HARLEY HADDOW

The Horniman Museum - Plant Room 3 Water Works

Mechanical Services Specification

May 2019

4433-HAH-00-ZZ-SP-Z-70-0001

Contact
45 Great Guildford Street
Ground Floor
London
SE1 0ES
enquiries@harleyhaddow.com

Document Revision Control

Revisions	Date	Reason for Issue	By	Approved
P01	24/05/19	Tender	RL	CJM
P02	28/05/19	Updated Tender Issue	RL	CJM

The Horniman Museum and Gardens - Plant Room 3 Water Works

Custom Report

28/05/2019 - 14:23

Table of Contents

00-05-10 Project definition....4
00-05-15 Works terminology.... 5
00-05-20 Project participants....8
00-05-70 Project location....9
00-10-70 Works Contract Content.... 10
00-20-70 Works contract.... 13
00-30-70 Works Contract Procurement.... 14
00-40-70 Works Contract Establishment.... 19
00-50-70 Works Contract Management.... 23
00-60-70 Works Contract Verification....26
00-70-70 Works Contract Administration....37
00-80-70 Works Contract Completion.... 53
Outline Specification.... 64
55-40-40/110 Incoming water supply.... 68
55-40-40/130 Pumped cold water supply system....72

304433

Project Management

28/05/2019 - 14:23

00-05-10 Project definition

101 Project description

- **Project reference:** 304433
- **Project title:** Horniman Museum - Plant Room 3 Water Works
- **Project description:** Installation of a new mains water supply, water booster pump set and water services pipework reconfiguration.

Design information

165 Drawings

- **Details:** Refer to drawing Register
- **Contract drawings:**
  - **Generally:** The same as the tender drawings.

00-05-15 Works terminology

110 Terminology

- **Meaning:** Terms, derived terms and synonyms used are as defined in this section or in the appropriate referenced document.

210 Description terminology

- **Attendance:** Provision of temporary works and facilities to a third party. If not detailed in the contract, to be as described in RICS NRM coverage rule 10.4.
- **Building Manual:** A document containing information of use to subsequent building owners, occupiers and users about the requirements and procedures for effective operation, maintenance, decommissioning and demolition of the building.
- **Construction Work:** Permanent work together with temporary work.
- **Contractor:** The party who undertakes to perform the services, supply goods or carry out work defined in a contract. Includes Main Contractor, Prime Contractor, Supplier, Service provider, Builder, Subcontractor, etc. as the context dictates, which may be defined terms in certain standard contract forms. The contracto is responsible for ensuring all persons and employees are suitably skilled and instructed to complete the tasks.
- **Contractor’s choice:** Selection delegated to the Contractor, but liability to remain with the specifier.
- **Contractor's design:** Design to be carried out or completed by the Contractor, supported by appropriate contractual arrangements, to correspond with specified requirements.
- **Cost:** The amount paid or given by one party to another in exchange for goods, work or services.
- **Designer:** A person carrying out design on a project.
- **Deviation:** Difference between a specified dimension or position and the actual dimension or position.
- **Employer:** The party to the Contract for whom the goods, work or services are provided. Includes Client (in consultancy contracts and CDM Regulations), the Employer, Building owner or Purchaser (in construction contracts), the Developer (in development agreements and funding agreements), or the 'Main' contractor in contractor/ subcontractor agreements - which may be defined terms in certain standard contract forms
- **Estimate:** An approximate evaluation of quantity, number, extent, time or cost of part or the whole of a project.
- **Execute:** To complete a task fully and put into effect. To fix, apply, install or lay products securely, accurately, plumb and in alignment.
- **Fastener:** Device for mechanically attaching something to something else.
- **Manufacturer and Product reference:** Manufacturer – the person or legal entity under whose name or trademark the particular product, component or system is marketed.
  Product reference – the proprietary brand name and/ or identifier by which the particular product, component or system is described.
  References are as specified in the manufacturer’s technical literature current on the date specified.
- **Manufacturer's standard:** Where used in conjunction with a specified proprietary product, accessories to be those recommended by the product manufacturer.
- **Permanent Work:** Work to be constructed and completed in accordance with the Contract.
- **Price:** An indication of the amount required to be paid by one party to another in exchange for goods, work or services.
- **Product:** Material, both manufactured and naturally occurring, goods and accessories for permanent incorporation into the Works.

- **Requirements:** A description in outline or detailed form of the development, or a part of it, which one party wants another to undertake, design and/ or construct.
- **Schedule of rates:** The subdivision of product and execution prices by a pre-determined unit basis.
- **Schedule of Work/ Work Schedule:** The subdivision of work items by a pre-determined classification. Can form the basis of a pricing document where Bills of Quantities are not used.
- **Schematic:** A drawing of a system showing components, products, systems and their interconnections.
- **Site equipment:** The Contractor's apparatus, appliances, machinery, vehicles or things of whatsoever nature required in or about the construction for the execution and completion of the Works and the remedying of defects.
  Includes Appliances, vehicles, consumables, tools, temporary work, scaffolding, cabins and other site facilities.
  Excludes: Temporary work, Employer's products and equipment or anything intended to form or forming part of the permanent Works.
- **Specification:** Written description of requirements.
- **System:** Products, components, equipment, accessories, controls, supports and ancillary items, including installation, necessary for that section of the work to function.
- **Temporary work:** Incidental work to undertaken during construction but not intended to form part of the completed work.

310 Activity terminology

- **Advise:** See 'Communicate'.
- **Agree:** See 'Communicate'.
- **Approve:** Record conformance of work to specified criteria by giving formal or official sanction.
- **Communicate:** Includes advise, inform, agree, confirm, notify, seek or obtain information, consent or instructions, or make arrangements.
- **Confirm:** See 'Communicate'.
- **Ease:** Adjust moving parts of designated products, systems or work to achieve free movement and good fit in open and closed positions.
- **Fix:** Receive, unload, handle, store, protect, place and fasten in position; dispose of waste and surplus packaging; to include labour, materials and site equipment for that purpose.
- **Give notice:** Communicate in writing to the person administering the Contract at the address listed therein.
- **Inform:** See 'Communicate'.
- **Keep for recycling:** As 'keep for use' but relates to a naturally occurring material rather than a manufactured product.
- **Keep for reuse:** Do not damage designated products, systems or work. Clean off bedding and jointing materials. Stack neatly, adequately protect and store until required by the Employer or Purchaser, or for use in the Works as instructed.
- **Make good:** Execute local remedial work to designated work. Make secure, sound and neat.
- **Match existing:** Provide products and work of the same appearance and features as the original, excluding ageing and weathering. Make joints between existing and new work as inconspicuous as possible.
- **Notify:** See 'Communicate'.
- **Quote:** Use 'Estimate'.
- **Recycle:** Collect, sort, process and convert discarded or recovered components into raw materials for use in the creation of new products.
- **Refix:** Fix previously removed products.

- **Remove:** Disconnect, dismantle as necessary and take out the designated products or work, together with associated accessories, fixings, supports, linings and bedding materials. Dispose of unwanted materials.
  Removal of a system includes this work.
- **Remediate:** Action or measures taken to lessen, clean-up, remove or mitigate the existence of hazardous materials existing on a property; in accordance with standards, specifications or requirements as may be required by statutes, rules, regulations or specification.
- **Repair:** Execute remedial work to designated products. Make secure, sound and neat. Excludes redecoration and replacement.
- **Replace:** Supply and fix new products matching those removed. Execute work to match the original new state of that removed.
- **Reuse:** Recover components to be fixed or used in the project or other buildings without the requirement for recycling.
- **Submit:** Deliver an item in a specified format to a specified person within a specified timeframe.
- **Submit proposals:** Submit information in response to specified requirements.
- **Supply and fix:** Supply of products, components or systems to be fixed, together with their fixing.

00-05-20 Project participants

Management and delivery roles

120 Client

- **Name:** The Horniman Museum and Gardens
- **Address:** 100 London Road, Forest Hill, London SE23 3PQ

130 Contract Administrator

- **Name:** Harley Haddow (London) Ltd
- **Address:** 45 Great Guildford Street, London, SE1 0ES

135 Employer

- **Name:** The Horniman Museum and Gardens
- **Address:** 100 London Road, Forest Hill, London SE23 3PQ

145 Engineer

- **Name:** Harley Haddow (London) Ltd
- **Address:** 45 Great Guildford Street, London, SE1 0ES
- **Contact:**
- **Telephone:**
- **Email address:**

205 Principal Designer

- **Name:** Purcell UK
- **Address:** 15 Bermondsey Square
  Tower Bridge Road
  London
  SE1 3UN
- **Contact:**
- **Telephone:**
- **Email address:**

00-05-70 Project location

110 Project location

- **Details:** The Horniman Museum and Gardens
- **Address:**
  - **Street:** 100 London Road,
  - **City:** Forest Hill, London
  - **Post code:** SE23 3PQ

170 Access

- **Details:** Initial Access to be arranged via Client.
- **Limitations:** Limitation set out within the main contract Preliminaries.

