CEH Wallingford Washroom Refurbishment
Links 3 & 5

April 2015

Mechanical & Electrical Services
Specification

Contents

1. Project Particulars

1.1 PROJECT OVERVIEW:

The Centre for Ecology and Hydrology (CEH), Wallingford is located on Benson Lane in Wallingford Oxfordshire.

The project entails the refurbishment of 2 toilet blocks at the Centre of Ecology and Hydrology in Wallingford.

The mechanical and electrical services works shall include but are not limited to:

- New LV supplies to mechanical equipment and hand dryers.
- New Internal Lighting, Emergency Lighting and controls.
- Temporarily remove and relocate fire alarm sounders.
- Refurbish the existing heating system.
- Extend and refurbish the existing Cold and Hot Water Services.
- Extend Above Ground Drainage.
- Install new mechanical Extract Ventilation System.
- Removal / make new redundant mechanical services plant & equipment.

This specification is split into two volumes:

Volume 1: Mechanical & Electrical Services Specification

Volume 2: Builders Works Specification

All works shall be priced as a single packaged with specialists sub-contractors contractors for the respective components.

1.2 MAINTENANCE OF EXISTING SERVICES:

The site shall remain fully operational throughout the period of the toilet refurbishment. All mechanical and electrical services shall be maintained to areas outside the 'work area' throughout the duration of the contract. The contractor is to provide any additional work and materials necessary to maintain these services at all times during the duration of the Contract. Downtime of the heating system must be limited to an absolute minimum and shall be restricted to the respective heating zones. Any existing services disturbed by the Works are to be reinstated fully in accordance with the standards of quality defined in the specification and to the satisfaction of the Contract Administrator.

The programme shall be developed by the Contractor, in discussion with the Project Manager. The programme for any mechanical and electrical shut-downs shall be agreed before work commences.

1.3 THE EMPLOYER:

Client	Centre for Ecology and Hydrology Nigel Parfitt Building and Services Manager 01491 692 726 nipa@ceh.ac.uk
CONTRACT ADMINISTRATOR/ PROJECT MANAGER:	Centre for Ecology and Hydrology Denise Dolton Facilities Operations Manager 01491 692 476 dsd@ceh.ac.uk

1.4 CONTRACTOR:

This document has been prepared to be issued to a mechanical and electrical contractor. All associated builders works in connection with the works outlined in volume 2 of this specification shall be provided by specialist sub-contractors and be the responsibility of the mechanical and electrical contractor.

1.5 SITE INVESTIGATION:

The Contractor shall:

- Visit site during the tender period, no additions will be accepted as a result of not carrying out a site visit. The site visit shall be arranged with the client.
- Ascertain the nature of the site and all local conditions and restrictions likely to affect the execution of the Works.
- Before commencing work, carry out a survey and examination of building, structure, asbestos register and engineering services affected by the works. Bring all issues raised to the attention of the CA.
- Examine all available drawings of the engineering services and report any discrepancies to the CA.
- Take record photographs of current desk and carpet state of repairs, and any existing building defects in the areas of works.

2. GENERAL QUALITY STANDARDS/CONTROL:

The entire installation shall comply with the requirements of the Local Authority, Building Control Officer, and the Environmental Health Officer, the Fire Officer, the Local Statutory Bodies and the following:

- British Standards
- Health & Safety at Work Act
- 17th Edition of IEE Wiring Regulations
- HSE Code of Practice for the Prevention and Control of Legionella
- Water Supply (Water Fittings) Regulations
- COSHH Regulations
- Gas Safety Regulations Act and CORGI Regulations and Recommendations
- Control of Pollution Act
- The Pressure Systems and Transportation Gas Containers Regulations
- BSRIA Commissioning Publications
- CDM 2015 Regulations
- Associated Statutory Acts.

The Chartered Institute of Building Services Engineers (CIBSE) Guides shall be adhered to wherever they are relevant.

All materials and equipment shall be installed in accordance with the manufacturer's recommendations. Any conflicts between the manufacturer's details and this specification must be raised to the Contract Administrator prior to proceeding.

The design has been based on visual non-intrusive surveys and therefore, exact positions and routes for the new installations must be established on site by the Contractor to co-ordinate with the existing building layout and services.

The contractor shall allow in his tender for locating equipment and outlets within one metre of the position shown on the contract drawing at no additional cost to the contract.

The contractor is reminded that the site shall be occupied throughout the contract and that all services must remain operational at all times except for those previously agreed with the site facilities manager. The Contractor shall not be allowed to disconnect any of the existing services that are not directly connected to the works without prior agreement with the Contract Administrator.

All areas would need to be appropriately protected within the working zone and "made good" if damaged by the contractor.

3. STANDARD CONDITIONS

3.1 TENDER DOCUMENTATION

This Specification and the Tender Drawings are complimentary to each other and as such are to be used jointly.

Any discrepancy or ambiguity between the Tender Drawings and the specification shall be referred to the Consulting Engineer at the time of tendering for clarification.

3.2 RESPONSIBILITY

The Contractor shall be responsible for the correct installation of the works as specified and/or indicated on the Tender Drawings and for the proper operation of the installations to the complete satisfaction of the Employer and the Consulting Engineer. The Contractor shall be responsible for compliance with all tests called for herein or required by the Consulting Engineer. In the event of anything described in the Specification or indicated on the Tender Drawings being in the Contractor's opinion unsuitable or inconsistent with his guarantee and responsibilities, the Contractor shall draw attention to these matters at the time of Tendering.

The Contractor shall, on appointment, acquaint himself with the general arrangement and layout of other services to ensure that ducts, chases, wall spaces and plant rooms are most economically used to accommodate the services which are to be installed. The M&E Contractor shall liaise with the other sub-Contractors to ensure coordinated installation of all services, and the building fabric. If, as a result of failure to comply with this Clause, it is necessary to remove and re-install or to modify any equipment, pipes or cables, which in the opinion of the Consulting Engineers could have been avoided with reasonable co-operation, the Contractor shall carry out such work as may be required with no extra cost to the Contract.

3.3 MATERIALS AND WORKMANSHIP

All materials supplied and work carried out shall comply with British Standards and statutory requirements including those standards issued in respect of materials manufactured to harmonised and Euro-Norm standards. Where specific British Standards are referred to herein, these shall be deemed to refer to the current edition of such Standards and to include as far as practicable any amended requirements which may become current before the date at which the work is carried out.

Where more than one manufacturer's name is indicated, or where the Contractor puts forward alternatives, such items wherever possible (e.g. switches, socket outlets etc.) Shall be of the same manufacture not a combination of various makes, and shall be CE marked to signify compliance with one or more European product directives appropriate to the item.

Returned Tenders shall be compared on the basis of the specified plant and equipment. Alternatives submitted by the Contractor may be considered after this evaluation.

3.3.1 ALTERNATIVE MANUFACTURERS/SUPPLIERS:

In addition to and at the same time as his costs for the Works as defined in the documents, the Contractor may, at his discretion, submit alternative manufacturers or suppliers for consideration. Alternatives, which would involve significant changes to other work, will not be considered. The tender sum must however be based upon the specified manufacturers/suppliers and alternatives offered as a cost reduction to the specified item.

Such alternative(s) must include all additional costs arising from necessary changes to the details of the installation, including changes to the design and drawings, as well as any associated ancillary equipment items.

Such alternative(s) is/are deemed to be alternative tender(s) and each must include a complete and precise statement of the effects on cost and programme.

Full technical data for each such alternative must be submitted together with details of any consequential amendments to the design and/or construction/installation of other parts of the Works.

3.3.2 SELECTION OF MANUFACTURERS/SUPPLIERS:

Where manufacturers, suppliers or installers of products are NOT identified by name, select products that comply in all respects with the specification and, as and when requested, demonstrate such compliance.

Where manufacturers, suppliers or installers of products are identified by name, or names, but no reference is made to "Or approved equivalent" use these exclusively.

Where manufacturers, suppliers or installers of products are identified by name, or names, but reference is made to "Or approved equivalent" alternatives may be selected and shall be submitted to the CA for approval.

Check that any proposed alternatives comply with any stated British (or other equivalent recognised International) Standards. Confirm equivalence in quality, operation and space requirements to those items, which have been specified by name. If, and when requested demonstrate the proposed alternative is fully equivalent to the specified item and identify any constructional, cost, programme, maintenance or other differences.

3.4 GUARANTEE

The Contractor, in quoting for a specific item of equipment or apparatus, whether specified herein by name or whether of a make selected by the Contractor, shall be deemed to guarantee its satisfactory performance under all working conditions which may be encountered.

The Contractor shall be responsible for any defects which may arise during the Defects Liability Period in accordance with the Provisions of Clause 3.18.

