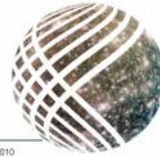


**New Plumbing Workshop
Banagher Further Education Training Centre, Main Street, Banagher,
Co. Offaly**

**Volume A.2.3
OF THE WORKS SPECIFICATION**

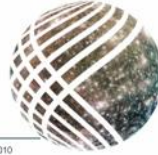
Mechanical Services Particular Specification

Tender Issue (T1)



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Part 1: Preliminaries & General Items

1.1 Introduction and Intent

The intent of this specification and the contract drawings issued is to describe and provide for a complete, fully tested, and operational mechanical services installation. The Contractor is advised that the work to be executed as described in these documents shall be complete in every detail, notwithstanding that every small individual item involved may not be specifically mentioned or described.

The Contractor shall allow for all materials, accessories, and labour necessary for an entire and functional installation and shall not avail of any unmentioned error or omission should such exist. The works entail the mechanical installations, fit-out, and refurbishment of the new Plumbing Workshop at Banagher Further Education Training Centre.

All works shall strictly follow all relevant Building Regulations, Irish Standards, British Standards, CIBSE Guidelines, and Good Engineering Practices. The Contractor shall ensure all necessary flexibilities and engineering resources are available to the project to meet active construction deadlines and design programmes. The Contractor shall take all reasonable care to ensure all site workers and visitors are not endangered by any element of their works.

1.2 Site Visit Prior to Tender Submission

The Contractor shall be deemed to have carried out a thorough site visit prior to the completion and formal return of his tender to ascertain for themselves the full extent, routing variables, and physical nature of the works. The Contractor shall ensure that all installation factors, local site conditions, and architectural constraints are fully taken into account, allowing for what items are necessary in order to complete the installation and to leave same in a complete working condition to the absolute satisfaction of the Employer's Representative.

No extras, retrospective claims, or cost variations shall be allowed for additional work that could have been easily ascertained by visiting the site during the tendering window. Tenderers shall note that no claim in respect of lack of knowledge of prevailing site conditions, builders work, or existing services can be considered. The tender drawings are based on the best information available at the time of preparation and by visiting the site the contractor shall satisfy himself of the exact extent and nature of works involved.

1.3 Standards, Acts, and Regulations

Unless specifically stated otherwise, or approved in writing by the Engineer, all execution methods, raw materials, and mechanical plant shall be in accordance with the relevant Irish, European, International, and British Standards and Codes of Practice, whether

indicated in this Specification text or not. The mechanical services installation shall fully comply with:

- The Safety, Health and Welfare at Work Act, 1989.
- Requirements of the Health and Safety Authority (HSA) / S.I. 138.
- Requirements of the local Fire Officer.
- All Irish Building Regulations including Building Control (Amendment) Regulations (BC(A)R), S.I. 9 of 2014.
- Factories Act / Statutory Instruments.
- Chartered Institute of Building Services Engineers (CIBSE) Application Guides.
- Standard BCGA Code of Practice CP4 and CP5 for industrial gas systems.
- The Tender Drawings and Contract Preliminaries.

The tender figures must be based on the Acts and Regulations current on the date for the return of tenders. If these legislative acts or building regulations are amended after that date, the Contractor shall inform the Engineer immediately.

1.4 Setting Out of Works and Coordination

The Contractor shall set out the whole of the mechanical works and be held individually responsible for the correctness of the spatial positions, levels, and dimensions of the several lines. All openings, structural sleeves, plinths, bases, and holes to be cut or formed in the building structure shall be positioned and marked out on-site by the Mechanical Contractor in sufficient time to avoid construction delays.

The tender drawings are diagrammatic and indicative only. The Contractor shall allow for a practical layout on-site, allowing for the setting around structural obstructions and other minor modifications which may or may not be apparent from the architectural, engineering, structural, or services drawings. The exact courses and positions of all pipes, ducts, flues, cabling, conduit, trunking, etc., shall be duly laid out and marked on the job by the Contractor and approved before execution, having regard to temperature and the proximity to other services plant.

Before any works are started on site, the Mechanical Contractor shall hold formal coordination meetings with the Electrical Contractor to integrate the M&E installations. No adjustments will be made to the contract sum where additional work is required due to poor inter-trade coordination.



1.5 Conflict Between Documents

In the event of there being an apparent conflict or contradiction between the drawings and this specification, the tenderer shall obtain formal clarification from the Engineer before submitting his tender. Failure to do so will be deemed to imply that the most onerous, rigorous, and expensive requirements have been included for within the returned tender price.

Claims raised post-tender in relation to contradictions shall not be entertained, and the onus remains with the contractor to highlight any such design issues during the tendering period. This in no way overrides the order of precedence of information as defined within the contract. Plant and equipment which is installed and which conflicts with existing work or installations will be removed and reinstalled without expense to the client by the Contractor.

1.6 Materials and Workmanship

All materials used in the works shall be new, fit for the use for which they are intended, and suited for the environmental conditions in which they are to operate. All construction products must bear a clear CE mark in accordance with the provisions of the Construction Products Directive (89/106/EEC) and adhere to the following:

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

The mechanical installation shall be carried out and maintained in the best, most substantial, and workmanlike manner by fully qualified, competent tradesmen. Workmanship shall comply with British or Irish Standards and the relevant codes of practice. No lines, services, or drains shall be hidden, bricked in, or covered up prior to formal inspection and witness sign-off by the Employer's Representative. Wherever a proprietary name is used to specify a material, it shall be deemed to have the term "or equal equivalent" appended to it, indicating the standard of construction, durability, and appearance acceptable to the client.