00-10-70 Works Contract Content

135 The contract work

- **Details:** The mechanical, electrical, and public health (MEP) contractors shall be responsible for completing and co-ordinating the outline design indicated on the contract drawings.

  The MEP contractors will be bound to the conditions set out within the contract preliminaries, those stated within the contract documentation stated above and this specification.

  The contract shall be on a lump sum basis and accordingly shall not be subject to re-measurement.

  The contract price shall include everything necessary for all design development to allow a fully integrated installation on site including (but not restricted to); co-ordination, installation, supervision, services, operations, materials, consumables, labour and plant necessary for and incidental to the proper construction, completion, testing, commissioning and adjustment of the Works to the satisfaction of the CA and in accordance with the conditions of contract, the specifications and the drawings.

  The tender drawings primarily describe the "design intent" of the Works, the working principles of the systems, general arrangements, principles of services co-ordination and the intended methods of installation. The MEP sub-contractors shall be fully responsible for the complete development and co-ordination of the design intent to installation on site.

  The drawings are accordingly part diagrammatic with runs of piping, ducts, cable, containment and the like being shown to small scale and not necessarily indicating exact installation positions.

  TECHNICAL DESIGN DRAWING
  The 2D CAD drawings, which forms part of this tender shall be provided to the standards set out in BSRIA BG6/2014 Pro-forma 4A. The drawings shall indicate the detailed MEP design, with locations of main plant items, pipes, ducts and cables using generic objects in positions that are feasible for the contractor and sub-contractor to price and install without major re-routing. The drawings will not indicate the precise position of the services/plant, but it shall be feasible to install the services within the general routes indicated. It will be possible for the contractor and sub-contractor to produce co-ordinated working drawings and/or installation drawings without major re-routing of the services.

  The drawings shall also provide sufficient information:
  o Allow the completion of the MEP service design from the design intent drawings.
  o To facilitate the preparation of an estimate and tender
  o To enable all other participants to appreciate the inter-relation of the works with other trades and disciplines
  o To enable the preparation of the final or supplementary builder's work information, co-ordination, installation and shop drawings incorporating manufacturing drawings and final details of specified or selected plant and equipment.

  The drawings indicate equipment, pipework, ductwork, cable tray routes and trunking, in sufficient detail to show how all the engineering services can generally be accommodated and coordinated with each other, the architecture and the structure. These drawings are provided for information purposes only. The installer shall be responsible for all detailed co-ordination of building services.

  The drawings will not necessarily show dimensions required to construct the works nor will they accurately locate every item of equipment or plant ancillary which does not influence the visual impact of the completed works. The decision of the CA as to what has a visual impact shall be

final.

Co-ordination drawings do not detail the building fabric or structure whether new or existing nor are they based on survey drawings or installation drawings of any other party or consultant.

Obtain all information required to produce the co-ordination and installation drawings or requirements at no cost.

Where it is necessary to survey an existing building or existing structure or services within that building to prepare coordinated installation and shop drawings undertake responsibility for obtaining that information. The cost of obtaining that information must be included in the contract price.
Plant and equipment is shown based upon the manufacturers' catalogue information and is subject to verification or revision when manufacturers' drawings are available.

Interpret the design intent of the tender drawings and reflect same in the co-ordination and installation drawings subject to the comments of the CA. Where differences occur between the tender and the co-ordination and installation drawings these differences shall be deemed to be included in the contract price for the Works and no additional cost shall be allowed due to any variation in layout, arrangement or detail unless the deviation is specifically covered by an CA Instruction before the production of the drawings.

The contractor shall be responsible for handing over a complete coordinated installation that is commissioned and snag free, with a complete set of approved operation and maintenance manuals.

The MEP Contractors shall supply, install and satisfactorily test and commission the said services, and to provide full documentation comprising operating, maintenance instructions and record information and building log book to facilitate the successful management, operation and running of the new MEP Engineering Services all as set out herein and shown on the tender/contract drawings.

All works executed under this contract shall be carried out in strict accordance with BS7671 17th Edition and any subsequent amendments, English Technical Standards and to the complete satisfaction of the CA/Engineer.

All plant, equipment and materials shall be sourced from local suppliers and manufacturers, where possible, without compromising quality, service or maintainability of the final installation. All materials must meet the relevant standards for each item as identified in the project and contract documentation.

All plant equipment and materials shall be ethically sourced preferably from EU countries with particular care taken regarding obtaining the same products and services from other commercial markets.

The Contractor must obtain written approval from the Contract Administrator (CA) before deviating from the preferred manufacturers specified herein or other sections of the specification or contract documentation.

The tender drawings and specification for the MEP services comprise full details of the systems to be installed, tested and commissioned comprising of but not limited to:-

Heating, cooling, Ventilation, de-humidification, Drainage, BMS controls and Power.

The electrical contractor shall allow for all new circuits as shown on the distribution schematic supplied in conjunction with this document and allow for all accessory boxes and terminations they require.

The electrical contractor is responsible for coordinating with the mechanical contractor to ensure all power supplies are captured for the project. The electrical contractor shall request a detailed schedule of required supplies at tender for inclusion in the electrical tender submission.

The electrical contractor is responsible for coordinating with all sub-contractors or specialist sub-contractors to ensure all power supplies are captured for the project. The electrical contractor shall request a detailed schedule of required supplies at tender for inclusion in the electrical tender submission.

The MEP contractors shall be deemed to have carefully examined this specification, tender documents and tender drawings. Any inconsistencies within the tender documents, specification and drawing shall be clarified with the Engineer during the tender period and confirmed in writing.

Where quotations have been sought and incorporated into this specification it shall be the responsibility of the Contractor to check that the quantities correspond with the specification and drawings. Subsequent claims on the basis of inconsistencies within the tender documentation will not be accepted.

160 Products provided by, or on behalf of employer

- **General:** Details of products to be fixed by the Contractor are given in the relative work sections.

00-20-70 Works contract

SUBCONTRACT

- **The Contract:** Refer to main contract preliminaries for contract details.
- **Requirement:** Allow for the obligations, liabilities and services described.
    - **Date for Commencement:** Refer to the main contract preliminaries.
    - **Date for Completion:** Refer to the main contract preliminaries.
    - **Amendments to clauses:** Refer to the main contract preliminaries.
    - **Additional clauses:** Refer to the main contract preliminaries.

00-30-70 Works Contract Procurement

110 Compliance with Tender rules

- **Compliance:** Tendering Contractors must price specification, drawings and equipment as specified within the tender documentation. Any proposed alternatives must form a cost saving option. With full justification and technical details to be passed to the Engineer for appraisal. Failure to comply will result in Tenders being rejected.
- **Costs:** No liability is accepted for costs incurred in the preparation of a Tender.

120 Preliminary Enquiry

- **Details:** The Tenderer shall acknowledge receipt of the tender documentation and confirm that they are able to submit a tender in accordance with the instructions to tender within 2 working days from receipt.

135 Instructions

- **Execution: Exclusions**
  If the Tenderer cannot tender for any part(s) of the work defined in the tender documentation written notification must be made to the office of issue of the tender documents, stating the relevant part(s) and the reasons for their inability to tender.

  Acceptance of instructions
  The submission of a tender will denote the tenderer's acceptance of an undertaking to comply with all the clauses contained in the tender documentation.

  Liability to tenderers
  The Employer will not be responsible for or pay any expenses or losses which may be incurred by any Tenderer in the preparation of his tender, neither does he undertake to accept the lowest or any tender.

  Checking Documents
  The Tenderer is required to check the tender documentation for obvious errors and missing pages. Should any such errors or omissions be discovered he must inform the office issuing the documents at once in writing in order that a correction may be issued and all Tenderers advised before the date for submission of the tender.

  Unqualified Tenders
  Other than as part of an alternative offer as described elsewhere, no account will be taken of any qualification or standard or special conditions that a Tenderer may impose on his tender and any tender which contains such additional conditions may be rejected by the Employer.

  Named Suppliers
  In certain cases, manufacturers of equipment are mentioned in the Specification. The tender shall be based on all named manufacturers. Nevertheless, the Contractor will be held responsible for ensuring that the equipment will give the performance specified.
  Other "equal and approved" shall mean by approval of the Client/Lead designers and alternatives shall only be considered prior to submission of Tender, when they have been submitted and approved in writing.
  Alternative equipment, specialists or methods of carrying out the works in addition to those described in the tender documents may be submitted. Alternative offers shall be indicated on the appropriate document and include:
  • Details of the alternative equipment, specialist or method proposed.
  • Full technical data for each such alternative together with details of any consequential amendments to the design and/or other parts of the works. Demonstrate compliance with any stated British (or other equivalent recognised International) Standards.

