

- (i) Coarse dirt to be removed by brush with fine dust being removed by an Industrial Vacuum Cleaner.
- (ii) Painted or other finished surfaces on Panels, Pumps, etc to be cleaned with a suitable cleaning agent to ensure that these are in an 'As New' conditions of handover.

CT1.4 TESTING

All materials and equipment and the various installations are to be fully tested in accordance with this Specification, the Manufacturer's recommendations and/or the relevant British Standard.

- (a) The Contractor to be responsible for ensuring that all required inspections and testing during manufacture, installation or on site are arranged at mutually convenient times

allowing reasonable notice, this normally to be a minimum of one week.

- (b) Test Certificates to be provided for all equipment etc as called for in the Specification.

Test Certificates to show the actual test operating duty as well as the test figures.

- (i) In the case of coils, calorifiers, etc the actual pressure drop through the appliance is to be included on the Certificate.
- (ii) Actual performance curves for all fans and pumps are to be provided.

CT1.5 TESTING (LPHW & PLUMBING)

Low pressure hot water heating and plumbing pipework to be hydraulically pressure tested to a pressure of 5 bar or twice the working pressure, whichever is the greater.

- (a) These pressures to be maintained for a period of two hours in the presence of the Consulting Engineer.
- (b) Defects to be repaired and the test re-applied.
- (c) Gauges to be accurate enough to ensure no over-pressurising of the attached equipment.

Prior to commencement of the test the Mechanical Sub-Contractor shall submit to the Engineer for his approval, a marked-up print of the "as installed" drawing and a marked up print of the Engineer's design drawing indicating the extent of the test.

As well as this, he shall submit a typewritten test sheet with the following information:

- (a) System
- (b) Test number or reference
- (c) Proposed test pressure
- (d) Expected duration of test
- (e) Pressure limits of connected equipment
- (f) Date and time of commencement of test

CT1.6 PRE-COMMISSIONING CHECKS

Pre-Commissioning checks as recommended by the manufacturers and as described in the various CIBSE Commissioning Codes are to be carried out to the satisfaction of the Consulting Engineer. Checks to include the following:

- (a) A visual check to be made of all installations, plant and equipment to ensure that they are clean and in a fit state to run.
- (b) Where applicable lubrication is to be checked.
- (c) Control and safety mechanisms are to be checked to ensure correct operation.
- (d) All guards and other safety devices must be in position and correctly fixed.
- (e) Electric motors to be checked for correct rotation.
- (f) Belt drives to be checked for correct alignment and tension.
- (g) Fire and regulation dampers to be in the fully open position.
- (h) When pipework systems are ready for commissioning the Chemical Dosing and

Treatment of the Water Contents is to be carried out as specified elsewhere in the Specification.

- (i) Prior to commissioning the Contractor is to provide the Consulting Engineer with 'As Installed' Resistances for all pumped water systems and for all supply and extract fan systems.

Three resistances are to be calculated on the actual installed pipework and ductwork arrangements in order that final pre-commissioning checks can be carried out on all pump and fan duties.

CT1.7 COMMISSIONING

The various installations and all associated plant and equipment to be commissioned to the satisfaction of the Consulting Engineer, and as described to ensure that the installation operates in conformity with the requirements of the Design Specification. Commissioning shall be carried out by a specialist company such as Total Fan Services Limited under the direction of the mechanical sub-contractor. Only experts in the field of commissioning shall be used and if they are not acceptable to the Consulting Engineer the mechanical sub-contractor shall provide such personnel and equipment who are acceptable to the Engineer. Copies of all of the proposed test sheets shall be submitted to the Engineer for approval before commencing commissioning.

LPHW Heating Installation

All LPHW heating pipework to be balanced using the special balancing valves, test plugs, etc specified elsewhere in the Specification.

Control Installation

All controls to be tested set and fully commissioned to provide the specified conditions.

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

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

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

Complete records of all flow rates, velocities, pressures, speeds, damper and valve fittings, etc to be kept by the contractor, two copies of which are to be handed over to the Consulting Engineer on satisfactory completion of commissioning.

The Contractor shall also record all control settings, duplicate copies of which are also to be provided to the Consulting Engineer.

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

The manufacturers, their representatives or specialist contractors are to be present during this demonstration.

After completion of commissioning and the demonstration to the Consulting Engineer, the Contractor to arrange a further demonstration of the operation of each installation or system

of the Client's staff.

Demonstrations to be of sufficient duration to ensure the Client's staff have full knowledge of the operation of the installation or system and are fully competent to operate same correctly.

CT1.8 COMMISSIONING (LPHW INSTALLATION)

The LPHW installation and associated boiler plant to be commissioned in accordance with CIBSE commissioning codes 'B' and 'W' and with the following:

- (a) Circulating pumps to be checked for correct operation and duty.
- (b) Pipework gradients to be checked to facilitate correct venting.
- (c) All pipework circuits to be balanced using the balancing valves and self-sealing test plugs, as described elsewhere in the Specification.
- (d) Ensure correct water quantity to all Plant items.
- (e) After commissioning all strainers to be cleaned out.

CT1.9 COMMISSIONING (CONTROL INSTALLATION)

The complete control installation is to be fully commissioned in accordance with CIBSE Commissioning Code 'C' by the controls manufacturer to ensure that the system operates to the fully intention of the specification.

- (a) Each component to be checked for correct operation.
- (b) Each control system to be checked to ensure it is performing the intended control function.
- (c) Where a control system can be affected by winter and summer temperatures and humidity differences, recommissioning as required to be carried out during the following seasons.
- (d) After all controls have been commissioned the set points or conditions are to be recorded and duplicate copies of these records handed to the Consulting Engineer.
- (e) Due to the complexity of the control system the contractor to include for as many visits as necessary by the control specialist (during the commissioning period and the defects liability period) to ensure the correct operation of all controls.
- (f) After the controls have successfully commissioned the complete control system is to be demonstrated to the Consulting Engineer to prove that each control function is operating as intended.