1.7 Plant Warranties and Liability for Defects

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

Works showing operational defects or physical damage, whether caused by negligence on behalf of the Contractor or not, discovered during the progress of the works or within the subsequent defects liability period, shall be made good by the Contractor at his own expense. On refusal to do so, the Employer shall be entitled to carry out the work necessary and recover the expenses associated with such work. Allow for maintaining the complete installation in perfect condition for a period of 12 months after the issue of the Certificate of Substantial Completion.

1.8 Conditions of Site and Property Damage

The Mechanical Contractor shall note that any damage caused to the existing walls, doors, ceilings, windows, floor coverings, external yards, main entrances, grassed areas, access roads, or paved areas arising during the construction stage of the project and caused by construction works, transport vehicles, or installation staff, is to be made good to the satisfaction of the Client at no extra cost. The Contractor shall provide all necessary protection to existing paved, grassed, and landscaped areas around the site.

The work is not to interfere in any way with public roads. In particular, the roadways are to be left free of all dirt, debris, and builder's materials, and shall be thoroughly cleaned as and when required. Any damage caused to surrounding public or barracks roadways shall be made good to the satisfaction of the Local Authority or Client at the Contractor's expense. The Contractor shall pad ladders, protect surfaces, and shield finished elements so that the structure is not stained by oil, grease, or tool scores. Remove all rubble and waste as it arises to keep the site clean, safe, and tidy.

1.9 Trade Union Rates and Agreements

The Contractor must be in full compliance with all relevant Trade Agreements and shall pay all employees connected with the mechanical project current trade union rates of pay. If the Contractor appoints approved sub-specialists to complete specific elements of work, they too shall be compliant with current trade union agreements. This will be actively monitored on-site, and all employees and sub-contractors must carry their union cards on them at all times.

1.10 NZEB/BER Compliance

This building needs to be Net Zero Energy Building (NZEB) compliant. An NZEB compliance report and calculation has been carried out for this project based on all the plant, equipment, and materials as specified below. The Contractor shall ensure that all specified items are installed exactly as described.

If the Contractor proposes alternatives, they must ensure that these items match the specified criteria. If the Contractor installs any item that isn't an equivalent or isn't formally approved by the Engineer, they shall be required to carry out an individual NZEB/BER assessment at their own expense. If the alternative plant and materials do not

match and the NZEB assessment does not pass, the Contractor will be liable for removing the item and replacing it with the specified equipment to ensure NZEB compliance.

1.11 Building Control Regulations (BC(A)R)

All works shall be carried out to the new Building Control (Amendment) Regulations (BC(A)R), S.I. 9 of 2014. The Contractor shall allow for the following obligations across all contract stages:

- **Commencement Stage:** Familiarise themselves with the drawings, specifications, and documents lodged with the Commencement Notice. Ensure a competent person is assigned to oversee construction works.
- **During Construction:** Install the services and construct the building in accordance with the plans and specifications. Ensure workmanship and selected materials comply fully with the Building Regulations. Co-operate with the design team, Assigned Certifier, and other certifiers for the implementation of the site inspection plan. Give the Engineer at least 5 days' notice to carry out any necessary inspections. All services to be hidden or concealed shall be left exposed until inspected. Prior to closing up services in walls, ground, or attics, all tests shall be completed and signed off.
- **Upon Completion:** Sign the Certificate of Compliance (Completion). Provide the Assigned Certifier with all technical documentation, confirmations, and test certificates required to collate particulars for handover, certification, and submission to the Building Control Authority. Maintain all project records. No cost variations will be accepted for time delays or opening up for inspections if these procedures are not strictly followed.

Part 2: Section 14 Mechanical Installations

All pipework runs must be measured linearly. Rates must include all inline fittings such as bends, tees, and reducers. Do not quantify or price these inline fittings separately.

2.1 System Categorisation: Domestic Water Services (CWS/MWS/HWS)

Pipeline Infrastructure (ARM Linear Measurement Rule)

28mm Mains Water Supply (MWS) Line: Copper pipework to I.S. EN 1057:2006 running from the incoming underground site boundary public supply connection, rising

through the structure to the attic vault zone as shown on Drawing No. 2512-CCE-00-ZZ-DR-M001 and site layout Drawing No. 2512-CCE-00-ZZ-DR-S002. Measured linearly over all fittings.

22mm Mains Water Supply (MWS) Link: Light-gauge copper feed line routing from the 28mm main directly into the internal cold water storage tank ball-valve assembly as shown on Drawing No. 2512-CCE-00-ZZ-DR-M001. Measured linearly over all fittings.

15mm Mains Water Supply (MWS) Booth Drops: 14 individual vertical copper drops serving the training plumbing booths as layouted on Drawing No. 2512-CCE-00-ZZ-DR-M001. Drops must terminate exactly 1200mm above finished floor level (AFFL) complete with a chrome-plated mini ballofix isolation valve or equal equivalent and a temporary capped test connection. Measured linearly over all fittings.

22mm Cold Water Service (CWS) Header: Boosted copper distribution loop feeding utility wash basins, changing facilities, and workshop sinks as structured on Drawing No. 2512-CCE-00-ZZ-DR-M001. Measured linearly over all fittings.

15mm Cold Water Service (CWS) Branch: Copper supply line branching from the header to serve the WC cistern assembly as configured on Drawing No. 2512-CCE-00-ZZ-DR-M001. Measured linearly over all fittings.