• A detailed breakdown of any omissions or additions to the basic tender sum indicated on the appropriate document.
• The impact of all proposed alternative equipment or materials on Part L compliance including:
-The CO2 Target Emissions Rate.
-The final 'as constructed' CO2 Buildings Emissions Rate.

The Contractor must confirm equivalence in quality, operation and space requirements to those items which have been specified by name. Demonstrate the proposed alternative is fully equivalent to the specified item and identify any constructional, cost, programme, maintenance or other differences.
The Contractor must include for all necessary measures to ensure alternative manufacturer's equipment and the total installation is equivalent to that specified.

The Tenderer shall include the costs necessary for re-sizing and reselection of associated equipment (including pipework, ductwork and cable sizes) resulting from the proposed alternative together with all resulting design and coordination.
Alternative offers will only be considered if accompanied by a compliant tender. Additional costs resulting from non-compliance with the above will not be accepted. All alternatives must be declared during the tender process. No alternatives will be accepted following agreement of the Tender proposals.
For full instruction to alternatives please refer to "Works Contract Verifications".

Privacy of information
All details contained in these tender documents shall be treated as private and confidential.

Accuracy of quantities
Attention is drawn to the clause headed "tender drawings" of the General Conditions, as relates to the function of the drawings issued as part of the tender documents. The tenderer is required to supplement the information contained on the drawings in such a manner as he shall consider appropriate and as normal custom and practice in order that the quantified schedule of rates produced by him and forming the basis of his tender, shall constitute an accurate and comprehensive representation of the various items which together form the contract works.
No claim for additional monies, or for extension of time, will be allowed due to any failure on the part of the tenderer to recognise the diagrammatic and preliminary nature of the drawings and to make due allowance in his tender accordingly.

Interpretation of the specification
Should the tenderer be in doubt about the precise meaning of any item or figure for any reason whatsoever, he must inform the office of issue of the tender documents in writing in order that the correct meaning may be given no more than 7 working days before the date for submission of tenders.
Any clarification of the meaning or intent shall be issued in writing only and no other means of communication shall be valid. All Tenderers will be notified of any such explanation.
No liability will be admitted, nor claim allowed, in respect of errors in a tender due to mistakes that should have been rectified in the manner described above.

Schedule of rates
Prior to the acceptance of any tender the Tenderer shall prepare and submit at no extra cost a quantified schedule of rates showing how the tender sum has been calculated. The schedule of rates shall be fully priced to agree with the tender sum. Each item is to be priced to include the cost of the item, fixing, overheads and profit.
A schedule of rates must be submitted with the tender.

Further information
Subsequent to the submission of a detailed schedule of rates and prior to the award of the Contract, the Tenderer may be called upon to provide further information used in the pricing of their tender that may reasonably be required to enable a proper assessment to be made thereof. Such information may include the inspection of the manufacturers' quotations, labour and

material prime costs and verification of percentage additions covering overheads, profit, fixed price allowance and the like.
In the event of a lump sum or sums being inserted the Tenderer willbe required to provide a detailed breakdown of the amount so included.

Programme
The Tenderer shall submit with their tender a programme or a summary thereof indicating the sequence and timing of the principal parts of the works including periods for planning, design, procurement, installation and commissioning.

Operating procedure statements
The following operating procedure statements must be submitted with the Tender in addition to those stated elsewhere:
• Management procedures to be adopted for the project
• Commissioning and testing management
• Managing and resourcing of design duties and responsibilities including design capability
• Quality control management and procedures
• Statement describing any significant and unavoidable risks associated with executing the works

Tender pricing document
The Tenderer shall complete all sections of the tender pricing document in full. Items identified on the tender summary shall not have their cost element included within other items. Items described in the pricing document are abbreviated for the purpose of the schedule. The Tenderer is to make full allowance for all works associated with the installation of a particular element. Items entered in the pricing document shall be deemed to include all costs involved in carrying out the Works, but the Tenderer where required must identify separately the cost of all items specifically described under preliminaries.
Provisional items will be adjusted at the final agreed rates when information is issued in respect of these items.

Procurement of materials
The Tenderer shall allow for the procurement of materials and equipment from suppliers at such time, and in such a manner as may be necessary to allow for the completion of the Works in accordance with the contract programme.
The Tenderer shall clearly state in the tender return any foreseen difficulties with delivery periods for the selected equipment.
No additional costs resulting from non-compliance will be accepted.

Alternatives
Tenderers may submit alternative equipment or methods of carrying out the works in addition to those described in the tender documents. Alternative offers shall include the salient features of the equipment or method proposed together with a detailed breakdown of any omissions or additions to the basic tender sum and all shall be indicated on the appropriate document.
Full technical data for each such alternative must be submitted together with details of any consequential amendments to the design and/or other parts of the works. Alternatives that involve significant changes to other work may not be considered.
Where an alternative manufacturer's equipment is offered the Tenderer shall include for all necessary measures to make the equipment and the total installation equivalent to that specified.

The Tenderer shall include the necessary resizing and reselection of associated equipment (including systems controls, pipework, ductwork and cable sizes) resulting from the proposed alternative together with all necessary design and coordination.
Additional costs resulting from non-compliance with the above will not be accepted.
Alternative offers will only be considered if accompanied by a compliant tender and a significant benefit/cost saving to the project.

All alternatives must be declared during the tender process. No alternatives will be

accepted following agreement of the Tender proposals.

For full instruction to alternatives please refer to "Works Contract Verifications".

150 Tender Programme

- **Details:** Refer to letter/email of Invitation to Tender.

170 The Tender documents

- **The Tender documents:** Form of Contract
  MEP Specification and preliminaries
  Schedules of equipment
  Detailed design drawings
  Pricing schedule

180 Tender queries

- **Notification requirements:** Refer to CA/Project Engineer.

190 Tender instructions

- **Qualifications:** No alterations or erasures to the text of any part of the tender documentation shall be permitted.
  Any tender containing such alterations or erasures may be rejected.
- **Confidentiality:** Do not reveal details of parts of the Tender or supporting documents (except for the necessary purposes of preparing that Tender) without the Employer's express written permission.

210 Pricing

- **Pricing:** Price and extend each item individually as instructed. Do not group items together.
- **Currency:** Pounds sterling.

220 Site visit

- **Nature of the site:** On receipt of the tender documentation the tenderer is advised to inspect the site and any existing installations relevant to the works and to study any relevant existing record drawings.

  Ascertain before Tendering, including access thereto and local conditions and restrictions likely to affect the execution of the Work.

  No claims will be allowed after submission of a tender for lack of information or other reasons which could have been resolved by such a visit to the site. Arrangements for the visit must be made through the office issuing the tender documents and with prior agreement.
- **Arrangements for visit:** Contact CA/Project Engineer.

230 Return of Tender

- **Return of Tender:**
  - **Destination:** Refer to letter/email of Invitation to Tender.
- **Inability to tender:** Advise immediately if the work as defined in the Tender documents cannot be tendered.
  Define those parts, stating reasons for the inability to tender.

320 Error resolution

- **Arithmetical errors:** Tender price will prevail. An opportunity will be given to confirm the Tender or withdraw.
- **Technical errors:** The Tender is deemed to meet or exceed the requirements of the Tender documents. Amendment of the Tender to reflect this will not constitute a variation and no claim for additional costs will be accepted.
- **Corrections:** An endorsement will be added to the priced documents indicating that rates or prices (excluding preliminaries, contingencies, Prime cost and Provisional sums) inserted therein will be adjusted in the same proportion as the corrected total differs from that stated incorrectly.

340 Post-Tender negotiations

- **Negotiations:** Will be required.

410 Notification to Tenderers

- **Notification method:** Via the CA/Project Engineer

00-40-70 Works Contract Establishment

ACCESS

110 Access to the site

- **Details:** Contact the CA/Project Engineer.

150 Storage, accommodation, mechanical plant, temporary works and services

- **Position:** To be agreed with CA and Client. Refer to Contract Preliminaries

GENERAL INFORMATION

PROGRAMME

280 Start of work on site

- **Notice:** Before the proposed date for start of work on site give minimum notice of two weeks.

HEALTH AND SAFETY INFORMATION

310 Health and Safety statement

- **Content:** The Tenderer shall submit a statement with the tender describing any significant and unavoidable risks that they consider might arise as a result of executing the works.

  The Tenderer shall also submit with the tender measures considered necessary to safeguard the operatives and of any person who may be affected by the contract works.