3.5 REJECTION OF UNSUITABLE MATERIALS

The Consulting Engineers shall be at liberty to reject plant, materials, etc., and workmanship not complying with the requirements of Clause 3.3 hereof or which are in any way unsuitable; and to order the removal and replacement without extra cost to the Employer, of any faulty plant, materials or inferior work. The above shall apply not withstanding that the Consulting Engineer and/or Employer may have previously nominated a particular make or type of plant or materials. The Consulting Engineer's decision as to what constitutes compliance with requirements and suitability shall be final and binding. The true intent and meaning of the Contract being that the whole of the Works shall be completed to the satisfaction of the Employer and the Consulting Engineer.

3.6 PACKING, STORAGE AND PROTECTION

All plant, equipment, apparatus, materials and parts shall be delivered to the Site in an 'as new' condition and properly packed and protected against damage due to handling, adverse weather or other circumstances and, so far as is practicable, shall be kept in the packing case or under protective covering until required for use.

Any items damaged in transit or on the Site shall be replaced without extra cost to the Employer. The Contractor shall suitably protect, encase, cover over, etc., as may be appropriate, all installed plant and equipment to prevent damage due to building operations, adverse weather or other causes up to the Date of Completion and shall make good any damage and hand over the entire installation in a new and undamaged condition.

During the progress of the Works all open ends of pipes, ducts, conduits, etc., shall be suitably capped to prevent the ingress of foreign matter.

The Contractor shall take every reasonable precaution to prevent dirt or debris entering plant, equipment or distribution services during installation and shall inspect each length of pipework after jointing to ensure that it is clean inside.

3.7 INSPECTION

The Contractor shall be responsible for inspecting, as necessary, all plant, equipment and materials at the manufacturer's works and for checking its suitability for use and shall, if so requested, make the necessary arrangements for joint works inspections and/or tests of such

Plant, with the Consulting Engineer. Any such inspections shall not relieve the Contractor of his responsibilities under this Contract.

The Contractor shall provide to the Consulting Engineer a copy of the of Works Test Certificates in respect of all plant, equipment and materials, showing compliance with tests to British Standards and with additional tests specifically called for herein. Additional copies of the Works Test Certificates shall be provided in the O&M Manuals.

3.8 ORDERING

On appointment the Contractor shall obtain confirmation of all particulars and details necessary to enable orders to be placed and shall place such orders for all plant, equipment and materials. The Contractor shall on request, provide to the Consulting Engineer copies of such orders so placed, together with the approximate cost thereof. In placing such orders it shall be the Contractor's responsibility to ensure that suppliers are aware of, and work strictly to, the requirements of the Contract and the Programme of Works.

3.9 REGULATIONS

The Contractor shall comply with all Acts of Parliament and relevant statutory instruments and regulations (including European Directives) current at the date of Tender.

The plant and materials supplied and installed shall conform to the requirements of the appropriate British Standards or Codes, whether the appropriate Standard or Code is referred to in this Specification or not.

Throughout the execution of the Works the Contractor shall be responsible for ensuring compliance with statutory regulations and British Standards and shall notify the Consulting Engineer of any infringements which directly or indirectly detract from the safe and satisfactory operation of the installations whether or not such infringements relate to the Works covered by the Contract, associated works of others or existing installations to which the specified works are to interface.

3.10 SETTING TO WORK COMMISIONING AND TESTING

NOTE: The term "the installation" in the following clauses shall be read to include the complete installation(s) or any part of them which it may be required to commission, test, operate, etc., as separate entities.

Subject to any additional requirements stated in the Particular Specification, the Contractor shall:

1. On completion of the installation of each system ensure that all plant spaces and distribution routes are clear of debris, redundant materials, and are clear of obstruction.

2. Thoroughly clean and blow through all airways, switchboards, panels, cabinets and any other items of equipment, flush all pipework systems and equipment and generally prepare the installations for operation.

3. Commission the installations by provision of all necessary skilled and unskilled operatives and calibrated instrumentation, and prove that they are operating in accordance with the Specification, prior to offering them for demonstration.

4. Operate the installation for a reasonable time to allow for the observation of results and subsequent adjustments. The Contractor shall demonstrate to the satisfaction of the Consulting Engineer that the installations which have been set to work, comply In all respects with the requirements of the Specification.

5. Demonstrate to the satisfaction of the Consulting Engineer that the Installation(s) already demonstrated separately, are capable of simultaneous operation in accordance with the requirements of the Contract.

3.11 RESULTS OF TESTING AND COMMISSIONING

The Contractor shall record all test results and commissioning data (including test instruments calibration certification) and, where these have been successfully completed, provide a copy of all results to the Consulting Engineer in an agreed format.

If the tests show that any item of the plant, equipment or system is not operating correctly, due to an installation problem or equipment fault, the Contractor shall carry out all remedial measures or adjustments necessary to achieve the specified operation of each system at no cost to the Client, in order to satisfy the specified design criteria.

3.12 CONTRACTORS DRAWINGS

3.12.1 RECORD DRAWING:

Drawing showing the building and services installations as installed at the date of practical completion are to be provided by the Contractor and shall provide one month prior to Practical Completion, two copies of the Record Drawings to the Consulting Engineer, for approval.

The complete installation shall be detailed on the drawings including plant, equipment, pipe and cable routes. The precise location of all services buried within the structure and any sections of external services shall be declared on the drawings. Each service shall be identified in accordance with relevant labelling and schedules.

The Contractor shall provide at Practical Completion one set of the approved “Record Drawings” on paper, plus a copy on CD together with further sets of prints bound into the Operating and Maintenance Manuals.

The main features of the record drawings should be as follows.

Provide a record of the locations of all the systems and components installed including pumps, fans, valves, strainers, terminals, electrical switchgear, distribution and components. Use a scale not less than that of the installation drawings.

Have marked on the drawings the positions of access points for operating and maintenance purposes.

The drawings should not be dimensioned unless the inclusion of a dimension is considered necessary for location.

The drawings shall be produced using AutoCad™ unless otherwise stated, on A0 to A4 paper as appropriate. Each drawing shall include the following information within the title block and clearly identified as a “Record Drawing”.

- Name of Contract and Site Location.
- Description of Drawing.
- Name and Address of Contractor and Consulting Engineer.
- Scale.
- Date

Drawings shall include:

- General arrangements of all services to a scale not less than 1 to 100 or 1 to 50 as appropriate.

- Schedule of all equipment, switches, distribution boards, etc.

- Revised Mechanical & Electrical Distribution Schematic

3.12.2 BUILDER'S WORK AND WORKING DRAWINGS

Working installation drawings and builder’s work drawings are to be prepared by the Contractor and submitted to the CA for review. This requirement particularly applies to the final location of the holes required through the external wall.

The CA will insist on originally prepared working drawings, drawn by the Contractor. It will not be acceptable to use the Consulting Engineer's drawings as working drawings.

The Contractor's working drawings shall be coordinated drawings, and shall show any elements of other Contractor's work, which affect his installation.

Builder's work and working drawings shall be based on the tender drawings and shall take into account all latest drawings applicable to other disciplines, trades and services, and all modifications, which may have or will take place to the buildings or installations. These drawings shall be correctly related to the specified or selected plant and equipment. The level of detail required for the working drawings shall be in accordance with BSRIA Guide 'A Design Framework for Building Services' BG 6/2009.

The Contractor shall be responsible for providing all builder's work and working drawings in adequate time to ensure that there is no delay in the contract programme.

The Contractor shall be responsible for any error discrepancy or omission in any drawings prepared by him or on his behalf.

Drawings to be provided by the Contractor shall be as follows but not limited to:

a) Details of all attendant builder's work, holes, chases, etc., for trunking, trays, external louvres etc. and any item where access for, or function of mechanical/electrical services is indicated, to a scale of not less than 1:100.

b) Details of all purpose made brackets, hangers, trunking/tray supports, and panel support arrangements etc., to a scale of not less than 1:20.

c) Details of all purpose made fixings, supports and mountings for general and specialist electrical services equipment and luminaires to a scale of not less than 1:20.

d) Details of all services layouts to a scale of not less than 1:50.

e) All ranges of fabricated equipment, e.g. Ductwork, switchboards, distribution boards, etc., to a scale of not less than 1:50.

f) Detailed electrical wiring diagrams of all equipment supplied by the Contractor, showing all inter-connections between equipment to enable the necessary wiring to be carried out.

g) Sections through service voids, at a scale of not less than 1:20, indicating tray/trunking routes etc.

All drawings shall be prepared from the latest issue of detailed layouts, which must be obtained by the Contractor. The contractor shall co-ordinate and detail all the service installations under his direction, relative to both building fabric and other services installations, so as to enable a fully integrated and co-ordinated installation to be provided.

The service routes indicated on the tender issue drawings do not necessarily detail the number of bends, sets or fittings required for the installation. The contractor is deemed to have allowed for all such works in the tender submission.