15mm Hot Water Service (HWS) Feeders: Copper pipelines extending locally from decentralized undersink electric cylinders to paired tap sets as detailed on Drawing No. 2512-CCE-00-ZZ-DR-M001. Limit maximum dead-leg path lengths between any water heater and its blended outlet point to 300mm to comply with anti-legionella stagnancy guidelines. Measured linearly over all fittings.

Installation, Jointing & Supporting Specifications

Incoming Connection Survey: The existing incoming mains water supply pipework entering the building is installed in High-Density Polyethylene (HDPE) plastic pipework. The Mechanical Contractor shall carry out a comprehensive survey of the existing mains routes, isolation valves, and pipework prior to cutting in. Isolate the supply, take a new connection off the existing HDPE line, and install a new main isolation valve at the connection point as shown on site layout Drawing No. 2512-CCE-00-ZZ-DR-S002.

Copper Tube Quality: All copper tubes shall be Irish manufactured, CE marked, and compliant with I.S. EN 1057:2006 (Material Grade Phosphorus de-oxidised copper; Cu-DHP or CW024A as defined in BS EN 1976). Minimum copper content must be 99.90%, with phosphorus between 0.015% and 0.040%. Tubes must be of uniform thickness, smooth, clean, and free from internal or external defects.

Jointing Method: The whole of the internal copper pipework shall be bronze welded using approved flux and phosphor bronze filler rods (typically 95% copper, 4.5% tin, 0.5% phosphorus) or brass rods (60% copper, 40% zinc with silicon/phosphorus).

additives) to prevent oxidation. Soft solder, silver solder, and standard mechanical compression fittings are strictly prohibited.

Bends and Support Spacings: Pipe bends up to 38mm shall be made cold using spring bending tubes; the internal radii must not be less than 3 times the diameter of the tube. All exposed pipework shall be cleaned with emery cloth to a smooth polished finish. Pipe brackets shall be heavy gunmetal (G.M.) screw-on type, keeping a clearance from finished floor level of 100mm and a gradient of approximately 1:60 in the direction of drain flow. Anchor bolts shall be fitted at 6m intervals to control lateral movement. Fix brackets at the following linear centers:

- 15mm to 22mm bore: 1.2m spacing.
- 28mm to 35mm bore: 1.5m spacing.
- 40mm to 54mm bore: 1.8m spacing.

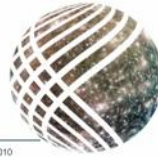
Thermal Insulation (Uniclass Pr_35_31_53): Wrap all hidden water services pipelines situated within unoccupied zones (ceiling voids, attic spaces, service shafts, furniture chasings, or false walls as mapped on Drawing No. 2512-CCE-00-ZZ-DR-M001) with rigid preformed sections of reinforced foil-backed mineral wool insulation featuring a self-adhesive overlap vapour barrier of *Isover Climpipe* or equal equivalent, or *Rocklap H&V* or equal equivalent. Apply insulation continuously over all connections, bends, tees, and valves. Exposed lines exiting walls at low level to sanitary fixtures do not require insulation. Thickness criteria:

- Pipes 15mm to 28mm diameter: 30mm thick insulation.
- Pipes 35mm to 54mm diameter: 40mm thick insulation.
- Technical baselines: Thermal conductivity of 0.033 W/mK at 10°C; full compliance with B.S. 5422:2009 and B.S. 5970:2012; fire performance achieving Euroclass A2L, s1, d0 fire rating and Class O compliance under BS EN 13501-1; aluminium foil facing meeting BS 476 Part 6 and Part 7.

Labelling and Inscriptions: After insulating, all pipelines shall be labelled with self-adhesive colour identification bands and flow arrows to BS 4800 at least once within each structural compartment and every 10m on long runs. Provide engraved steel plate labels inscribed with "Drinking Water" at each designated drinking water tap location.

Plant Equipment Schedule

W.ST/G.01 Cold Water Storage Tank (Nr 1): One Glass Reinforced Plastic (GRP) sectional cistern located in the circulation area storage deck/attic vault as positioned on Drawing No. 2512-CCE-00-ZZ-DR-M001. Nominal capacity: 225 Litres; Length: 1200mm, Width: 535mm, Height: 480mm. Model: *Tricel TW225* or equal equivalent. Features an internal divider to split the tank in two for maintenance, flanged panel thickness of



14.5mm conforming to DIN 53452/53455, an insulated heavy-duty *Format 30* polyurethane foam lid with a GRP skin, and a secure lockable hinged access hatch (minimum 610mm square). Comply with BS 3692, BS 5252, and BS 6700; all underwater bolts and tie bars must be stainless steel Grade 316 S16. Supply complete with a matching condensation drip tray, a screened air inlet vent, and 0.65mm micro-mesh rodent/insect screens on all overflow connections. Ensure a minimum of 500mm walking/maintenance clearance is maintained around all sides of the tank shell.