  The Tenderer shall also include with the tender (bound as a separate document):

  • A copy of the company's health and safety policy document including risk assessment procedures
  • Accident records for the last five years
  • Details of any Health and Safety Executive enforcement action
  • Details of staff responsible for health and safety on this project with details of their qualifications and duties
- **Submittal date:** Within one week of request.

330 Health and safety hazards

- **Potential hazards to be considered:** Refer to the Design Team Risk register and risk assessments.
- **Limitations:** The nature and condition of the site and/ or building cannot be fully ascertained before it is opened up.
- **Information:** The accuracy and sufficiency of this information is not guaranteed by the Employer or the Employer’s representative. Ascertain if additional information is required to ensure the safety of all persons and the Works.

- **Site staff:** Draw to the attention of personnel working on the site the nature of possible contamination and the need to take appropriate precautionary measures.

340 Preconstruction information

- **Availability:** Integral with the project specification, including but not restricted to the following:
  Description of project.
  Client's consideration and management requirements.
  Environmental restrictions and on-site risks.
  Significant design and construction hazards.
  The Health and Safety File.

350 Execution hazards

- **Common hazards:** Not listed. Control by good management and site practice.
- **Significant hazards:** Refer to the project Risk Register or individual risk assessments.
- **Hazard:** Refer to the project Risk Register or individual risk assessments.
- **Precautions assumed:** Works carried out by a competent contractor in line with HSE and CDM requirements.

360 Product hazards

- **Hazardous substances:** Site personnel levels must not exceed occupational exposure standards and maximum exposure limits stated in the current version of HSE document EH 40
- **Common hazards:** Not listed. Control by good management and site practice.
- **Significant hazards:** Refer to the Design Team Risk register and risk assessments.

MANAGEMENT AND STAFF

400 Management and staff – Contract minimum requirement

- **Details:** Allow for compliance with contract obligations.

  The Tenderer shall submit with their tender a line management diagram starting at the site supervisors and rising through the management levels. Relevant names and addresses shall be shown on the diagram.

  The Tenderer shall set out details of their management team and the commitment to the project.

  The Tenderer shall submit with their tender the curriculum vitae and references for each of the key personnel that will be used on the project. Curricula vitae, qualifications, recent project experience and definition of the person's role in the contract shall be clearly stated.

  Details shall be provided for both the site and office based teams
- **Cost significant items:** Project Specific management and staff.
  Visiting management and staff.
  Extraordinary support costs.
  Staff travel.

410 Management and Staff – Services Co-ordinator

- **Dedicated staff role:** The **contractor** shall allow for the employment of a suitably qualified and experienced engineering Services Co-coordinator who will ensure compliance with the contract drawings, specification and programme.

  The Services Co-ordinator must be a qualified Electrical or Mechanical Services Engineer and

have at least ten years working experience in Building Services Installations including on-site installations works, and he must be able to communicate at all levels from Site Operatives to Consultant.

The service co-ordinator shall be employed (part-time) during the mechanical and electrical works.

The service Co-ordinator must be fully competent in both mechanical and electrical installations.

The Services Co-ordinator shall provide at least the following duties:-

o Carry out regular inspections to ensure compliance with the Contract Specification & good workmanship and shall provide programmes of works to rectify any defects or items of non compliance.

o Prepare defects lists for all Engineering Services Works and shall ensure any defects are addressed timeously.

o Attend the project Pre-Start Meeting providing a programme of anticipated critical path inspections to be carried out. Notwithstanding the aforementioned these inspections shall be undertaken at regular intervals, not exceeding one working week.

o Identify areas of non-compliance or defects as the works progress to ensure a quality installation is provided within the projects programme.

o All installations offered up for inspection must be substantially complete. The Design Consultants will not prepare extensive defects lists. If significant defects exist the Contractor will be asked to correct defects and re-offer the systems for inspection when defects are substantially complete. All M&E installations shall be snagged and signed off by the Services Coordinator prior to them being offered to the design team for inspection.

o Co-ordinate and progress timeously the various items of builders work relative to Mechanical, Electrical and other Specialist Services installations, particularly the properly dimensioned positions of all holes to be cut or provided. This shall involve the procurement of Sub-Contractors Builders work Drawings detailing all services builders work requirements for approval by the Architect/Engineer.

o Co-ordinate the execution of all Services Installations and ensure that information is timeously exchanged with the various Services Sub-Contractors and Direct Works Contractors to maintain progress in accordance with the programme and to ensure all installations are commissioned at the proper time and to the full satisfaction of the Architect / Engineer.

o Ensure that each Engineering Service Sub-Contractor is provided with all relevant Contract Drawings to ensure that the services are set out to take into account building configuration, adjacent services and any particular Architectural requirements.

o Identify and report any conflict in the positioning between Engineering Services or with the structure.

o Ensure that services work carried out in common voids are carried out in a correctly sequenced manner to ensure compliance with programme, phasing and design requirements.

o Check the services ceiling/floor voids, specifically to ascertain if structural tolerances have been exceeded, which may reduce services voids accordingly, and in such instances to take on-site dimensions and advise the Design Team of proposed corrective action to maintain the original floor/ceiling heights.

o Timeously advise the Design Team of future access requirements to switches, void detectors,

drain points, air points and other manual devices.

o Monitor the progress of all Engineering Services Sub-Contractors Production / Working Drawings. The Co-ordinator shall ensure that suitable procedures are in place to ensure these Production Drawings are co-ordinated. Prior to information being forwarded for approval the Services Coordinator should satisfy himself that suitable information is provided, this information has been properly co-ordinated and this information is issued timeously.

o Renew the subcontractor's RFI's/TQ's and action accordingly. Any non relevant or site co-ordination type query should be dealt with by the Services Coordinator with suitable correspondence issued to the Design Team confirming action.

o Convene Services Sub-Contractors Meetings and review the progress of all Sub-Trades and identify critical action items. The meetings should be recorded with minutes issued to the design team timeously.

o Procure from the Commissioning specialist a logic diagram and full commissioning method statement at an early stage to ensure that sufficient time is made available for commissioning the systems prior to Practical Completion.

o Provide a schedule of dates and time of all tests, commissioning, etc to be witnessed by the Employer's Agent.

o Be responsible for ensuring record As-Built Drawings and the Operating and Maintenance Manuals are produced timeously and of a suitable standard for comment.

o Ensure that the Operating and Maintenance Manuals for each discipline follow the same general format and together provide a "site specific" set of documents.

TEMPORARY SERVICES

500 Temporary Services – contract minimum requirement

- **Details:** Allow for compliance with Contract obligations.
- **Cost significant items:** Temporary water supply.
  Temporary electric supply.

540 Lighting and power

- **Supply:** Electric power from the existing mains may be used for the Works as follows:
- **Metering:** If applicable the the meter shall be installed by the the Contractor and charged to the Contractor.
- **Continuity:** No liability will be accepted for the consequences of failure or restriction in supply. The contractors temporary supply shall be adequately protected such that the buildings electricity supply is not affected by a fault on the contractors temporary supply.

00-50-70 Works Contract Management

GENERALLY

SUPERVISION, COOPERATION AND COORDINATION

130 Supervision

- **Requirement:** The whole of the contract work and any significant parts must be under the close control of competent trade supervisors to ensure maintenance of satisfactory quality, progress and coordination.
- **Evidence:** Submit, including details of the person proposed; their relevant skills, training and knowledge; practical experience; qualifications; membership or registration with professional bodies; employment history; work related assessments and management structure.
- **Submittal date:** Two weeks before start on site.
- **Replacement of supervisory personnel:** Give maximum possible notice before changing supervisory personnel.

PROGRESS

170 Subcontractor's progress report

- **General:** Ensure the Works programme is maintained up to date and redraft, without delay, in any circumstance arise that affect the progress of the Works and submit to the CA.

  Provide progress reports to the CA every 2 weeks in addition to any other information required under the contract conditions.

  Record progress of the Works weekly on a copy of the programme.

  Maintain a set of the latest drawings, which shall form the basis for the record drawings, marked up as the works progresses. These shall be available for inspection by the CA at any time.

  If at any time the execution of the Works falls behind the contract programme formulate corrective measures and notify the CA of these intended measures prior to their being adopted.
- **Requirement:** The report must include the following.
- **Content:** • Date of order and delivery of all major plant and equipment.
  • Materials and equipment on site or installed.
  • Site labour employed.
  • Activity breakdown indicating target percent progress and actual percent progress for each activity monitored against the contract programme.
  • Latest schedule of information required indicating required / received dates and highlighting critical path items.
  • Status of utility services with connection dates for each service.
  • Latest progress indicated on a copy of the programme. The programme shall include a base line activity bar for each activity and a separate progress bar to each activity bar
  • Any proposed alteration to the programme. Alterations shall be identified clearly prior to the activities being undertaken and shall be in accordance with the contract.
  • Copies of snagging/defects lists verifying that inspections are being undertaken.