The Contractor shall, as required, revised and update his working drawings in accordance with all revisions to tender drawings and CA instructions covering variations in the Works.

All such drawings, schedules, diagrams, etc., are to be submitted to and approved by, the consulting engineer in writing before any work is put in hand. After approval, four copies of all such approved

Drawings and/or schedules are to be provided by the contractor for distribution, unless particularly specified otherwise.

The contractor shall also submit to the consulting engineer two copies of all drawings for manufactured items such as control panels, etc., before work on each item is commenced. The contractor shall submit these drawings two weeks before he requires manufacture to commence, to comply with the construction programme.

The contractor shall maintain a set of working drawings on site. These shall comprise a full set of approved installation drawings and be marked up on site, on a daily basis, with any alterations and additions or omissions, such that they will be a current record of the progress of work and form the basis of Record Drawings at the handover stage.

Alterations to working drawings shall be clearly identified, dated and countersigned by the consulting engineer or project manager.

3.12.3 AS-INSTALLED DRAWINGS:
Provide drawings/records retained on site to record the progress of and any site modifications to the Works including any changes to software.

3.13 OPERATING AND MAINTENANCE MANUALS:

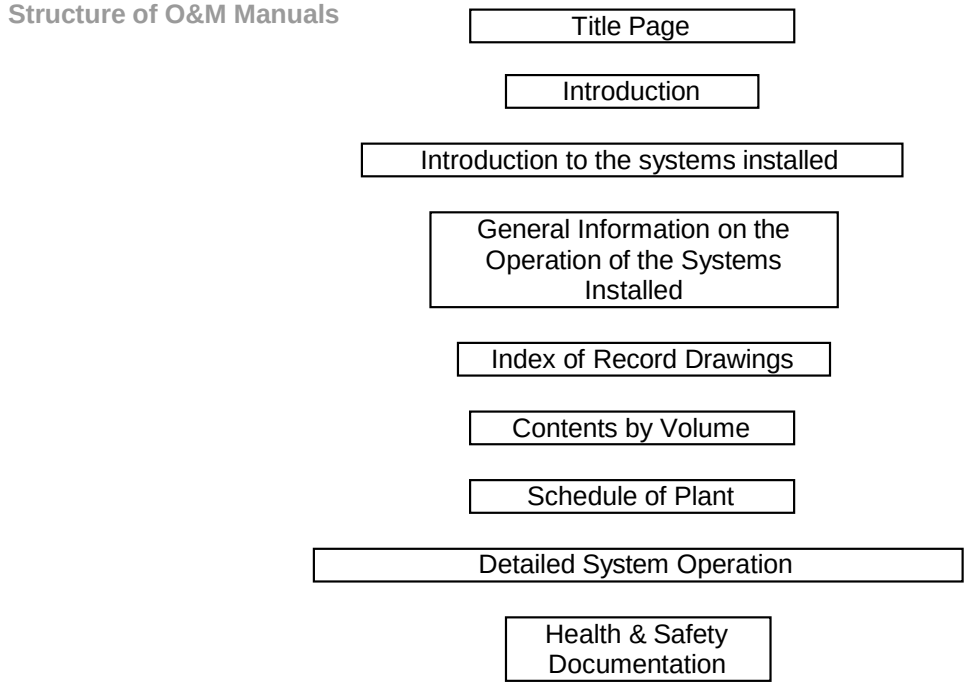
Prior to Practical Completion the Contractor shall issue two draft copies of the Operating and Maintenance Manuals to the Consulting Engineer for approval.

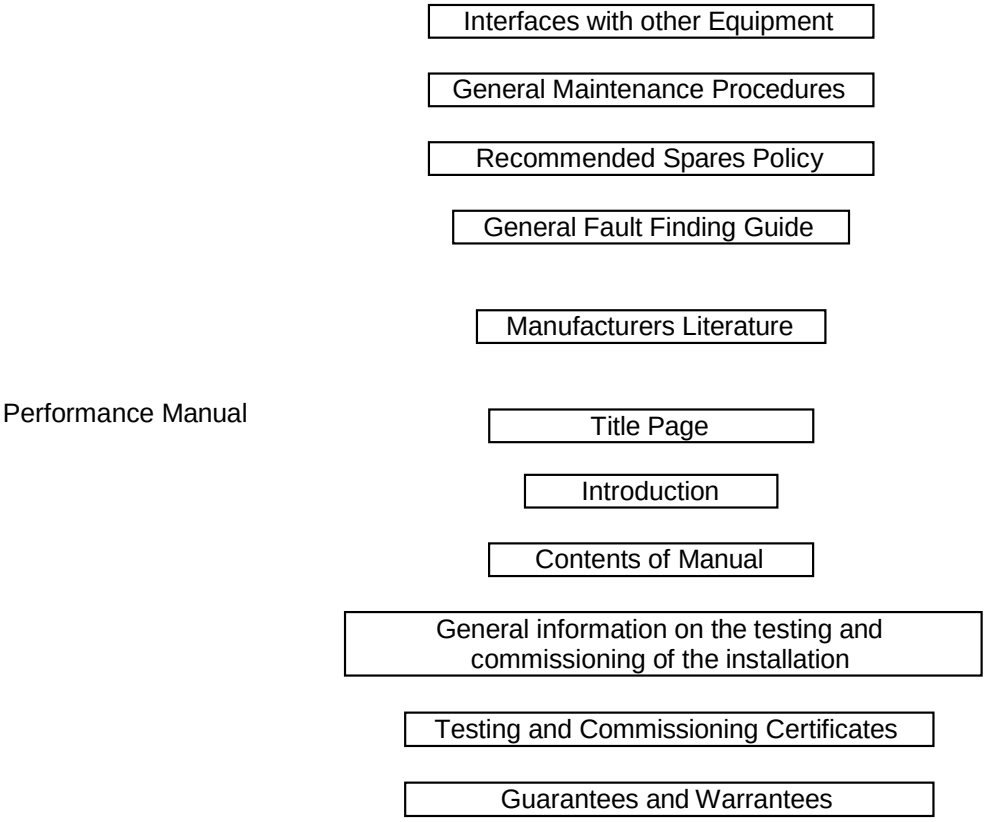
An electronic copy on CD shall also be provided.

The manuals shall be size A4 with stiff sided, two or four ring PVC covers and shall indicate the following information:

Operating and Maintenance Manual for Mechanical and/or Electrical Services as applicable.
Project Name
Volume number

The manual shall be divided into the following main sections, each of which shall have a correctly sized pastel coloured divider. Operating and Maintenance manuals shall be provided by the contractor to the following format;





3.14 DATE OF COMPLETION

For the purpose of this Contract, the Date of Practical Completion of the Works, shall be the date when the final phase is complete and handed over, or at such other date of substantial completion agreed in writing. Prior to this date the Contractor shall demonstrate to the Consulting Engineer that the installations are satisfactory and that the operational and documentation requirements of this Specification have been met.

3.15 BENEFICIAL USE OF THE INSTALLATION

Up to the Date of Practical Completion the Contractor shall, operate the whole or part of the installations for the benefit of the Employer, provided that this operation does not prejudice the Contractor's responsibilities and obligations under the Contract, and does not unreasonably interrupt or interfere with the progress of the work or commissioning and testing.

During this period the Contractor shall attend to all necessary routine maintenance, lubrication, etc., and shall effect all necessary insurances, including third-party insurance (he shall be reimbursed in respect of labour and other charges directly attributable to the above maintenance works).

After the Date of Completion the Contractor shall similarly operate the installations, if requested, (and during this period shall be reimbursed in respect of all such labour and stores properly expended for that purpose).

3.16 WATER AND ELECTRICITY

Unless otherwise stated, all water and electricity required for setting to work, commissioning, testing and operation of the installations shall be provided by the client.

3.17 CLEARING UP ON COMPLETION

On completion of the Works, the Contractor is to clear away all temporary plant, surplus materials and debris and make good or reimburse the Employer for any damage caused to the building fabric, roadways, pathways, landscaping or services during the execution of the Works.

3.18 DEFECTS LIABILITY

Not with standing any provisions of the Main Building Contract, if applicable, the Defects Liability Period for the purposes of this Contract shall be a period of twelve months from the Date of Practical Completion, or the clearance of faults and defects unless otherwise stated in the Contract Conditions.

During the Defects Liability Period the Contractor shall at his own cost remedy and make good, as soon as reasonably possible, any faults or defects arising in the plant or Works which in the opinion of the Consulting Engineers, is due to faulty materials and/or Workmanship and shall indemnify the Employer and/or Main Contractor against any damage or injury to the Building, contents and/or occupants arising as a result of such faults or defects. The Contractor shall not be liable under this clause for defects arising as a result of fair wear and tear or improper operation by the Employer after the Date of Practical Completion. Access to the Works shall be by prior appointment with the Employer's Representative.