EWH/G.01 Undersink Water Heater (Nr 1): One compact decentralized electric storage water heater situated beneath the utility wash basin array as planned on Drawing No. 2512-CCE-00-ZZ-DR-M001. Model: *Ariston Andris10U* (or *Ariston Lux Eco* or equal equivalent). Nominal capacity: 10 Litres; Length: 360mm, Width: 298mm, Height: 360mm, Depth: 294mm. Wired to a remote 7-day electromechanical timeclock in the local electrical board. Technical metrics: 2500W power (230V, single phase), high-density polyurethane foam insulation, titanium enamelled tank, internal sacrificial magnesium anode rod, electronic thermostat, ErP Class A rating, IPX3 protection, and an ABS safety system featuring anti-overheating, anti-freezing, and dry-heating self-diagnosis. Supplied with a calibrated 6-bar expansion safety relief valve (SRV) and a 2-litre expansion vessel with an inline non-return check valve to prevent hot water backflow into the cold main. Pipe the SRV discharge to the nearest local drain point.

EWH/G.02 Undersink Water Heater (Nr 1): One compact decentralized electric storage water heater situated beneath the primary workshop sink array as planned on Drawing No. 2512-CCE-00-ZZ-DR-M001. Model: *Ariston Andris15U* (or *Ariston Lux Eco* or equal equivalent). Nominal capacity: 15 Litres; Length: 360mm, Width: 346mm, Height: 360mm, Depth: 294mm. Built to identical technical, electrical, and expansion valve trim specifications as EWH/G.01, including automatic anti-legionella cycling to 65°C, WRAS and CE approvals, and a hidden adjustable thermostat enclosure.

TMV/G.01-05 Thermostatic Mixing Valves (Nr 5): Five TMV-3 and WRAS certified thermal blending valves installed beneath sanitary wash basins and sinks as located on Drawing No. 2512-CCE-00-ZZ-DR-M001. Model: *Rada 215-t3dk* or equal equivalent low-pressure loss type. Fabricated from DXR brass nickel-plated body with a white plastic locking temperature shroud and a preset maximum exit water temperature stop locked at 43°C to prevent scalding. Complete with flat-faced union connectors terminating in 15mm compression ends, integrated isolation valves, check valves, easily removable strainers, and service-free cartridges. Suitable for a minimum dynamic supply pressure of 0.15 bar, delivering at least 0.1 Litres/second at an inlet head of 1.5m. Must comply with BS EN 1111 and BS EN 1287; connect exclusively to hot and cold distribution services (never to the mains water supply) with a maximum dead-leg distance of 200mm to the blended tap.

IV/G.01-12 Main Isolation Valves: Lever-operated main branch isolation valves shall be *Crane D171* or equal equivalent bronze gate valves as positioned on Drawing No. 2512-CCE-00-ZZ-DR-M001. Local appliance connections require chrome-plated brass screwdriver-slot ballfix isolation valves with compression ends to BS EN 1254-3, ensuring independent isolation capabilities for every individual sanitary ware item.

2.2 System Categorisation: Ventilation & Extraction (LEV) & Destratification

Equipment Schedule

VEA/G.01-14 Extraction Arms (Nr 14): 14 roof-mounted local exhaust ventilation (LEV) hood arms deployed over individual student training booths as mapped on Drawing No. 2512-CCE-00-ZZ-DR-M002. Model: *Nederman Original* or equal equivalent. Structural configuration: Diameter of 160mm, friction-stabilized extension reach length of 4000mm, and a designed capture velocity extraction air volumetric target of 800 m³/hr per hood. Supported via column brackets mechanically anchored to the structural steel uprights. System design must comply fully with Health and Safety Executive standard HSG258, Health and Safety Authority (HSA) requirements, and be fitted out by a specialist contractor.

V.CF/G.01-02 Centrifugal Extraction Fans (Nr 2): Two internally wall-mounted high-pressure centrifugal fan units handling the primary workshop exhaust loads as structured on Drawing No. 2512-CCE-00-ZZ-DR-M002. Model: *Nederman (Model 14522028)* or equal equivalent. Performance metrics: Rated total airflow capability of 5600 m³/hr against full system static resistance. Electrical profile: 4.0 kW, 208V, 3-phase, 60Hz motor block with a 90° clockwise rotation casing layout. Installed at a clear mounting elevation height of 4000mm on a bespoke steel support frame complete with rubber vibration-isolating mountings and flexible inlet/outlet sleeve connections. Casing constructed from heavy plastic material fitted with flexible rubber seals. Exhaust must discharge horizontally through the building external cladding wall via high-velocity weatherproof exit cones.

V.VSD/G.01 Fan Speed Inverter (Nr 2): Two three-phase variable frequency inverter modules to control the operational profiles of the LEV centrifugal extraction fans as connected on Drawing No. 2512-CCE-00-ZZ-DR-M002. Model: *Nederman 1452137* or equal equivalent. Fans must be proportionally commissioned via the VSD to lock in exact design flow rates.

V.DF/G.01-03 Destratification Fans (Nr 3): Three high-level thermal destratification fan units suspended from the ceiling structural steel using proprietary anti-vibration fixings as laid out on Drawing No. 2512-CCE-00-ZZ-DR-M002. Model: *Airius Model 15* or equal equivalent. Technical parameters: Diameter of 355mm, total shell height of 546mm. Operational capacity: 690 m³/hr volumetric down-draft capability running at 1230 RPM

on single-phase 230V electrical feeds. Deployed with dedicated variable speed controllers. Control circuits must be electrically interlocked with the primary LEV extraction network (via interfaces detailed on electrical schematic Drawing No. 2512-CCE-00-ZZ-DR-E004) to deactivate down-drafts when welding occurs, ensuring local thermal air currents do not disrupt the critical plume capture velocities of the primary welding hoods. Coordinate final suspension positions on site to avoid conflicts with lighting layouts and radiant heating panels.