- **Progress statement:** Detailing matters materially affecting the regular progress of the Works including suppliers' progress reports.
    - **Information:** Requirements for further drawings or details or instructions to fulfil obligations under the Conditions of Contract.

OPERATION

200 Safety provisions for site visits

- **Access:** Provide at reasonable times.
- **Inspections:** Agree dates and times several days in advance, to enable affected parties to be present.
- **Safety:** Submit details in advance of safety provisions and procedures (including those relating to materials, which may be deleterious) which will require compliance when visiting the site.
- **Protective clothing and/ or equipment:** Provide and maintain on site for visitors to the site.

210 Removal or replacement of existing work

- **Extent and location:** Agree before commencement.
- **Execution:** Carry out in ways that minimize the extent of work.

230 Measurement

- **Covered work:** Give notice before covering work required to be measured or inspected for quality

PROTECTION FROM

410 Fuel, lubricants and hydraulic fluids

- **Restrictions:**
    - **Storing, handling and refuelling:** On hard standing or other approved areas. Keep away from watercourses, drains, soil, planting and grassed areas.
    - **Vehicles and equipment:** Prevent leakage or spillage. If it occurs, inform immediately and take emergency action.

430 Nuisance

- **Duty:** Prevent nuisance from smoke, dust, rubbish, vermin and other causes.
- **Surface water:** Prevent hazardous build-up on site, in excavations and to surrounding areas and roads.

440 Asbestos containing materials

- **Requirement:** Report immediately suspected materials discovered during execution of the Works. Do not disturb and agree methods for safe removal or encapsulation.

450 Fire prevention

- **Requirement:** Prevent personal injury or death, and damage to the Works or other property from fire.
- **Standard:** Comply with 'Fire prevention on construction sites' - the joint code of practice on the protection from fire of construction sites and buildings undergoing renovation.

460 Smoking on site

- **Smoking on site:** Not permitted.

510 Waste

- **Includes:** Rubbish, debris, spoil, containers and surplus material.
- **Requirement:** Keep the site and Works clean and tidy. Remove rubbish, dirt and residues before closing voids and cavities in the construction.
- **Waste:** Remove frequently and dispose off site in a safe and competent manner as approved and directed by the Waste Regulation Authority.
- **Recyclable material:** Sort and dispose at a Materials Recycling Facility approved by the Waste Regulation Authority.
- **Documentation:** Retain waste transfer documentation on site.

520 Electromagnetic interference

- **Duty:** Prevent excessive electromagnetic disturbance to apparatus outside the site.

540 Powder actuated fixing systems

- **Use:** Not permitted.

PROTECTION OF

630 Existing features

- **Protection:** Prevent damage to existing buildings, fences, gates, walls, roads, paved areas and other site features, which are to remain in position during execution of the Works.

640 Existing work

- **Protection:** Prevent damage to existing work, structures or other property during the execution of the Works.
- **Removal:** Minimum amount necessary.
- **Replacement work:** To match existing.

690 Protection of subcontract work

- **Protection:** Check regularly.

METHOD AND SEQUENCE

760 Materials for recycling or reuse

- **Duty:** Sort and prevent damage to stated products or materials, clean off bedding and jointing materials and other contaminants.
- **Storage:** Stack neatly and protect until required by the Employer or for use in the Works as instructed.

790 Working hours

- **Specific limitations:** Monday to Friday 8:00am to 5:00pm. Approval from the CA & Client required for working outwith these times.

00-60-70 Works Contract Verification

STANDARDS OF PRODUCTS AND EXECUTIONS

110 Substitute products

- **Details: <u>All tender prices MUST include all equipment manufacturers / systems types / specialists as detailed within the specification, schedules and drawings</u> .**

  Failure to comply with this will result in the Tender being rejected. If the contractor wishes to propose products of different manufacturer to those specified, the contractor must submit a cost saving proposal togther with reasons for each proposed substitution, full technical details for appraisal and programme advantages.

  Substitutions which have not been notified at tender stage may not be considered. If no options are given or the contractor fails to confirm manufacturers at the time of the tender return, it shall be deemed that the contractor is in full compliance withe the tender documentation and manufacturers / specialist contained within.
- **Compliance:** In certain cases, manufacturers of equipment are mentioned in the Specification. The tender shall be based on all named manufacturers. Nevertheless, the Contractor will be held responsible for ensuring that the equipment will give the performance specified.

  Other "equal and approved" shall mean by approval of the Client/Lead designers and alternatives shall only be considered prior to submission of Tender, when they have been submitted and approved in writing.

  Alternative equipment, specialists or methods of carrying out the works in addition to those described in the tender documents may be submitted. Alternative offers shall be indicated on the appropriate document and include:

  • Details of the alternative equipment, specialist or method proposed.
  • Full technical data for each such alternative together with details of any consequential amendments to the design and/or other parts of the works. Demonstrate compliance with any stated British (or other equivalent recognised International) Standards.
  • A detailed breakdown of any omissions or additions to the basic tender sum indicated on the appropriate document.
  • The impact of all proposed alternative equipment or materials on Part L compliance including:
  -The CO2 Target Emissions Rate.
  -The final 'as constructed' CO2 Buildings Emissions Rate.

  The Contractor must confirm equivalence in quality, operation and space requirements to thoseitems which have been specified by name. Demonstrate the proposed alternative is fullyequivalent to the specified item and identify any constructional, cost, programme, maintenance orother differences.The Contractor must include for all necessary measures to ensure alternative manufacturer'sequipment and the total installation is equivalent to that specified.The Tenderer shall include the costs necessary for re-sizing and reselection of associatedequipment (including pipework, ductwork and cable sizes) resulting from the proposed alternativetogether with all resulting design and coordination.Alternative offers will only be considered if accompanied by a compliant tender."Additional costs resulting from non-compliance with the above will not be accepted.

  All alternatives must be declared during the tender process. No alternatives will be accepted following agreement of the Tender proposals.

120 Substitution of products

- **Products:** If an alternative product to that specified is proposed, obtain approval before ordering the product.
- **Reasons:** Submit reasons and relevant information for the proposed substitution.
- **Information to be submitted:** • Company details
  • Manufacturer and product reference.
  • Full technical data and performance characteristics
  • Certification attained & Relevant standards.
  • Details of any implications or consequential amendments to the design and/or construction / installation of other parts of the Works
  • Availability.
  • Performance.
  • Compatibility of accessories.
  • Proposed revisions to drawings and specification.
  • Compatibility with adjacent work.
  • A complete and precise statement of the effects on cost. Relevant cost savings will be deemed to have allowed for all consequential costs associated with amendments of other parts of the Works.
  • Identify 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
  • Effects on construction, programme, maintenance, cost in use or other differences
  • Copy of warranty or guarantee.
- **Alterations to adjacent work:** If needed, advise scope, nature and cost.
- **Manufacturers' guarantees:** If substitution is accepted, submit before ordering products.

DOCUMENTS AND INFORMATION

150 Currency of documents

- **Currency:** References to published documents are to the editions, including amendments and revisions, current on the date of the Invitation to Tender.

160 Incomplete documentation

- **Products and executions:** Where and to the extent that products or executions are not fully documented, they are to be as follows.
- **Requirements:**
  - **Standard:** Of a kind and quality appropriate to the nature and character of that part of the Works where they will be used.
  - **Suitability:** Suitable for the purposes stated or reasonably to be inferred from the project documents.
- **Contract documents:** Omissions or errors in description and/ or quantity shall not vitiate the Contract nor release the Contractor from obligations or liabilities under the Contract.

210 Record drawings and information

- **Record drawings:**
  - **Drawings scope:** As the construction period progresses the design team will not update drawings to reflect changes which arise. All design/client changes will be covered via an Engineers instruction and sketch "part Plan". It is the contractors responsibility to maintain a set of up to date "working" drawings which included all changes arising throughout the contract.

Record drawings

Drawing showing the building and services installations as installed at the date of practical completion. The main features of the record drawings are:

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 location, including level if buried of public service connections provided within the contract, no matter who installed them, together with the points of origin and termination, size and materials of pipes, line pressure, flow and other relevant information.

The location, including level if buried of public service connections provided within the contract, no matter who installed them, together with the points of origin and termination, size and materials of cables, and cable ducts other relevant information.

Location and depth of all buried services

Schematic drawings of each system indicating principal items of equipment, zoning, means of isolation, etc in sufficient detail to understand the system operation and the inter-connections between various systems.

The layout, location and extent of all piped services showing pipe sizes, together with all valves for regulation, isolation and other purposes, drain cocks, test points, gauges, flow or pressure switches and other instruments.

The layout, location and extent of all cables, including sizes, together with all accessories locations, for each system: power, lighting, data, security, fire, communications, etc.