If the Contractor fails to remedy such faults or defects that may arise within a reasonable time, the Employer may proceed to do so at the risk and expense of the Contractor and without prejudice to such other rights as the Employer may have under this Contract.

3.19 PATENT RIGHTS

The Contractor shall include in his Tender, sums in respect of any Royalties or other charges which may be payable in regard to any patent rights, design trademark or name, or other protected rights in respect of any plant or equipment, method or material used for or in conjunction with the Works.

The Contractor in accepting the Contract shall be deemed to indemnify the Employer, the Builder and the Consulting Engineer against all claims, proceedings, damages, or expense whatsoever in relation thereto.

3.20 FIRE HAZARD

The Contractor shall take all reasonable fire precautions in respect of his stores, workshops, etc.

Where it is necessary for the Contractor to use any naked flame or welding equipment in the carrying out of his work, adequate protection shall be given to all other materials and personnel. Suitable fire extinguishers and any other necessary fire or safety equipment shall be readily available at the position where such work is proceeding. The Contractor shall ensure compliance with the permit to work system operating at the site.

3.21 SPARES

In cases where the Contract includes the provision of spares for the use of the Employer, the Contractor shall hand over all such spares to the Employer properly packed and labelled and accompanied by a detailed schedule. The Employer shall sign a copy of such a schedule which shall constitute a receipt for the spares and which shall be produced to the Consulting Engineer.

The spares required are detailed below.

1. TC-DEL Lamp 26W (x5)

3.22 PHOTOGRAPHS

No photographs of the Site or of the Works or any part thereof shall be taken except with the permission in writing of the Client and no such photographs shall be published or otherwise circulated without permission.

3.23 CONTRACTOR'S MANAGEMENT RESPONSIBILITIES

N/a

3.24 BUILDERSWORK IN CONNECTION WITH M&E INSTALLATION

All holes 50mm diameter and below shall be drilled and made good by the mechanical & electrical services contractor. Holes above this size shall be marked on site by the mechanical & electrical services contractor and drilled/formed by the building contractor.

3.25 ASBESTOS

Should the Mechanical & Electrical Contractor, during the execution of their work, identify any form of Asbestos and/or hazardous materials not previously identified and being dealt with under the contract, the Contract Administrator shall be notified immediately and the Mechanical & Electrical Contractor operatives withdrawn from the area awaiting further instructions.

The Contractor and their operative shall be aware of his obligations under the Health and Safety at Work Act and COSHH (Control of Substances Hazardous to Health) Regulations.

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4. Description of the Works

4.1 Decommissioning & Removal

The existing mechanical and electrical services within the three toilet blocks shall be adapted as follows to accommodate the planned refurbishment works:

- Male Washrooms – Link 3 Male Ground Floor and Link 5 Male Ground Floor

  The existing luminaire and controls shall be removed; new luminaires and controls shall be installed as shown on the tender drawings. The existing cabling shall be isolated and removed and new circuits shall be installed from the dedicated circuit boards as shown on the tender drawings.

  The fire alarm shall be temporarily removed during (rest of the system to remain operational at all times) installation works and reinstated as shown on the tender drawings.

  The existing domestic hot water generator shall be isolated, made safe, drained down and stripped-out to be relocated elsewhere within the room along with its manual switch retained in its current location. The Contractor is to investigate the existing concealed units when on site the condition of the existing units and confirm if they are suitable for reuse.

  The existing HWS pipework shall be isolated, made safe, drained down and stripped-out and disposed of to make way for new. The existing CWS pipework shall also be isolated, made safe and drained down to remove connections. CWS shall be made good to allow pipework to be extended to accommodate new CWS connections.

  The existing radiator shall be isolated, drained down, stripped out and disposed of. This shall be replaced with a new radiator elsewhere within the room. Existing heating pipework dead-legs shall be reduced to a minimum.

  The existing above ground drainage for wash hand basin waste connections, shower and urinals and WC soil connection to be isolated, drained down and stripped back to soil stack or common float if still required. The existing common float waste pipework to be made good to accommodate being extended or adapted to allow for new connections, new connections shall be made as shown on the tender drawings.

  Any existing mechanical ventilation plant, duct work or grilles located in the existing ceiling void shall be isolated, stripped out and disposed of to make way for a new mechanical extract system local to each space. Any remaining ductwork shall be capped, with dead legs reduced to a minimum.

- Female Washrooms – Link 3 Female First Floor and Link 5 Female First Floor

  The existing luminaire and controls shall be removed; new luminaires and controls shall be installed as shown on the tender drawings. The existing cabling shall be isolated and removed and new circuits shall be installed from the dedicated circuit boards as shown on the tender drawings.

  The fire alarm shall be temporarily removed during (rest of the system to remain operational at all times) installation works and reinstated as shown on the tender drawings.

  The existing domestic hot water generator shall be isolated, made safe, drained down and stripped-out to be relocated elsewhere within the room along with its manual switch retained in its current location. The Contractor is to investigate the existing concealed units when on site the condition of the existing units and confirm if they are suitable for reuse.

  The existing HWS pipework shall be isolated, made safe, drained down and stripped-out and disposed of to make way for new. The existing CWS pipework shall also be isolated, made

Safe and drained down to remove connections. CWS shall be made good to allow pipework to be extended to accommodate new CWS connections.

The existing radiator shall be isolated, drained down, stripped out and disposed of. This shall be replaced with a new radiator elsewhere within the room. Existing heating pipework dead-legs shall be reduced to a minimum.

The existing above ground drainage for wash hand basin waste connections and WC soil connections to be isolated, drained down and stripped back to soil stack or common float if still required. The existing common float waste pipework to be made good to accommodate being extended or adapted to allow for new connections, new connections shall be made as shown on the tender drawings.

Any existing mechanical ventilation plant, duct work or grilles located in the existing ceiling void shall be isolated, stripped out and disposed of to make way for a new mechanical extract system local to each space. Any remaining ductwork shall be capped, with dead legs reduced to a minimum.

Redundant equipment shall be removed from site by the contractor and disposed of in accordance with current environmental legislation as it shall not be permitted to remain on site.

4.2 Hot and Cold Water Services

4 new unvented point of use electric water heaters shall be located within their corresponding room and shall retained its existing control philosophy of manual switching, complete with an unvented system kit, including expansion vessel, expansion valve, non-return valve, strainer & pressure reducing valve (refer to B1 for specified water heater). The water heater shall be capable of raising the temperature within the unit to pasteurise the stored water as required to control the growth of legionella bacteria.

The water heaters shall be reconnected into the existing cold water service.

CWS pipework will be isolated, made safe, drained down and stripped back from the existing wash hand basins and made good to accommodate new CWS pipework to extend to the new wash hand basin location.

A new HWS pipework distribution system shall be installed using copper tube to BS EN 1057 R250, employing soldered joints. Copper fittings shall be designed for use on hot and cold water services and manufactured from copper/copper alloy.

Domestic hot water shall be supplied at 50°C maximum to wash hand basins. CEH does NOT permit the use of local thermostatic mixing valves (TMV's) in accordance with HSE guidance.

Each hot water draw off point shall be fitted with an isolation valve for maintenance purposes.

All water fittings and materials utilised shall be listed in the Water Fittings and Materials Directory published by WRAS for hot water.

All HWS circulation pipework concealed in ceiling voids, boxings, cupboards and distributed at high level shall be thermally insulated, all in accordance with Building Regulations guidance relating to maximum heat transmission through the insulation. The insulation shall be protected in a manner appropriate to its location, e.g. using foil face finish where concealed within void spaces.

All exposed pipework in toilets shall be chromium plated. The tendering mechanical contractor is encouraged to consider the use of an alternative material and jointing systems to present a cost saving to the project. Alternative material or jointing system proposals shall be reviewed by the Clients Advisors prior to design.

The distribution pipework shall be pressure tested in accordance with BSRIA / CIBSE guidance prior to concealment and thermal insulation being applied.

The distribution pipework shall be cleaned and flushed thoroughly in accordance with BSRIA / CIBSE guidance and chlorinated immediately before handover.

4.3 Gas Fired Boilers

The existing modulating gas fired condensing boilers shall provide the heating requirement to the toilets as this demand remains the same.

During the heating system downtime should be kept to a minimum.

4.4 Low Temperature Hot Water Heating

New panel radiators shall be installed in all 4 washroom areas.

All new radiators shall be complete with thermostatic radiator valves and matching lockshield valve and shall be sized to suit a temperature difference between room temperature and mean water temperature of 50ºC (80ºC flow, 60ºC return, & 20°C Room).

To accommodate the relocation of the new radiators, the LTHW heating pipework shall be extended and shall be heavy grade mild steel pipework and fittings throughout the scope of works.