VEF/G.01 Sanitary Extract Fan (Nr 1): One wall-mounted exhaust extractor fan serving the wheelchair-accessible WC toilet zone as shown on Drawing No. 2512-CCE-00-ZZ-DR-M002. Model: *Vent-Axia Lo-Carbon Quadra HTP* or equal equivalent. Designed minimum volumetric extract flow rate: 6 Litres/second (210 m³/hr at 70Pa static pressure). Powered via 0-10V inputs, featuring sound-absorbent casing insulation for quiet operation. Controlled via a remote surface-mounted 360° passive infrared (PIR) sensor (Model *CPFL-S* or *CPTA-E* or equal equivalent) sensitive to moving bodies, complete with an integrated 15-minute adjustable electrical overrun timer. Specific fan power must be less than or equal to 0.1 W/(l/s) (system cap at 0.25 W/(l/s)).

Ductwork and Air Accessories

Duct Manufacture and Pressure Class: All primary passive supply and extraction ventilation ducting throughout the building shall be fabricated from best quality galvanized sheet steel wide strip plate to BS EN 10142 (Grade DX51D+Z, coating type Z275). Construction, sealing, and hanging must comply with HVCA DW/144 (*Specification for Sheet Metal Ductwork*) Class B medium-pressure specifications. Designed for a positive pressure threshold of 1000Pa and a negative pressure threshold of 500Pa, ensuring a completely airtight, non-vibrating run. Main circular headers shall be routed within the false ceiling void at an approximate height of 3200mm AFFL, dropping a maximum of 300mm to terminate at grilles positioned in the suspended ceiling tiles at 2950mm AFFL as routed on Drawing No. 2512-CCE-00-ZZ-DR-M002. Outdoor uninsulated duct sections must be treated, degreased, and protected with two coats of an approved chlorinated rubber paint. Measured linearly over all inline fittings.

Ductwork Support Hanger Infrastructure: Brackets and unistrut systems for high-level ducting shall be installed at approximately 4000mm AFFL. Drop 10mm threaded rods from the roof concrete slab or purlins at rigid 500mm spacing intervals over the entire length of the duct run. Secure rods to structure using 10mm G-clamps or expansion anchor drillings. Base support beams must be constructed from 41mm double-channel steel unistrut, bolted to the threaded rods with locked nuts.

Flexible Connections: Use acoustic-insulated flexible duct connectors to couple circular spiral rigid duct headers to final ceiling grilles, inline fans, and ventilation units. Model: *Sonadec 25 AA3* or equal equivalent as supplied by *Ventac* or equal equivalent. The

maximum allowable straight length for any individual flexible hose branch link is strictly limited to 1000mm to prevent resistance losses.

Internal Grilles (EG.01-20 / PG.01-05): Supply and install circular disc exhaust valves manufactured with an adjustable central cone mechanism to regulate air paths. For main circulation areas (EG.01-16), provide 16 units with a 125mm neck diameter and 160mm overall face diameter, modelled on *KSU exhaust valves* or equal equivalent. For smaller sanitary/passive lines (EG.17-20 / PG.01-05), provide 100mm neck diameter and 125mm overall face diameter disc valves.

External Louvres: Supply and install external wall louvres featuring a solid cast aluminium metal finish, an integrated plenum box back-connection, and a Grade 316 stainless steel bird-mesh screen. Louvres for 100mm lines (EEG.01-09 / EPG.01-03) must utilize *Series CL (Model CL-100)* or equal equivalent with a 125mm neck / 140mm face. For large air paths (FAG/SAG arrays), utilize *Model CL-250* or equal equivalent with a 250mm connection spigot / 295mm overall face. All external louvres must be finished with a high-durability polyester powder coating spray-painted on site to a specific RAL colour code to match the building's external architectural masonry cladding panels.

VCD/G.01-06 Volume Control Dampers: Manual balancing dampers must be integrated across all ductwork branches as configured on Drawing No. 2512-CCE-00-ZZ-DR-M002. Model: *HVC-NCA Series 900 (Model B)* or equal equivalent for rectangular ductwork, and *Model C* or equal equivalent for circular lines as supplied by *Lindab* or equal equivalent. Constructed from high-grade aluminium blades with stainless steel jamb seals and an opposed-blade operational mechanism. Equipped with an adjusting lever, a manual position-locking quadrant, and spigot connections. Must be independently tested to DW144 Class D integrity standards at a static pressure of 2000 Pa for a minimum of 15 minutes. The final balanced position of each damper blade after regulation must be indelibly marked and scored directly onto the outer casing lever quadrant for future reference.

Identification and Labelling: Identify and label all ductwork service runs in accordance with DW/144 Appendix B using self-adhesive flexible plastic labels or stencilled permanent paint matching the BS 4800 colour designation schedule. Labels must state the duct's specific function, design air quantity (m^3/hr), air velocity (m/s), and flow arrows. Engrave rigid plastic labels (approximate size 150mm x 80mm x 1.63mm) and mechanically screw them onto all major equipment items including fans and speed drives.

2.3 System Categorisation: Above-Ground Soils & Wastes

Pipeline Infrastructure (ARM Linear Measurement Rule)

110mm Soil Stack Pipework: Heavy-gauge uPVC soil stack lines routing drainage drops from water closets through the building envelope to terminate beneath the floor slab as

routed on Drawing No. 2512-CCE-00-ZZ-DR-M003. Measured linearly over all inline fittings.