Location, identify, size and details of all equipment and controls equipment served by, or associated with, each of the various services.

The layout, location and extent of all air ducts, including those formed in builder's work or otherwise outside the contract, showing dampers and other equipment, acoustic silencers, grilles, diffusers, other air terminals, balancing dampers, access panels, fire dampers, turning vanes, hand holes, test holes, gauges and instruments. Each duct and terminal shall be marked with its size and air quantity flowing. Each terminal unit or grille shall have its duty clearly shown as recorded from the commissioning results.

The location and identity of each room including space housing plant, machinery or apparatus.

Detailed general arrangements of all boiler houses, machinery spaces, air handling plant rooms, tank rooms, electrical switch-room and other plant or apparatus, including the location, identity, manufacturer, size and rating of each item.

Detailed general arrangements of all elctrical distribution rooms/ cupboards, including the location, identity, manufacturer, size and rating of each item.

All necessary sections, elevations, isometrics and schematics of the each system.

Control and wiring diagrams shall be provided incorporating details of each instrument and equipment item and written description of the sequence of operation of each system. All diagrams shall include full details of internal panel wiring and connections to field mounted items.

Layout, location and extent of electrical switchgear, distribution boards cables and termination points.

Detailed general arrangements of all switch-rooms, riser cupboards, service trenches, transformer chambers, generator rooms and other plant or apparatus, including the location, identity, manufacturer, size and rating of each apparatus

Details to show inter-connections between the works and equipment or systems provided by others to which wiring and connections are carried out as part of the works

Detailed wiring drawings and diagrams for all systems showing origin, route, cable containment size, type and number of conductors, length termination size and identification, and measured conductor and earth continuity resistance of each circuit. Indicate if cable/conduit is surface mounted, concealed in wall chase, in floor screed, cast in-situ, in false floor, above ceiling void, etc.

Logic flow diagrams for each individual control or monitoring specification and for each engineering system to illustrate the logical basis of the software design.

Record drawings of the complete Works shall be provided at practical completion.

Record drawings of the final "as installed" layouts shall be issued in draft form to the CA for examination 4 weeks prior to the testing and commissioning period to allow checking for accuracy.

Record drawings will be prepared on the current Autocad format as agreed with the CA prior to production of the drawings.

All drawings shall be suitably layered, with different services on each layer. A detailed list of layers, external references or equivalent (if used) and list of files shall be provided with the discs. If the drawings were produced from CAD drawings provided by the CA, the same layering system shall be used.

The drawings shall be produced in full size metric units.

Once approved the complete set of record drawings shall be revised as necessary to incorporate testing and commissioning data where applicable, and the final set(s) of record drawings and computer discs shall be handed over at practical completion.
Issue at practical completion the complete approved package of record drawings in the following numbers:

CAD disk(s) 2no sets of complete record drawings

'white' prints 2no sets of complete record drawings

Each CD shall be labelled and CD jewel cases shall be labelled identifying project title, issue date and index of contents.

Valve charts, electrical distribution charts in panels and the like, shall be issued for examination at agreed dates to allow adequate time for manufacture and installation prior to practical completion.

Where portions of the work are to be concealed, draft copies of record drawings shall be supplied to the CA before the work is concealed in order to facilitate checking and examination.

The record documents shall be correlated so that the terminology and the numerical and/or other references used therein are consistent with and similar to those used in the physical identification of component parts of the Works.

Each record drawing shall show the following information:
• The name of the contract and, where appropriate, the zone or floor designation.
• Description of drawing, drawing reference and scale.
• Name and address of the contractor and the consulting engineer.

The completed drawings shall be signed as record drawings.

Each record drawing shall be endorsed with the words 'Record Drawing' in the bottom right hand corner adjacent to the title block.

Mark up 'as installed' details weekly and before any work is hidden from view.

Failure to undertake the above procedure for the preparation of record drawings and leaving the production of such drawings too late in the construction/commissioning period will result in practical completion not being granted by the CA.

Plant and switch room drawings, schedules and schematics;
Provide good quality plant and switch room drawings, schedules, schematics and instructions and hang in the respective plant room or any other appropriate location or where directed by the CA.

Protect surfaces of such information by pressure lamination and hang using suitable fixings and provide backboards if necessary.

A sample shall be submitted for approval prior to commencing production.
Provide information as stated elsewhere and include:
• All information required under statutory or other regulations
• Location of all incoming service isolating and metering facilities
• Emergency operating procedures including details for emergency call out service
• First aid instructions for treatment of persons after electrical shock
• Schematic drawings of installations showing identification and duties of equipment
• Controls schematics

Prior to being fixed, plant and switch room drawings, schedules, schematics and instructions shall be submitted for review by the CA. The review procedure shall be as for record drawings as stated elsewhere and all items shall be fixed prior to practical completion.

- **Drawings format: M&E Sub-Contractor is to Maintain a full set of up to date paper and electronic "Working" drawings, that should be no more than 1 week out of date.**

  All information shall be provided in editable electronic format on request. The drawings should be available at any organised site inspection.

- **Record specification:**
  - **Specification format:** Be advised that great importance will be placed upon quality, accuracy, clarity and completeness of the record documents and upon these being made available promptly.

    Practical completion will not be granted unless an approved copy of the record

documentation has been prepared, and is available for handover to the Employer.

Comply with the requirements of the CDM Regulations in providing the appropriate input to the health and safety file for the Works.

Comply with the requirements of the Building Regulations in providing all necessary documentation and information.

Provide record documentation, as detailed elsewhere, to include but not limited to:
• Record drawings and schedules.
• Plant room and switch room drawings, schedules and schematics.
• Operating and maintenance manuals.
• Blank maintenance logs.
• Building log book information.

Ensure record documents clearly record the arrangements of the various sections of the Works as actually installed and identify and locate all component parts.

The record documents shall set out the extent to which maintenance and servicing is required and how, in detail, it should be executed. Sufficient, readily accessible and proper information shall be provided to enable spares and replacements to be ordered.

Correlate record documents so that the terminology and the references used are consistent with those used in the physical identification of the component parts of the installations.

Demonstrate as required throughout the execution of the contract works that complete and accurate records are being maintained and that the record documents are being progressively compiled as the work on site proceeds.

All information shall be provided in editable electronic format.

- **Submittal date:** Two weeks after request and at least 1month before project completion or phased hand-over

220 Technical information

- **Retain:** Available on site for reference by supervisory personnel.
- **Information:** Manufacturer's current information and relevant British Standards, relating to products to be used in the Works.

230 Evidence of Compliance

- **Proprietary products:** Retain on site evidence that the proprietary product specified has been supplied.
- **Performance specification:** Submit on request evidence of compliance with performance specifications, including test reports indicating properties tested, pass or fail criteria, test methods and procedures, test results, identity of testing agency, test dates and times, identities of witnesses and analysis of results.

PRODUCTS AND EXECUTION

240 Workmanship skills

- **Operatives:** Appropriately skilled and experienced for the type and quality of work.
- **Registration:** With Construction Skills Certification Scheme.

- **Evidence:** Operatives must produce evidence of skills and qualifications when requested.

250 Quality of products

- **Generally:** New.
- **Supply:** Each product from the same source or manufacturer.
- **Quantity:** Whole quantity of each product required to complete the Works of a consistent kind, size, quality and overall appearance.
- **Submittal date:** Evidence of source of supply when requested.
- **Recycling:** Proposals for recycled products may be considered.

260 Quality of execution

- **Generally:** Fix, apply, install or lay products securely, accurately, plumb, neatly and in alignment.
- **Colour batching:** Do not use different colour batches where they can be seen together.
- **Dimensions:** Check on-site.
- **Finished work:** Not defective, damaged, disfigured, dirty, faulty, or out of tolerance.
- **Appearance:** Adjust joints open to view so they are even and regular.

270 Inspections

- **Standard:** Inspection, or other action, of products or executions must not be taken as approval unless confirmed in writing including the following:
  Date of inspection.
  Part of the work inspected.
  Respects or characteristics which are approved.
  Extent and purpose of the approval.
  Associated conditions.

  Inspection before concealment

  Whenever work requiring inspection or testing is subsequently to be concealed, 7 days notice shall be given to the CA so that inspections may be made or tests witnessed before concealment.

  Failure to give due notice may necessitate the uncovering of the work and reinstating it at no extra cost or claim or extension to the programme or allowance for delay.

  Record drawings of any services to be concealed shall be issued to the CA at the time notice is given.

  Inspections Generally

  Prior to commencement of the works submit schedules indicating those parts of the contract works for which inspections and tests are required to substantiate conformity with the specification.

  Should any alternative item be proposed that does not carry appropriate certification, ensure independent testing is carried out at no expense to the contract works to confirm compliance.