Commissioning valves, isolation valves, drain cocks and air vents shall be installed as necessary to allow commissioning to be carried out during construction, and future maintenance during operation.

The new LTHW pipework installation shall be a two-pipe flow and return system and be part of the existing heating zone the current radiator is controlled by throughout the CEH.

The existing LTHW installation complete with air/dirt separator, dosing pot, expansion vessel and pressurisation unit will be utilised to ensure the correct operation of the new installation.

The whole of the new LTHW installation shall be thermally insulated throughout with foil faced phenolic foam, all in accordance with Building Regulations guidance relating to maximum heat transmission through the insulation. The insulation shall be protected in a manner appropriate to its location, e.g. using aluminium cladding within the Plant Room, and foil face finish where concealed within void spaces.

The distribution pipework shall be pressure tested in accordance with BSRIA / CIBSE guidance prior to concealment and thermal insulation being applied.

The distribution pipework shall be cleaned and flushed thoroughly in accordance with BSRIA / CIBSE guidance and chemically treated to the boiler manufacturer’s recommendations.

4.5 Mechanical Ventilation

All toilet areas to be provided with mechanical ventilation at a minimum of 6 air changes per hour. The duct work shall be galvanised steel and is uninsulated with a self-closing shut off dampers located on the exhaust.

The fans shall be operated on local PIR control with a fifteen-minute run-over timer to prevent continuous switching of the fan.

The ventilation system is to be via duty/standby extract fans duct mounted in the ceiling void local to each toilet block. Prior to installation of new suspended ceiling the Contractor shall liaise with the Builder to ensure there is adequate clearance for new extract fans and duct work. The make-up air to

Balance the mechanical extract from the toilets will come from the surrounding areas, drawn into the toilets via undercut doors (up to a maximum flowrate of 30l/s) and openable windows.

The vitiated air shall be extracted from the space using constant pressure principle via balancing damper installed within the accessible ceiling void local to each toilet block. Once commissioned and set to work, the fan will maintain the preset pressure and remain at the design speed.

4.6 Drainage

The mechanical contractor is to allow for the supply and installation of the complete system of soil, waste and vent pipework where required as indicated on the tender drawings, including the connection to the drains installed by others to remove the waste from the sanitary ware and other items as required.

The installation of the soil and waste pipework shall comply with the requirements of the 2002 Building Regulations Approved Document H1 and the British Standard Code of Practice BS EN 12056 - 2: 2000 Gravity Drainage Systems Inside Buildings.

The pipework installation shall comply with the recommendations of BS EN 12056 - 2: 2000 Gravity Drainage Systems inside Buildings and any Local Authority Bye-Laws.

The above ground drainage system will be adapted to convey waste and foul water effluent from the new basins and WCs.

Branch connections of 50 and less shall be made to the stacks via boss pipes with a built in gradient. The 100 branch connections to the stack shall be made using radius pattern branch fittings. Square branches will not be allowed. If additional offsets are required in the wet part of the soil and waste stacks due to misalignment or lack of co-ordination, the written approval of the Engineer is to be obtained before the pipework is installed. The WC manifolds are to be fabricated using the Polypipe Terrain Ref 129 range of WC manifold connectors. The WC manifolds are to have a minimum gradient of 1.25º.

Concertina type WC connectors and strap-on boss connectors will not be permitted.

The soil waste and vent pipe system is to be installed in UPVC and MUPVC pipework and fittings, with all joints installed in accordance with the Manufacturer's site instructions.

The 75 and 100 stub stack and soil waste and vent pipes shall be installed in UPVC pipework and fittings to BS EN 1329-1: 2000 as Polypipe Terrain System 100. The 32, 40 and 50 waste pipes are to be installed in MUPVC pipework and fittings to BS 5255 as Polypipe Terrain System 200. All UPVC and MUPVC pipework and fittings exposed to view within the Buildings are to be coloured white.

4.7 LV Distribution

All new circuits to be installed are shown on the distribution board schedule on the tender drawing. Typed circuit charts shall be provided and DB labelled. The contractor shall identify all existing circuits on t6he distribution board schedules shown on the tender drawings and verify cable types and sizes as requested on the tender drawing.

Within each toilet area:

New supplies shall be allowed for lighting and hand dryers from the dedicated distribution boards to the proposed toilet area.

4.8 General Lighting

The existing lighting, wiring and switching/ controls shall be isolated and removed.

New lighting and associated wiring and accessories shall be installed within the washrooms located on the ground and first floors as indicated on the tender drawings.

PIR controls shall be installed within toilet areas to reduce energy usage.

4.9 General LV Power

New cabling shall be installed from the existing distribution board to the fused connection units within the toilet areas that supply the new hand dryers as shown on tender drawings.

The contractor shall allow a cost on the tender return sheet for a new supply to each water boiler. See Appendix D.

4.10 Emergency Lighting

The emergency lighting shall be integral to the new luminaires within the toilets and adjacent corridor.

4.11 Fire Detection and Alarm

The existing fire alarm sounders shall be relocated as shown on the tender drawings to facilitate the new toilet layouts.

4.12 Testing and Commissioning

All new and/or modified mechanical & electrical services systems shall be fully tested and commissioned by a competent person before handover to the Employer. That person must have access to the specification, drawings and any other relevant documentation prior to commencing commissioning.

Each local system shall be proved before the system is proved as a whole. A method statement shall be issued to the Project Manager for prior approval for each activity.

Any electrical supplies should be tested and commissioned and test certificates included in the O&M manual.

The Contractor shall record all test results and commissioning data (including test instruments calibration certification).

Typed copies of test sheets signed by the Commissioning Engineer shall be included in the O&M manual.

A final test and commissioning certificate shall be signed by the commissioning engineer and included in the O&M manual.

4.13 Record Drawings

The Contractor shall provide prior to Practical Completion, two copies of the Record Drawings to the Consulting Engineer, for approval. The complete installation shall be detailed on the drawings including plant, equipment, conduit, trunking and cable routes. Each service shall be identified in accordance with relevant labelling and schedules.

The drawings shall be produced using AutoCad™ unless otherwise stated, on A1 to A4 paper as appropriate.

A revised electrical schematic distribution diagram shall be produced on laminated plastic sheet, fixed to the building fabric in an approved position within the boiler room/ intake.

Drawings(s) shall show all the main and sub-main switchgear, ratings/types of over current protective devices, cable sizes/types and points of isolation.

4.14 Operating and Maintenance Manuals

Prior to Practical Completion the Contractor shall issue two draft copies of the Operating and Maintenance Manuals to the Consulting Engineer for approval.

An electronic copy on CD shall also be provided.

5. Scope of the Works

For the avoidance of doubt the Mechanical & Electrical Services Contractor shall include for the following:-

- All plant, tools, equipment, lifting and hoisting tackle, ladders, scaffolds, trestles and temporary buildings that may be required to carry out the works.
- Taking site dimensions and preparing all drawings and diagrams (including points schedule, wiring schedules, equipment schedules, and wiring routes) necessary to meet all the requirement of the specification and programme.
- Co-ordination; preparation of working drawings and diagrams; manufacture, supply, delivery to site, installation, cleaning, testing, commissioning, demonstrating, certification and hand-over of a complete working installation in accordance with the drawings and specifications supplied.
- Supply and installation including off loading, storing, handling, moving into position, erecting, and assembly of all equipment and materials.
- Protecting and maintaining “as new” all plant and equipment to be installed by the Contractor.
- Preparation, priming, painting and protecting and making good as called for in the specification to surfaces, walls ceilings etc.
- Holding down bolts, brackets, hangers and steel-work, together with any other form of fixing required by the specification and necessary to ensure a complete and acceptable system.
- A competent level of on-site supervision during the construction period.
- Drilling all BWIC holes 50mm diameter and below.
- Removing rubbish generated by the Contractor to central designated segregated disposal points(s), including removal from site.
- Attendance at sub-contract meetings as deemed necessary by the Project Manager / Client Team.
- “As Fitted” Record Drawings and Diagrams in both paper and electronic format.
- The supply of spares as detailed within the specification.
- Provision of method statements and risk assessment both for safety and infection control.
- All fire alarm system components and equipment required for a complete operational system.
- All emergency lighting system components and equipment required for a complete operational system.
- BMS software engineering, any software licences, including all access codes and access to the system for in-house maintenance and system alterations.
- On site demonstration and instruction of the installation. Operation, setting, resetting, use of control system.
- Operating and Maintenance manual information for equipment supplied and installed, together with a full and detailed description of the system operation and maintenance requirements.

6. Technical Specification

6.1 Pipework Installation

The intent of this specification is to provide a safe, sound installation, free from potential difficulties due to air-locking, blockages, contamination or other hazards.