40mm Sink Waste Drainage Line: uPVC waste piping routing greywater from deep workshop utility sinks down partition walls to floor collection points as indicated on Drawing No. 2512-CCE-00-ZZ-DR-M003. Measured linearly over all inline fittings.

32mm Basin Waste Drainage Line: uPVC waste lines routing discharge away from wheelchair-accessible hand washing basins as indicated on Drawing No. 2512-CCE-00-ZZ-DR-M003. Measured linearly over all inline fittings.

Installation Standards & Trap Seal Criteria

System Design: Above-ground drainage services shall be executed as a single-stack gravity system as configured on Drawing No. 2512-CCE-00-ZZ-DR-M003. Jointing of uPVC pipes must be made with solvent-fusion sockets or synthetic O-ring coupled joints in strict compliance with BS EN 12056-2:2000 (*Codes of practice for sanitary installations*). All bends and changes in direction must utilize easy-sweep type fittings.

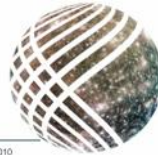
Slab Connections: This contract covers above-ground drainage works only, culminating in final connections to the underground foul network sockets provided by others at ground floor slab level. The Mechanical Contractor shall make an engineering representative available to coordinate with the Main Contractor on site to ensure the exact planning and setting out of all slab ground sockets match the dimensional footprints of the free-issue sanitary ware. Extend waste runs from these ground pop-ups to the appliances using sweep fittings.

Appliance Trap Seal Configurations: Connect fixtures to the uPVC branches using deep liquid-seal foul air traps matching the following parameters:

- Water Closets (WC): 110mm diameter connection pipework; minimum 50mm liquid trap seal depth.
- Wash Hand Basins (WHB): 32mm diameter collection pipework; minimum 75mm liquid trap seal depth.

Soil Vent Pipes (SVP): uPVC soil vent stacks shall rise vertically from the toilet zones as shown on Drawing No. 2512-CCE-00-ZZ-DR-M003. Stacks must be fitted with an approved weather-proofing flashing sleeve and an upper synthetic vermin guard grid, with final exit locations agreed with the Engineer.

Floor Gullies: Supply and install a heavy-duty floor gully as layout on Drawing No. 2512-CCE-00-ZZ-DR-M003. Gully must be manufactured from Grade 316L stainless steel, complete with a removable integrated foul air trap (Model *KFT110* or equal equivalent) and connected to the local uPVC waste system. Models as supplied by *Kent Stainless* or *Richmond Trading* or equal equivalent:



- For sheet vinyl floors: Utilize *Model KVV225/110TP* or equal equivalent featuring a circular cover plate clamped to the vinyl perimeter.
- For tiled / epoxy resin / concrete floors: Utilize *Model KVT170/110TPSQ* or equal equivalent complete with a square perforated stainless steel heel-guard grating.

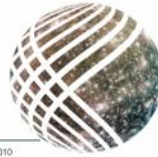
Maintenance Cleanouts: Localized cleaning doors and access eyes must be provided above the maximum appliance flood level on all main soil vent stacks and branch lines to facilitate system maintenance without destructive entry. If the Employer's Representative identifies any section as having inadequate cleaning access, the Contractor shall install additional doors at zero cost.

Fire Barrier Protection: Install surface-mounted intumescent fire collars on all plastic uPVC waste and soil lines with an outer diameter equal to or exceeding 50mm at all fire-rated wall, floor, or structural slab crossings mapped on Drawing No. 2512-CCE-00-ZZ-DR-M003. Collars must feature a heavy mild galvanized steel hinged circular shell containing a reactive intumescent compound insert mechanically anchored to the structure via fixed steel brackets. Must provide a certified 2-hour (120 minutes) thermal and smoke containment barrier tested in strict compliance with BS 476 Part 20 and EN 1366-3 (CE marked). Designed to accommodate standard non-destructive thermal pipe expansion, with an intumescent compound unaffected by ambient weathering or moisture (Type X Durability).

Acoustic & Vapour Waste Insulation: All above-ground internal uPVC waste lines located above false ceilings, in service shafts, partition voids, or bulkhead box-outs shall be thermally insulated using foil-backed rigid mineral wool sections (*Isover Climpipe* or *Rocklap H&V* or equal equivalent). Insulation thickness must be 30mm for lines up to 28mm, and 40mm for lines from 35mm to 54mm, applied continuously over all bends and tees. Technical parameters must meet B.S. 5422:2009 / B.S. 5970:2012, thermal conductivity of 0.033 W/mK at 10°C, and a Euroclass A2L, s1, d0 fire rating to satisfy IMO Resolution MSC 61(67) smoke generation thresholds.

2.4 System Categorisation: Gas Distribution Systems (Oxyacetylene)

Procurement Route Status: Contractor Design Development. The schematic layout, indicative pipe sizing, and routing parameters shown on Drawing No. 2512-CCE-00-ZZ-DR-M004 are preliminary. The Contractor shall engage a certified, competent Specialist Gas System Designer to perform final engineering calculations, verify gas material wall thicknesses, maximum pressure values, and dynamic pressure drops prior to procuring any components.



External Storage and Trench Routing

Cylinder Enclosures: Establish two separate, dedicated external gas cylinder yards positioned on the building exterior: one for Oxygen Cylinder Storage and one for Acetylene Cylinder Storage as layout on Drawing No. 2512-CCE-00-ZZ-DR-M004. Allow for full mechanical connection to the respective multi-cylinder manifold regulators.