The operation of the control system is also to be demonstrated to the client's staff.

CT1.10 OPERATING AND MAINTENANCE INSTRUCTIONS

At least one week before handover the following instructions, certificates, etc are to be provided by the Contractor.

- a) Four copies of Operating and Maintenance Instructions for all installations, plant and equipment.

- (i) These instructions are to be contained in loose leaf stiff covered manuals with each sheet bound in clear plastic.
 - (ii) The operating instructions for each of the installations are to be written specifically for this contract and are to be in the form of simple step by step instructions on starting, operating and stopping each installation.
 - (iii) Also to be included in these Manuals are:
 - List of all suggested spares
 - Copy of Manufacturer's maintenance recommendations
 - Planned maintenance programme
 - Copy of Maker's Test Certificates
 - Emergency procedure on failure of operation
 - Summary of suppliers, listing names, addresses and telephone numbers
 - Telephone numbers for emergency call-outs
 - (iv) A draft copy of this manual to be submitted to the Consulting Engineers for approval.
- (b) Four copies of all Commissioning Records.

SCHEDULE OF MECHANICAL SERVICES EQUIPMENT



SCHEDULE 1

SCHEDULE OF FANS

Description

In line & centrifugal acid resistant fans manufactured in propylene matched to the fume cupboard manufacturer- all as detailed on relevant drawings

SCHEDULE 2

SCHEDULE OF RADIATORS

Description:

The Radiators shall meet the following criteria:-

- Panel radiator to have steel thickness of 1.5mm
- Panel radiator to have 1mm or less gap between the tubes
- Fins are to be laser welded to steel tube to ensure maximum contact with the steel tube panel
- Panel radiator to have a standard test pressure of 13 Bar with an operating pressure of 10 Bar
- Outputs are to be tested in accordance with EN14037.
- Standard RAL 9016
- Outputs over 3500watts are to automatically come with ¾" connections as standard to make sure correct flow rate is achieved to give maximum output
- Panel radiator to come with choice of connection possibilities incl. BOE, TBOE and BOE vertical from underneath
- Radiant panels are to be as Runtal Carboline recessed & insulated panel integrated with ceiling system c/w 15mm f&r connection. Complete with matching suspension kit

Accessories: Lockshield valves as Myson full flow, Hattersley, Hertz or equal and approved.

SCHEDULE 3

GAS SAFETY SYSTEMS

Description

Where detailed on relevant drawings and as noted on relevant drawings provide gas safety systems consisting of the following to each science room

Manual Knock Off Button
Pressure Proving Panel
Slam Shut Valve
Control Panel
Fire Alarm Link

The system shall be to match the existing systems on site or equal & approved specifically for use in schools with automatic reset in event of fire alarm activation

Quantity	3 No
	Science Room
	Prep Room
	Demo Room

SCHEDULE 4 SEMI MOBILE DUCTED FUME CUPBOARD – or equal & approved



Airone 1000DS Semi-Mobile Ducted Fume Cupboard

Tested by CLEAPSS the new Airone 1000DS Semi-Mobile Ducted Fume Cupboard has been designed to comply with BS EN14175 for ducted fume cupboards and Building Bulletin 88 from the Department for Education and Employment.

The intelligent design of this cupboard creates a fully ducted system which is semi-mobile. The Airone 1000DS' design has two major advantages:

- 1 The teacher and pupils are protected from the effects of the substances being used as harmful fumes/irritants are removed at their source and ducted away from the classroom environment entirely to atmosphere.
- 2 Easily stored to the side of the room the cupboard can be wheeled into an open position for demonstrations. With 360° visibility everyone can see what is happening and the teacher is facing the class as the demonstration takes place.



The Airone 1000DS boasts a wealth of benefits

- Air By-pass System
- Sliding Front Sash
- Low Airflow Alarm
- Large Front Aperture
- Integral Storage Cupboard
- Restraining Stainless Steel Tether
- No Replacement Carbon Filter Costs

Options

- Remote Gas Service
- Remote Water Service Including Drip Cup and Bottle Trap
- Electrical Socket
- Cast Epoxy or Stainless Steel Tray



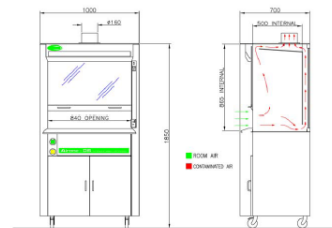
Technical Specification

Construction

Epoxy Coated Mild Steel Carcass	Safety Glass Sides & Rear Panel
Clear Back Baffle & Top Panel	Counterweighted Front Sliding Sash
Polypropylene Spillage Tray	Profiled Aluminium Aerofoils
Stainless Steel Cill	Restraining Stainless Steel Tether

Specification

Average Inflow:	0.4 m/s
Min Working Aperture:	200mm high
Max Working Aperture:	365mm high
Voltage:	230V 50Hz 1ph
Duct Spigot:	160mm
Gas & Water Services:	Quick release connectors and flexible hose



Dimension Drawing
Including
Airflow Diagram

A one year manufacturer's warranty is supplied with the Airone 1000DS cabinet. COSHH Regulation Nine stipulates that this type of equipment should be tested and calibrated at intervals of no greater than 14 months to ensure continued safe operation.

So that compliance with this mandatory requirement is achieved Safelab can provide full testing and routine servicing of fume cupboards which is the key to sustained safety, reliability and economy.

Call Safelab Service on: 01934 421 340.

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Note Unit to be provided with matched docking unit – Model