The installation of piped services shall be suitable for the particular service or application involved. Pipework shall be neatly arranged and adequately spaced to facilitate the application of insulation, where appropriate, with a minimum clearance of 25mm between un-insulated pipes, the finished face of pipe insulation and adjacent surfaces, and an ideal minimum clearance of 150mm from lighting fittings, power cables, conduits or trunking. Spacing shall permit access to valves or other components as may be necessary to operate or maintain the installation.

The installation shall comprise new materials throughout, a good quality standard of workmanship and shall be properly supervised.

6.2 Pipework Materials

Domestic hot and cold water services pipework shall be in copper tube conforming to BS EN1057-R250, employing ‘pressfit’ type joints with a temperature and pressure rating to suit the application. Copper fittings shall be designed for use on hot and cold water services and manufactured from copper/copper alloy incorporating an EPDM ethylene propylene ‘O’ ring.

LTHW heating services pipework shall be in heavy mild steel tube to BS EN10255, with carbon steel or malleable cast iron fittings, screwed or flanged to suit.

The above ground drainage soil waste and vent pipe system is to be installed in UPVC and MUPVC pipework and fittings, to be supported by zinc plated mild steel screw to wall holderbats and pipe brackets.

6.3 Pipework Supports

Pipework shall be securely supported, singularly or in groups, on suitable hangers and brackets, graded to levels required for venting and draining and having due regard to the requirements for thermal insulation.

Supports shall be provided at the bases of vertical pipes and at appropriate intermediate positions, as well as adjacent to valves, expansion fittings and other special pipeline components, to allow for the additional loading and removal of components without detriment to the adjoining pipework.

Pipework exposed to view shall have approved brackets or clips of neat appearance, screw fixed to the wall at intervals to give uniform spacing and neat appearance. All pipework in areas likely to be occupied by children shall be either contained in boxing or distributed at high level.

Drop rods shall be not less than 10mm diameter with the exception of single pipe (pipes under 22 dia.) supports when not less than 8mm is acceptable. Calliper hooks shall not be used.

Non-ferrous lined pipe clips and rollers shall be used on copper pipes.

Pipes at ceiling level or in roof spaces shall be suspended from rods or straps using adjustable mild steel hangers with swinging joints or purpose-made angle iron cradles or other steel sections.

PIPEWORK SUPPORT INTERVALS FOR COPPER PIPEWORK		
Nominal size of tube	Intervals for Horizontal Runs (bare or insulated)	Intervals for Vertical Runs Bare or insulated
Ømm	(metres)	(metres)
15	1.2	1.8
22	1.8	2.4
28	1.8	2.4
35	2.4	3.0
42	2.4	3.0
54	2.7	3.6

PIPEWORK SUPPORT INTERVALS FOR STEEL PIPEWORK		
Nominal size of tube	Intervals for Horizontal Runs (bare or insulated)	Intervals for Vertical Runs Bare or insulated
Ømm	(metres)	(metres)
15	1.8	2.4
22	2.4	3.0
28	2.4	3.0
35	3	3.6
42	3	3.6
54	3.6	4.5

The spacing of supports carrying pipework of various diameters and materials must be set out to satisfy the requirement of the pipe having the smallest spacing interval.

PIPEWORK SUPPORT INTERVALS FOR UPVC & MUPVC PIPEWORK			
Nominal size of tube	Horizontal	Vertical	Max Expansion Joint Distance
Ømm	(metres)	(metres)	(metres)
110	0.9	1.8	4.0
75	0.9	1.8	4.0
32	0.5	1.2	2.0
40	0.5	1.2	2.0
50	0.6	1.2	2.0

The suspended MUPVC pipework is to be supported by Boss Flamco pipe hangers complete with rubber lining and 10mm drop rods anchor fixed to the structures.

An additional bracket is to be installed adjacent to the Hepvo valve.

Support brackets are to be installed on the pipework within 500m of any fire collar or wrap.

A bracket is to be installed to support all suspended gully traps and adjacent to the transition from cast iron to UPVC pipework.

The Contractor shall install an anchor bracket to each seal ring expansion joint between the WC manifold branches.

6.4 Thermal Expansion of Pipework

The expansion of pipework shall be taken up at bends, changes of direction, natural deflection or, where expansion dictates, by the fitting of expansion devices or expansion loops complete with suitable anchors and guides.

Expansion loops, on heating and hot water services, shall be 1500mm deep minimum (at 90 deg to normal pipe run) and a minimum 1000mm length (parallel with the normal pipework run).

Where branch connections are taken off mains, full allowance shall be made for expansion in different planes by the use of suitable anchors and guides.

Expansion loops shall be of the same material as the pipework, formed in one length, and with dimensions suitable to accommodate the expansion movement to be accommodated.

Expansion loops are the preferred means of accommodating expansion in pipework: where spatial constraints prohibit the use of expansion loops, expansion bellows and axial joints may be utilised. Bellows shall be manufactured and installed to the requirements of B.S. 6129: Part 1, be of the fully articulated type with a suitable number of convolutions to accommodate the movement required.

The expansion joints and bellows shall be designed and selected by the manufacturer and fitted in accordance with the manufacturer's data and recommendations. Screwed connections on expansion bellows and loops shall not be used.

Anchor brackets generally to B.S. 3974: Parts 1 and 2 shall be rigidly attached to the building structural element to ensure correct expansion movement of the pipework.

Suitable 'U' bolts, flat strap or other type of guides shall be fitted in conjunction with the design of the anchor and roller/slider supports to ensure that expansion movement takes place in the same plane as the pipe run without deflection of the pipework.

For securing copper pipework anchors shall have wide copper straps brazed to the pipework such that no part of the pipe touches the steel structure.

6.5 Pressure testing

All equipment and assemblies which fall within the scope of the Pressure Equipment Directive (PED) 97/23/EC, implemented in the UK through the Pressure Equipment Regulations 1999, must be tested by the manufacturers, and be certified as compliant with the Directive. Such compliance shall be evidenced by displaying the appropriate CE Mark on the equipment and assemblies.

Only relevant equipment and assemblies certified as compliant shall be permitted under this specification, and any substitution put forward must also be compliant with the Directive.

6.6 Pipe sleeves and cover plates

Pipework passing through walls, floors, ceilings and partitions shall be fitted with sleeves of internal diameter at least 10mm larger than the external diameter of the pipework passing through the sleeve. Pipework subject to sideways movement due to expansion or where insulation is continuous on cold water services shall be fitted with oversize sleeves.

Sleeves for steel or copper pipe shall be of a material similar to that of the pipe and shall be treated against corrosion. Sleeves for plastic pipes shall be manufactured from rigid plastic or copper.

Sleeves shall be correctly positioned around the pipe, normally centrally except where lateral movement of the pipe requires off-setting of the sleeve. Sleeves shall be built into the building fabric by the Contractor.

Sleeves shall be finished flush with the finished face(s) of walls, floors, and ceiling and with the clearance around the pipe sealed with waterproof mastic by the Contractor.

Without restricting pipework movement within the sleeve the gap shall be packed with mineral wool for general internal locations, with fire stopping in fire rated structures complying with the requirements of the Building Regulations and, in particular, with Approved Document B, Fire Safety, Part B3, Section 11 using non-combustible material approved by the Fire Authority, and caulked-in weatherproof material in external walls.

Pipework passing through the structure and fitted with sleeves in areas occupied or otherwise in regular usage shall have cover plates fitted around the pipes (or sleeves in wet areas) to suitably conceal the gap and sleeve end. The plates shall cover the sleeve and, even where oversize sleeves are necessary, the spacing of adjacent pipes shall allow for this provision to produce a neat and tidy appearance.

The plates shall be of plastic, polished aluminium, or chrome-plate material, to suit the application.

6.7 Pipework Insulation

A specialist, approved contractor shall be employed to supply and install insulating materials in accordance with the specification.

All insulation is to be applied in accordance with the manufacturers' recommendations to meet the performance requirements of this specification.

All cold water pipework (with the exception of that exposed to view in toilet areas) shall be insulated and vapor sealed. The final pipework connections to the service outlets up to a maximum length of 1.0metre shall not be insulated.

All domestic hot water pipework (with the exception of that exposed to view in toilet areas) shall be insulated. The final pipework connections to the service outlets up to a maximum length of 1.0metre shall not be insulated.

All LTHW heating pipework (with the exception of that exposed to view at low level) shall be insulated.