Trench Infrastructure: High-purity gas pipelines must leave the external manifolds, drop below ground level, and be routed inside a purpose-built concrete protection trench extending to the building envelope perimeter entrance. Pipelines must be bedded in clean, washed sand, structurally protected against mechanical crushing or ground loading, and topped with a continuous high-visibility gas warning marker tape. Buried joints must be kept to an absolute minimum. Maintain strict engineering separation distances between the oxygen and acetylene medium lines within the trench as verified by the specialist. Lines must rise externally against the facade wall with rigid structural supports and enter the building via wall penetration sleeves, ensuring no joints sit within the sleeve casing. Pipes must not pass beneath building foundations.

Oxygen Pipeline Infrastructure (O₂ Medium)

Material Standards: The entire internal gaseous oxygen distribution loop must be constructed exclusively from seamless stainless steel piping or high-purity copper tubing. Prior to installation on site, all oxygen-carrying components must be certified clean and entirely hydrocarbon-free in strict compliance with CGA G-4.1 and ASTM G93 standards to eliminate explosive reactivity risks.

Indicative Sizing (Drawing No. 2512-CCE-00-ZZ-DR-M004):

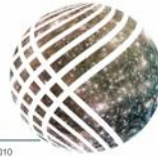
- Oxygen Header Main Line: 32mm nominal preliminary diameter.
- Sub-Main Distribution Loop: 25mm to 32mm nominal diameter.
- Booth Terminal Branch Drops: 15mm nominal diameter pipe dropping vertically inside each training booth station.

Acetylene Pipeline Infrastructure (C₂H₂ Medium)

Material Restrictions: Piping systems conveying acetylene gas must be constructed exclusively from heavy-gauge carbon steel or stainless steel materials. The use of copper, brass, or any alloy containing more than 65% copper is strictly prohibited due to the extreme risk of forming highly explosive copper acetylide compounds upon contact with the gas.

Indicative Sizing (Drawing No. 2512-CCE-00-ZZ-DR-M004):

- Acetylene Header Main Line: 25mm nominal preliminary diameter.
- Sub-Main Distribution Loop: 20mm to 25mm nominal diameter.



- Booth Terminal Branch Drops: 15mm nominal diameter pipe dropping vertically inside each training booth station.

Multi-Stage Gas Line Safety Devices

The specialist gas design and installation must comply with all current legislation, manufacturer parameters, and BCGA Code of Practice CP4 and CP5 guidelines. Every individual welding booth terminal branch gas drop must be equipped with the following sequential safety trim as configured on Drawing No. 2512-CCE-00-ZZ-DR-M004:

1. One main cylinder/line isolation valve.
2. One dual-stage pressure control regulator paired with an over-pressure relief valve or pressure-sensitive shut-off device.
3. One automatic temperature-sensitive and pressure-sensitive inline flashback arrestor block combined with an automatic gas cut-off valve.
4. One downstream mechanical non-return check valve to prevent cross-contamination of gases.
5. One manual, highly visible, quick-acting quarter-turn gas isolation valve positioned at the user control level.

Part 3: Section 17 Builders Work in Connection (BWIC)

3.1 Structural Holes & Openings

All physical cutting, structural forming of opes, core drilling, and making good of building fabrics shall be executed under the main contract by the Main Contractor. The Mechanical Contractor is responsible for preparing detailed builders work drawings and marking out the exact positions and dimensions of all required opes, bases, and chases on site in sufficient time to avoid delaying the construction schedule.

Wall Penetrations: All pipes passing through fire-barrier walls or floor slabs must be sleeved on both sides of the barrier. The Main Contractor shall pack the annular spaces and fire-proof the opes with an approved intumescent mortar after the mechanical lines are tested and signed off.

Façade Vent Ope: Two itemized rectangular openings cut through the 300mm insulated external masonry cladding wall at an elevation of 4000mm to accommodate the horizontal LEV fan discharge velocity cones as detailed on Drawing No. 2512-CCE-00-ZZ-DR-M002.

3.2 Equipment Concrete Plinths & Support Platforms

External Gas Supply Trench: A concrete protection trench cut into the external ground slab routing the sand-bedded oxyacetylene supply lines from the Oxygen and Acetylene yard manifolds to the building entrance point as detailed on Drawing No. 2512-CCE-00-ZZ-DR-M004. Excavation backfilling, compaction, and final external surface reinstatement are under the main contract.

Storage Tank Platform: A flat structural support platform assembly positioned across roof timber trusses to support the 225-litre GRP water tank as shown on Drawing No. 2512-CCE-00-ZZ-DR-M001. The platform and ironwork bearers must be flat, level, spaced at 500mm centres, and exceed the tank's outer base footprints by a minimum of 150mm on all sides to comply with *Tricel* installation and support guidelines.

Part 4: Section 26 Reference Testing, Dosing & Handover

4.1 Pressure & Leakage Testing Protocols

The Contractor shall advise appropriate personnel at least 5 days in advance of any pressure tests so they may be formally witnessed. All services to be hidden or concealed must remain exposed until testing is signed off. Maintain comprehensive test records detailing the tester's name, witness name, test type, duration, and pressures recorded, and include them within the final handover files.

Hydrostatic Water Pressure Test: Prior to final connection hookups to sanitary appliances or water heaters, the new copper domestic hot, cold, and mains water systems must be hydraulically tested with clean water to a test pressure of 7 bar. The installation must maintain this pressure drop-tight for a continuous holding verification period of 12 hours. If any pressure drop is recorded, the system is unsound and cannot be commissioned until the leak is located, repaired, and the test repeated. Test procedures must follow the HVCA *Guide to Good Practice for Site Pressure Testing of Pipework* and HSE Guidance Note GS4 (*Safety in Pressure Testing*).