  Provide method statements supported by risk assessments detailing the procedures for carrying out all on site tests.

  Agree in advance with all parties procedures for inspections and tests including periods of notice.

  Where a test indicates non-compliance with the specification submit immediately details of the non-compliance and details for corrective action.

Maintain records of all specified inspections and tests performed including third party and works testing and maintain copies of all records on site for inspection.

Inspection by Employer's insurance company

Where indicated elsewhere installations, equipment, plant or materials are to be inspected by a representative acting for the Employer's insurers.

The installations, equipment, plant or materials shall satisfy the insurance company's requirements in all respects.

Provide a programme for the inspection and certification and inform the CA when the installation or equipment is ready for examination.

Ensure all necessary information is provided to enable the insurers to approve the design before manufacture.

Arrange for the attendance of the insurance company's representative at agreed stages of manufacturer and installation and provide all necessary attendance, access and facilities for inspecting and testing as is required.

No equipment or installations subject to inspection and certification will be accepted on behalf of the Employer unless a satisfactory certificate has been received from the insurers.

The Employer will place an order with the insurance company and all insurance company charges will be (clarify in the tender submission whether paid for by the employer or included in the contract price). All other costs associated with such inspections shall be included in the contract price.

290 Manufacturer's recommendations and instructions

- **General:** Comply with manufacturer's printed recommendations and instructions current on the date of the Invitation to Tender.
- **Exceptions:** Submit details of changes to recommendations or instructions.
- **Execution:** Use ancillary products and accessories supplied or recommended by main product manufacturer.
- **Products:** Comply with limitations, recommendations and requirements of relevant valid certificates.

ACCURACY AND SETTING OUT GENERALLY

380 Setting out

- **General:** Submit details of methods and equipment to be used in setting out the Works.

  Ensure all items of plant and equipment can be installed in the available space and that there is adequate access to install plant to its final position in a safe manner.

  Install the Works so as to be accessible for safe operation, maintenance, repair and future replacement. Deviations form the drawings to achieve this shall be agreed with the CA and written approval obtained before installation work commences. Final position and size of access doors shall be agreed with the CA.

  Ensure uniform, neat and symmetrical arrangements of wall, floor and ceiling mounted equipment.

Agree with the CA all necessary horizontal and vertical alignment before installation work commences.

Amend any errors arising from inaccurate setting out or lack of site co-ordination at no additional expense to the contract.

- **Levels and dimensions:** Check and record the results on a copy of drawings. Notify discrepancies and obtain instructions before proceeding.
- **Completion of setting out:** Give notice before commencing construction.

400 Critical dimensions

- **Critical dimensions:** Set out and construct the Works in accordance with the critical dimensions and tolerances stated.

SERVICES GENERALLY

430 Services regulations

- **Services:** The complete services installation and components shall, unless stated otherwise, comply with the appropriate British Standard (BS and/or BS EN)) or Code of Practice (CP) and where no BS or CP is applicable the Agreement Certificate for the particular item.

  Ensure all equipment and systems are designed and installed in accordance with the relevant standards and that operational compatibility exists between the systems and any other system installed in the same location.

  All product and materials shall have product conformity certification (eg BSI Kitemark, BSI Safety Mark or CARES scheme) or product approval (eg British Board or Agrement Certificate)

  All products must have the recognised 'CE' mark attached.

  Certificates of compliance with British Standards, BSI Certification Schemes, and/or other Quality Assurance Schemes, shall be provided to the CA when requested.

  Notify all authorities in accordance with their regulations and obtain any required approvals for the Works.

  In the absence of specific design, performance or installation standards being stated seek the instructions of the CA prior to commencement of the Works and with adequate time so as not to cause delay.

  Comply with all statutory obligations where applicable, including, but not limited to, the following:

  • British Standard Specification (BS) and European Standards (BS EN).
  • British Standard Code of Practice (BSCP).
  • CIBSE Guides to Current Practice and Technical Memoranda
  • Institution of Engineering and Technology Regulations (IET) (BS 7671).
  • Institute of Plumbing and Heating Design Guide (IPHE).
  • Water Supply (Water Fittings) Regulations
  • Water Byelaws
  • The Building Regulations (Scottish Technical Standards)
  • Loss Prevention Council (LPC)
  • Building Research Station (BRE) digest recommendations
  • Building Services Research and Information Association (BSRIA) recommendations and guides
  • Local Bye-Laws and/or Regulations.

• Manufacturers instructions and recommendations for installation/testing
• Government (formerly PSA) specifications
• Health and Safety at Work Act
• CDM Regulations
• Health Technical Memoranda (HTMs)
• Health Building Notes (HBNs)
• Radiocommunications Agency

When new editions are published during the construction, the instructions of the CA shall be sought regarding any modifications or changes necessary.

References to BSI documents shall be to the versions and amendments listed in the British Standards Catalogue and in subsequent issues of BSI News up to one month prior to the tender issue date.

Reference to a British Standard shall mean all parts or sub-sections of that standard unless stated otherwise.

The tender shall be based on the Regulations current one month prior to the issue date of tenders.

460 Electrical installation certificate

- **Certification:** The original certificate is to be lodged in the Building Manual at the completion of relevant electrical work.

480 Mechanical and electrical services

- **Final tests and commissioning:** Carry out so that services are in full working order at completion of the Works.
- **Confirmation:** Provide a Building Regulations notice, signed by a suitably qualified person, to Building Control that systems have been commissioned in accordance with approved procedures.
- **Records:** A copy to be lodged in the Building Manual.

500 Continuity of thermal insulation

- **Record and report:** Confirm that work to new, renovated or upgraded thermal elements has been carried out to conform to the Specification.
  - **Content:** Address of premises, the Contractor's name and address, the name, qualification and signature of a competent person responsible for checking compliance and the date on which the installation was checked.
- **Submit:** Before completion of the Works.
- **Copy:** Include in the Building Manual.

QUALITY CONTROL

535 A General Requirements

- **Quality:** Prepare a method statement to indicate fully the quality control programme for the Works and indicate clearly the role of the CA in that programme.

  The objective of the quality control programme shall be:

  • Full compliance with the ISO 9001 standards and procedures
  • Full compliance with the specification in regard to materials and workmanship

• Establishment of standards that will be acceptable to the CA by means of a sample installations prior to full scale erection of all major elements and trades required
• Submission to the CA for agreement of any samples of proposed manufacturer's items to be utilised in the Works prior to ordering
• Establishment of method statements defining quality standards

The quality control system will be subject to audit at any time during the duration of the contract.

The CA shall issue a quality control instruction where the installation fails to meet the standard required in the specification.

Where the installation fails to meet the required standard submit written proposals for compliance.

The quality control system shall include a suitable methodology and recording procedure which shall enable the personnel responsible for any work to be identified.

540 Proposals for rectification of non-compliant products and executions

- **Non-compliant items:**
  - **Opening up, inspection, testing, making good, adjustment of the Contract Sum, or removal and re-execution:** Submit proposals
  - **Submittal date:** So soon as possible after discovery of items which are or appear to be non-compliant.
- **Acceptability:** Such proposals may be unacceptable and contrary instructions may be issued.

550 Measures to establish acceptability

- **General:** Wherever inspection or testing shows that the work, materials or goods are not in accordance with the Contract and measures (e.g. testing, opening up, experimental making good) are taken to help in establishing whether or not the work is acceptable, such measures will be at the expense of the Contractor and will not be considered as grounds for revision of the completion date.

00-70-70 Works Contract Administration

USE OF DOCUMENTS

140 Dimensions

- **Dimensions:** Use a laser levelling system to install all building services installations wherever possible and co-ordinate the measurements with all other trades and disciplines to prevent any clashes.

  Obtain all dimensions and levels on site for the actual setting out of the works. Ensure these dimensions are available before proceeding with the Works.

  Do not take dimensions from drawings by scaling. Where dimensions are indicated on the drawings check these on site, as appropriate, to ensure construction and manufacturing tolerances can be accommodated.

  As the development advances measure on site all works by others that may foreseeable affect the Works. These dimensions shall be incorporated into the drawings or marked up on revised drawings if already issued.

  No extra cost or claim will be allowed for any errors arising from inaccurate setting out or failure to check actual site dimensions. Reimbursement will be sought for any abortive expenditure.

  Any comments, discrepancies or divergences that will / may affect the Works shall be brought to the attention of the CA in adequate time to avoid delay or abortive expenditure.

  Setting out

  Ensure all items of plant and equipment can be installed in the available space and that there is adequate access to install plant to its final position in a safe manner.

  Install the Works so as to be accessible for safe operation, maintenance, repair and future replacement. Deviations from the drawings to achieve this shall be agreed with the CA and written approval obtained before installation work commences. Final position and size of access doors shall be agreed with the CA.