Insulation thicknesses shall be as set out in accordance with BS54422: 2001 and the following tables:

LTHW HEATING PIPEWORK INSULATION THICKNESS

Nominal Pipe Size (mm)	Water temperature of 70°C, Ambient temperature 15°C				
	Declared Thermal Conductivity (W/mk)				
	0.025	0.030	0.035	0.050	0.055
	Minimum Thickness of Insulation (mm)				
15	12	17	22	30	39
20	14	20	26	35	46
25	16	22	29	38	49
32	18	24	31	40	51
40	20	26	33	42	52
50	24	31	39	48	58
65	24	31	39	48	58

DOMESTIC HOT WATER PIPEWORK INSULATION THICKNESS

Nominal Pipe Size (mm)	Declared Thermal Conductivity (W/m°) at insulation mean temperature 50°C							
	Up to 0.020		0.0211 to 0.030		0.031 to 0.040		0.041 to 0.05	
	Minimum Thickness of Insulation							
Steel	Unheated	Heated	Unheated	Heated	Unheated	Heated	Unheated	Heated
15	15	12	22	17	42	31	71	53
22	19	14	26	20	47	34	72	56
28	21	16	28	22	49	36	72	57

DOMESTIC COLD WATER PIPEWORK INSULATION THICKNESS

Nominal Pipe Size (mm)	Declared Thermal Conductivity (W/m°) at insulation mean temperature 50°C							
	Up to 0.020		0.0211 to 0.030		0.031 to 0.040		0.041 to 0.05	
	Minimum Thickness of Insulation							
Steel	Internal	External	Internal	External	Internal	External	Internal	External
15	11	68	16	-	20	-	25	-
22	12	21	17	30	22	58	27	78
28	13	13	18	17	24	28	29	35

All insulation and finishing materials shall be free of asbestos, shall not contain any chlorofluorocarbons (CFC's)/ hydro chlorofluorocarbons (HCFC's); chlorofluorocarbons (CFC's)/ hydro chlorofluorocarbons (HCFC's) shall not be used in the insulation manufacturing process. Insulating materials with a Global Warming Potential (GWP) and Ozone Depletion Potential (ODP) of zero shall be utilised.

None of the materials or substances generally used in connection with the insulation works shall be, such as are known to be or suspected of being, deleterious at the time of use. Including without limitation substances which have been referred to by the Building Research Establishment at the date of the Contract as being hazardous to health and safety or to the durability of the property in the particular circumstances in which they are used and substances which are not in accordance with current European Specifications, British Standards and Codes of Practice or any equivalent where such exist.

Materials shall be procured from an ISO9000 Quality Assured source.

All insulants used within the building fabric and services shall have an ozone depleting potential (ODP) of zero and a global warming potential (GWP) of less than five, in either manufacture or composition.

Adequate precautions shall be taken against any hazard to health involved in the use of any adhesive, solvent, cleaner or other materials.

Insulation materials, adhesives and finishes shall be inherently proof against rotting, mould and fungal growth and attack by birds and vermin. Insulation materials shall be non- hygroscopic and in all respects be suitable for continuous use throughout the range of operating temperatures and within the environment indicated. All insulating materials shall be non-corrosive to and compatible with ferrous and non-ferrous metals.

Materials shall comply with BS 476:Part 4, non-combustibility test; or obtain a Class 'O' fire rating as defined in the Building Regulations Approved Document 'B' when tested in accordance with BS

476: Parts 6 and 7. Materials shall additionally achieve a smoke obscuration level of less than 5% (i.e. negligible) when tested in accordance with BS 5111-1.

Each pipe shall be insulated and/or clad separately so that any adjacent pipe is not married together with insulating materials.

6.8 Pipework Identification

Pipework services shall be identified in accordance with BS 1710 incorporating coloured plastic adhesive identification bands incorporating direction of flow arrows and appropriate abbreviation of the particular service. Colours to be in accordance with BS 4800. All systems shall be identified, regardless of location or if the service is insulated.

6.9 Valves

Valves and stopcocks shall be provided for the efficient and easy control of balancing and isolation of each and every part of the system. Drain cocks complete with hose union tails shall also be provided at all low points in the system and wherever required for the emptying of isolated sections of the installation, or of items of plant.

An isolating valve shall be installed adjacent to each motorised valve or control valve, mixing valve and all items of equipment such as pumps, batteries, calorifiers, etc.

All valves shall be installed so that they are accessible for inspection and maintenance, and are fully operable.

Valves shall be 'in-'line' size unless otherwise indicated on the drawings.

As far as possible the type and manufacture of valves shall be consistent throughout the installation in order to rationalise holding of spares.

6.10 Radiators

New radiators shall be supplied and installed throughout the CEH Toilet Refurbishment to replace existing in the three toilet blocks. Each radiator shall be fitted with matching TRV and LSV as described below.

Pipework connections shall be TBOE (Top and Bottom opposite end).

All radiators shall be manufactured and tested in accordance with BS EN 422 and be installed in accordance with the manufacturer's instructions.

Radiators shall be protected from damage when in transit and during installation. Any damage to radiators shall be made good or radiators replaced. This additional cost shall be met by the installer.

6.11 Radiator Valves

All radiators shall be provided with the following valves:

Drayton TRV4 (22mm) in the flow for control of room temperature, with a matching LSV for isolation on the return.

6.12 Pipework Cleaning & Water Treatment

The contractor shall employ the services of a water treatment specialist to carry out pipework cleaning and LTHW heating system treatment.

All systems shall be fully cleaned and flushed out prior to the addition of any water treatment. Immediately after hydraulic testing, all water from the system shall be fully drained and the system shall be re-filled and flushed out a minimum of two times. After flushing and draining all drain pockets, strainers, dead legs and control valves shall be checked to ensure the system is completely free from dirt before they are put into commission.

All closed circuits shall undergo a chemical cleaning process to remove light surface rust, mill scale and small debris from the internal surfaces. Circulate systems using pumps and introduce 3-4% (by volume) concentration of pre-operational cleaner, using a portable injection pump. Once it has been established the chemical solution is completely distributed throughout the system, it shall be circulated for a minimum of 16 hours. At the end of this period the system shall be completely emptied and re-filled with fresh water and a dispersant shall be added. The solution shall be circulated for a minimum of two hours and then completely emptied and the system shall be flushed again with clean water.

Following cleaning, a suitable passivator shall be added to give a minimum nitrate reserve of 800ppm and the system shall be circulated for a 24 hour period. The system shall be drained and re-filled with fresh water.

The system shall then be dosed with an appropriate scale & corrosion inhibitor and biocide and the water shall be analysed to confirm the correct condition and concentration of chemicals.

6.13 Chlorination

Domestic hot & cold water systems shall be flushed and disinfected in accordance with the requirements of BS 6700, and to the satisfaction of the local water supply authority. Systems shall be flushed with mains water until the water is clear.

Chlorination certification / test results shall be provided to demonstrate the water is suitable for consumption for inclusion in the Operating and Maintenance Manual.

The contractor employed to carry out the chlorination must ensure the Chlorination Certificates fully state the dosages and refer to the proper regulations/guide lines and contractors are qualified to carry out such works.

6.14 LV Switchgear

Refer to drawing no. EL (62, 63 & 68) 01 rev A.

The extent of works carried out involves 8 no. New circuits to be connected to an existing distribution board and all existing circuits to be identified as requested on drawing no. EL (62, 63 & 68)01 rev A.

All sub-circuits shall be wired in 6242B.

6.15 LV Distribution

Refer to distribution board schedule for cable type and sizes located on EL (62, 63 & 68) 01 rev

A. Sub circuits shall be wired in 6242B and installed in trunking and conduits.

6.16 General LV Power

Fuse connection units shall be MK Logic (preferably flush). Where flush outlets are unsuitable due to required builders work a surface mounted version may be acceptable, to be agreed with project manager on proposed location basis.

Any switch fused spurs to be located within approx. 1m of the appliance and engraved to state what they control.

Refer to tender drawings for location of outlets and type of outlets proposed for each area.

Circuit ways shall be clearly labelled on Distribution Boards and at the load, with relevant existing circuit charts updated.

6.17 Containment

Existing containment routes in existing circulation ceiling spaces can be utilised where possible. These shall be identified by the Electrical Contractor following a survey of the existing containment routes before commencement of the installation.

6.18 Fire Detection and Alarm

Refer to tender drawings for positions of relocated existing devices and design details.

All parts of the existing fire alarm system shall remain in operation.

6.19 General Lighting

New lighting and associated wiring and accessories shall be installed throughout the new toilets and adjoining areas, as indicated on the Tender drawings.

A new lighting scheme shall be provided with PIR controls as indicated on the Electrical Layout Drawing and in the lighting controls section in this specification.

The Electrical Contractor shall provide, install, commission and configure the system to the client's requirements and provide 'As Installed' information for the O&M Manual.

Design Parameters

The complete lighting installation shall form an energy efficient and effective scheme that shall adhere to the recommendations set out in this section and the following.

Illuminance levels from CIBSE Code for Lighting
Minimum colour rendering (Ra) is as CIBSE Code for Lighting.
Limiting glare rating is as CIBSE Code for Lighting.

Luminance limits as Table 2.4 of CIBSE Code for Lighting are not exceeded on DSE.