Air Ductwork Leakage Test: All low-pressure and medium-pressure galvanized spiral sheet metal duct networks must undergo air pressure testing in strict compliance with HVCA DW/143 (*A practical guide to ductwork leakage testing*) and table B16.15 of the CIBSE Guide / DW/144. The air leakage rate must not breach the allowable loss parameter profile.

4.2 System Dosing, Flushing & Disinfection

System Flush: Before filling, flush all water pipeline networks and the cold water storage tank with clean mains water to purge jointing scale, flux residues, and installation dust.

Chlorination Sterilisation: Disinfect the complete water storage tank and domestic hot, cold, and mains water distribution networks before the system is brought into human use. Introduce a liquid chemical sterilising solution to achieve a uniform free chlorine concentration of 20 mg/litre (if using hypochlorite with 35% available chlorine, the proportions shall be 1.45 kg per 1000 litres of water). Maintain a continuous holding contact time of 24 hours across all sections. Test the endpoints; if the residual free chlorine drops below 10 mg/litre, the system must be completely re-chlorinated. After successful holding, drain the chemical solution entirely into a foul sewer (never into a surface water sewer or watercourse) and refill the system with fresh mains water. Provide operators with protective clothing and goggles.

Microbiological Laboratory Validation: After refilling, a fresh water test sample must be collected from the cold water storage tank in the presence of the Engineer and/or their representative, using sterile containers. Submit the sample to an accredited testing laboratory for a detailed bacteriological analysis. The water test report must analyze and record readings for the following parameters prior to occupancy:

- E. Coli and Total Coliforms.
- Colony Count and Turbidity.
- pH level and Conductivity @ 20°C.
- Iron, Manganese, Sodium, and Nitrate levels.

Provide a signed Certificate of Sterilisation in the O&M manual containing the project name, contractor name, method, period, and witness signatures.

4.3 Portable Fire Extinguishers

Portable Fire Extinguishers (CO₂ and Dry Powder Type): Provide a complete installation of portable fire extinguishers as indicated on the Fire Extinguisher Layout Drawing. Extinguishers shall comprise CO₂ type for electrical equipment and associated electrical fire risks and dry powder (DP) type for general flammable liquid/gas and mixed

fire risks, with type, capacity and quantity to be suitable for the hazards identified within the building. All extinguishers shall be manufactured and tested to the applicable current Irish/European standards and shall be supplied complete with wall-mounted brackets, identification signage and all necessary fixing accessories. Extinguishers shall be securely mounted or suitably positioned at readily accessible locations, clearly identified and installed so as not to obstruct escape routes, doors or access to equipment. CO₂ extinguishers shall be provided with suitable discharge horns, with dry powder extinguishers provided where indicated for the relevant fire risk. The Contractor shall allow for all supports, signage, installation, inspection, commissioning and certification, including provision of manufacturer's documentation and maintenance requirements on completion.

4.4 Operation & Maintenance (O&M) Deliverables

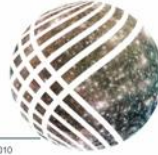
The Mechanical Contractor shall employ a suitably qualified, independent commissioning specialist company to carry out the final balancing and regulation of the entire ventilation system via proportional balancing methods. Obtain the design flow rates and tolerances from the Engineer, and provide a full commissioning report recording actual flow rates at each grille. Commission systems in the specified order: domestic cold water, mains water, gas/LPHW services/controls, hot water, and ventilation.

Manual Configuration: Deliver three comprehensive hard-copy Class D Operation & Maintenance manuals bound in heavy A4 lever-arch files with rigid plastic-coated covers (*EMGEE* or equal equivalent), along with three identical electronic copies on compact disks. Front covers must feature inlaid lettering indicating the title, project name, and volume number, with a contents label on the spine. Stiff cardboard section dividers with extended tabs (*SUMMIT Ring Book Guides* or equal equivalent) must separate sections.

Digital As-Built Layouts: The manuals must include three printed copies of each drawing and three native digital files saved in AutoCAD 2008 format (*DWG*) detailing all actual pipeline, ductwork, and tray/trunking routings. All O&M materials must be compiled in accordance with BSRIA document 1/87 (*Operating and Maintenance Manuals for Building Services Installations*) and handed over prior to the issue of the Practical Completion Certificate.

Required Technical Content Sections:

- **Section 1: Description:** Full descriptions of each building services system, general description of all plant, design baselines, and equipment performance schedules.
- **Section 2: Plant and Engineering Systems:** Detailed manufacturer technical literature, parts lists with component numbers matching manufacturer drawings, ordering instructions, manufacturer contact addresses/phone numbers, and a colour-coding identification schedule.



Provide formal Declaration of Performance (DoP) certificates for all plant and construction materials to satisfy Building Control Authority and BC(A)R sign-off.

- **Section 3: Operating and Maintenance Procedures:** Step-by-step methods for starting, running, and shutting down systems, including emergency shutdown sequences. Schedules for daily, weekly, monthly, and annual routine maintenance. List of required specialist tools/keys and fault-finding procedures.
- **Section 4: Commissioning and Testing:** Signed hydrostatic pressure test logs, air duct leakage test logs, volume control damper balancing markers, certified chlorination dosing logs, and the final laboratory bacteriological water analysis report.