Luminaires shall be supplied by Manufacturers as indicated on the layout drawing

All fittings shall be High Frequency Fluorescent supplied with white tubes (4000k).

6.20 Lighting Controls

The lighting controls shall be as EX-OR or equal and approved.

Presence detectors shall be used to control the lighting within all

the lobbies and washrooms to be refurbished:

The detectors shall not be daylight linked and therefore do not require the facility to dim the luminaires either.

Detectors are to be fed by a permanent live, not the switched live.

PIR Settings

AREA	Timer
Female Washrooms	20 minutes (Client to Confirm)
Male Washrooms	15 minutes (Client to Confirm)

Individual rooms are to be controlled separately to adjacent rooms.

Emergency Lighting
The emergency lighting shall be installed in line with the tender drawings.

All units to be maintained units, for 3 hour duration.

On each light fitting provide an identification number and record the number/location on a plan in the O&M and recorded on the TVP proforma.

Emergency light test switch to be located as shown on the tender drawings. Key switches shall be located separately where rooms have automatic lighting controls.

The switch is to isolate the power to the Emergency light only.

6.21 Controls Philosophy

Gas Fired Boiler Plant
The existing packaged gas fired condensing boilers and its control philosophy will be retained.

The BMS shall switch the plant on and off at the dictates of the control system for timed control and frost protection.

Boiler Primary Pumps
The existing Boiler Primary / Shunt Pumps and its control philosophy will be retained.

Variable Temperature Heating Pumps
The existing heating boilers direct weather compensation and its control philosophy will be retained.

Zone Control Pumps and Valves
The LTHW heating installation and its zone control will be retained.

Frost Protection
During off periods in winter mode the existing frost protection strategy shall be followed.

Domestic Hot Water Heater
The existing electric hot water storage heaters local to each space shall meet the domestic hot water heat demand.

The existing manual control system to dictate when to switch on and off the system shall be retained.

A minimum temperature of 60ºC shall be maintained in the storage vessel at all times.

Extract Fan (EF01/EF02/EF03)
The extract fan controls shall be linked to the local lighting circuit.

APPENDIX A - SCHEDULE OF TENDER DRAWINGS

A1 - MECHANICAL SERVICES TENDER DRAWINGS

Drawing No	Drawing Title	Revision
ML(52)01	Above Ground Drainage Layout	A
ML(53)01	Domestic Hot & Cold Water Services Layout	A
ML(56)01	Heating Layout	A
ML(57)01	Extract Mechanical Ventilation Layout	A

A2 - ELECTRICAL SERVICES TENDER DRAWINGS

Drawing No	Drawing Title	Revision
EL(62,63&68)01	LV Distribution, Small Power and Data Layout	A

APPENDIX B - SCHEDULE OF MECHANICAL EQUIPMENT

B1 - SCHEDULE OF POINT OF USE UNVENTED ELECTRIC WATER HEATERS

Reference		**WH01/WH02/WH03**
Model		Multipoint 10
Storage capacity	litres	10
Heat input	kW	3
Maximum hydraulic working pressure	mbar	6.0
Minimum hydraulic working pressure	mbar	0.8
Connections		
Cold Water Inlet	0mm	15
Hot Water Outlet	0mm	15
Drain (HWS return)	0mm	15
Electrical supply		
	v	230
	ph	1
	Hz	50
	W	130
Dimensions		
Overall height	mm	572
Overall width	mm	267
Overall depth	mm	252
Weight (operational)	kg	16.9

Notes:

1) All water heaters shall be commissioned by the manufacturer.
2) The water heaters shall be supplied complete with unvented system kit (including expansion vessel, expansion valve, non-return valve, strainer & pressure reducing valve). Blending valves are not included in the unvented system kit.
3) Water heaters shall be complete with packaged controls with no volt contacts providing link to the BMS.
4) All electric point of use water heaters shall be manufactured by Heatrae Sadia, or equal & approved.
5) Contractor to investigate and confirm as to whether new point of use unvented electric water heaters are required or if existing can meet the DHW demand.

B2 - SCHEDULE OF EXTRACT FANS

Ref No.	Location	Model	Required Flow Rate (l/s)	System Pressure Drop (Pa)	Electricity Supply	Power Requirement (W)
EF01	Link 3 Men Ground	ES - OPUSDC 60 - 2 M	29.6	120	230/ 1ph/ 50Hz	44
EF02	Link 3 Ladies First	ES - OPUSDC 60 - 2 M	29.6	120	230/ 1ph/ 50Hz	44
EF03	Link 5 Men Ground	ES - OPUSDC 60 - 2 M	29.6	120	230/ 1ph/ 50Hz	44
EF04	Link 5 Ladies Ground	ES - OPUSDC 60 - 2 M	29.6	120	230/ 1ph/ 50Hz	44

Notes:

1. All extract fans have been based upon Nuaire or equal & approved.
2. Final colour of external lourves to be confirmed by client

B3 - SCHEDULE OF EXTRACT GRILLES

Ref No.	Location	Model	Diffuser Type	Volume Flow Rate (l/s)	Pressure Drop (Pa)	Duct Connection (mm dia)
EG01	Link 3 Ladies	RRVO 125	Grille	21	60	100
EG02	Link 3 Ladies	RRVO 126	Grille	21	60	100
EG03	Link 5 Ladies	RRVO 127	Grille	21	60	100
EG04	Link 5 Ladies	RRVO 128	Grille	21	60	100
EG05	Link 3 Men	RRVO 129	Grille	21	60	100
EG06	Link 3 Men	RRVO 130	Grille	21	60	100
EG07	Link 5 Men	RRVO 131	Grille	21	60	100
EG08	Link 5 Men	RRVO 132	Grille	21	60	100

Notes:

1. Contractors shall allow within their costs for all grilles to be powder coated paint finish to either a standard RAL or BS colour, colours shall be confirmed by the client prior to the grilles being ordered.

2. All extract grilles have been based upon Solid Air Ltd or equal & approved.

B4 - SCHEDULE OF LOUVRES

Ref No.	Location	Model	Diffuser Type	Volume Flow Rate (l/s)	Duct Connection (mm dia)
L01	Link 3 Ladies	BMDRSO	Louvre	29.6	150
L02	Link 5 Ladies	BMDRSO	Louvre	29.6	150
L03	Link 3 Men	BMDRSO	Louvre	29.6	150
L04	Link 5 Men	BMDRSO	Louvre	29.6	150

Notes:

1. Contractors shall allow within their costs for all grilles to be powder coated paint finish to either a standard RAL or BS colour, colours shall be confirmed by the client prior to the louvres being ordered.

2. Insect mesh to be included.

3. The above louvres are to be based upon Solid Air Ltd or equal & approved.

B5 - SCHEDULE OF RADIATORS

Ref No.	Radiator Type	Number	Output (W)	dT (ºC)	Room Temperature (ºC)	Water Flowrate (litre/s)	Height (mm)	Length (mm)	Accessories/ Special requirements
00.R.01	Stelrad Compact K3	1	1898	50	20	0.024	700	700	
00.R.01	Stelrad Compact K3	1	1898	50	20	0.024	700	700	
00.R.01	Stelrad Compact K3	1	1898	50	20	0.024	700	700	
00.R.01	Stelrad Compact K3	1	1898	50	20	0.024	700	700	

Notes:

1) All radiators shall be polyester powder coat finished *White RAL9010, 20% Gloss*.

2) All radiators shall be manufactured by Stelrad, or equal & approved.

APPENDIX C - SUMMARY OF MECHANICAL SERVICES TENDER

SUMMARY OF MECHANICAL SERVICES TENDER

SECTION		
Demolitions/Strip-out		£
Holes/chases/covers/supports for services		£
Cold water services		£
Hot water services		£
Low temperature hot water heating		£
Automatic controls		£
Preliminaries		£
Operating and Maintenance Manuals		£
As Fitted Drawings		£
Testing & Commissioning		£
POU Water heaters		£
	Sub Total	**£**
	TOTAL	**£**

Tender figure to be carried forward to main pricing schedule

APPENDIX D - SUMMARY OF ELECTRICAL SERVICES TENDER

SUMMARY OF ELECTRICAL SERVICES TENDER

SECTION		
Demolitions/Strip-out		£
Holes/chases/covers/supports for services		£
LV distribution		£
Internal Lighting/ Emergency Lighting		£
General LV Power		£
Fire detection Relocation		£
Earthing and bonding		£
Preliminaries		£
Operating and Maintenance Manuals		£
Spares		£
As Fitted Drawings		£
Testing & Commissioning		£
POU Water Heater Supplies		£
	Sub Total	**£**
	TOTAL	**£**

Tender figure to be carried forward to main pricing schedule

APPENDIX E - DESIGNERS RISK ASSESSMENT