  Ensure uniform, neat and symmetrical arrangements of wall, floor and ceiling mounted equipment. Agree with the CA all necessary horizontal and vertical alignment before installation work commences.

  Amend any errors arising from inaccurate setting out or lack of site co-ordination at no additional expense to the contract.

  Site modifications

  Site modifications to plant, equipment or assemblies shall not be undertaken without approval from the CA.

  Authorised site modifications shall be in accordance with manufactures' recommendations and requirements and comply with any type test certificate obtained for the arrangement of components.

  Terminal locations

The positions of all connection points, accessories, equipment and other room terminals as shown on the tender drawings are approximate and for guidance in the preparation of the tender.

Agree with the CA the room terminals that are subject to final positioning on site.

Allow for the movement of all such terminals up to a radius of 2.0 m from the positions shown on the drawings.

Confirm with the CA the mounting heights before commencing work on site.

DOCUMENTS PROVIDED BY CONTRACTOR

230 Additional copies of drawings and schedules

- **Additional copies:** In addition to those listed in the Subcontract Preliminaries the following will be provided in accordance with a programme to be agreed with the Subcontractor.
- **Details:** Coordination drawings showing the relationship to the structure and each other of piped supply, mechanical heating, mechanical ventilation, electrical supply and communications systems.

DOCUMENTS PROVIDED BY SUBCONTRACTORS

280 Schedule of Rates

- **Content:** Include items and materials included in the tender, together with their rates, extended and totalled. Separately price Preliminaries. Totals must agree with the Subcontract Sum and subtotals must agree with the priced breakdown of the tender.

  A quantified schedule of rates shall be prepared and submitted subsequent to tender and accepted by the CA shall only constitute part of the contract in the following respects:

  • The descriptions of the works and the rates and prices contained therein shall be used for the purpose of adjusting variations
  • The quantities contained therein shall be used to facilitate the preparation and the checking of interim applications for payment
  • The provisional and prime cost sums contained therein shall be subject to adjustment in accordance with the rules and procedures contained in the contract conditions.

  Failure to provide sufficient information to satisfy the CA of the accuracy of the schedule of rates shall entitle the CA to impose a schedule of rates for the Works. All costs associated with the preparation and issue of this schedule of rates shall be at the installer's cost.
- **Rates:** Contractor's cash discount is included.
- **Fully priced copy - submittal date:** With the tender.
- **Errors in quantification:** Correction will not lead to adjustment of the Subcontract Sum.

380 Method statements

- **Method statements:** Supply to the Principal Contractor, any method statements, he or the client may request. Comply with all CDM procedures required by the CDM Coordinator and the Principal Contractor.

  Provide method statements supported by risk assessments detailing the procedures for carrying out all on site tests.

Produce comprehensive commissioning method statements including procedures, logic diagrams and risk assessments for the pre-commissioning checks, setting to work, commissioning, system proving and environmental testing of the Works.

Produce flushing, chemical cleaning and water treatment method statements, logic diagrams and programme for integration into the building contractor's construction, commissioning and finishes programmes.

- **Submittal date:** 2 weeks prior to work element covered by Method Statement.

420 Design documents

- **Scope:**
  - **Design drawings:** The tender drawings primarily describe the design intent of the Works, the working principles of the systems, general arrangements, principles of services co-ordination and the intended methods of installation.

    The drawings are accordingly part diagrammatic with runs of piping, ducts, cable, containment and the like being shown to small scale and not necessarily indicating exact installation positions.

    The drawings indicate equipment, pipework, ductwork, cable tray routes and trunking, in sufficient detail to show how all the engineering services can generally be accommodated and coordinated with each other, the architecture and the structure. These drawings are provided for information purposes only. The installer shall be responsible for co ordination of building services.

    The Design Team shall produce the following information (except Contractor Design Items in which these requirements fall to the contractor);

    Technical design drawing
    A drawing showing the extent of the services installations. The main features of technical design drawings are:
    • Plan layouts to a scale of at least 1:100.
    • The drawings shall show the extent and type of services terminals visible within the space
    • Approximate locations of horizontal and vertical service runs shall be shown
    • Plant and distribution system sizes, particularly those affecting spatial allocation, while acknowledging that these may need some adjustment and refinement in the preparation of the detailed design drawings and equipment schedules
    • Pipework and electrical containment should be represented by single line layouts. Ductwork should be represented by either double or single line layouts as required to demonstrate that the routes indicated are feasible.
    • Symbols and line conventions in accordance with industry recognised standards for symbols and other graphic conventions.

    Detailed design drawing
    A drawing showing the intended locations of plant items and service routes in such detail as to indicate the design. The main features of detailed design drawings are:
    • Plan layouts to a scale of at least 1:100.
    • Plant areas to a scale of at least 1:50 and accompanied by cross sections.
    • The drawing will not indicate the precise position of services, but it should be feasible to install the services within the general routes indicated. It should be possible to produce co ordinated working drawings or installation drawings without major re routing of the services.
    • Pipework and cable containment represented by single line layouts.
    • Ductwork represented by either double or single line layouts as required to demonstrate

the routes indicated are feasible.
• Symbols and line conventions in accordance with industry recognised standards for symbols and other graphic conventions.
• The drawing should indicate the space available for major service routing in both horizontal and vertical planes.

The contractor shall be expected to produce the following information;

Co ordinated working drawing
• A drawing showing the inter relationship of two or more engineering services and their relation to the structure and building fabric. The main features of co ordinated working drawings are:
• Plan layouts to a scale of at least 1:50, accompanied by cross sections to a scale of at least 1:20 for all congested areas.
• The drawing should make allowances for installation working space and spave to facilitate commissioning and maintenance.
• The drawing should be spatially co ordinated i.e. there should be no physical clashes between the system components when installed.
• Critical dimensions, datum levels and invert levels should be provided together with dimensions in areas where tolerances are minimal.
• Spaces shown on the drawing should make allowance for the service at its widest point eg spaces between pipe and duct runs. Allowances for insulation, standard fitting dimensions and joint widths should be included on the drawing
• Make allowance for those plant items specified by the designer and identified in the design specification.
• The drawing should indicate positions of main fixing points and supports where they have significance to the structural design.
• The drawing should demonstrate a feasible sequence of installation of the services.
• The drawing should be supported with individual services drawings for clarity.
• Plant room layouts to a scale of at least 1:20, accompanied by cross sections and elevations to a scale of at least 1:20.

Installation drawing
A drawing based on the detailed design drawing or co ordinated working drawing with the primary purpose of defining that information needed by the tradesmen on site to install the works. The main features of installation drawings are:
• Plan layouts to a scale of at least 1:50, accompanied by cross sections to a scale of at least 1:20 for all congested areas.
• A spatially co ordinated drawing, ie no physical clashes between the system components when installed at the scaled off positions shown on the drawing.
• Make allowance for inclusion of all supports and fixings necessary to install the works.
• Make allowance for the service at its widest point for spaces between pipe and duct runs.

• Allow for insulation, standard fitting dimensions and joint widths on the drawing.
• Make allowance for installation details provided from shop drawings.
• Make allowance for installation working space; space to facilitate commissioning and space to allow on going operation and maintenance in accordance with the relevant health and safety requirements.
• Make allowance for plant and equipment including those that are chosen as alternatives to the designer's specified option.
• Provide dimensions where the positioning of services is considered to be important enough not to leave to the tradesmen on site
• Plant room layouts to a scale of at least 1:20, accompanied by cross sections and elevations to a scale of at least 1:20.

Installation wiring diagram
Drawing showing the interconnection of electric components, panels etc in accordance with the design and incorporating the details provided on manufacturer's drawings.

The information shall indicate maximum electrical loading for each supply cable; cable termination facilities; and cable identification and all terminal numbers.

Manufacturer's drawing
Drawing provided by a manufacturer, fabricator or supplier for a particular project, and which is unique to that project and indicates a project specific representation of the product, components or plant items to be supplied. Examples include: control and switchgear panels and associated internal wiring, pre-fabricated plant customised specialist systems and equipment etc.

Manufacturer's certified drawing
Drawing provided by a manufacturer or supplier to indicate details of the product, components or plant items and which the manufacturer or supplier guarantees the supplied equipment will comply with.

Record drawing
Drawing showing the building and services installations as installed at the date of practical completion. The main features of the record drawings are:
• Provide a record of the locations of all the systems and components installed including power, lighting, fire, data, data, communications systems, components, and associated containment.
• 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 location, including level if buried of public service connections provided within the contract, no matter who installed them, together with the points of origin and termination, size and materials of cables and cable ducts and other relevant information.
• Location and depth of all buried services
• Schematic drawings of each system indicating principal items of equipment, zoning, means of isolation, etc. in sufficient detail to understand the system operation and the inter-connections between various systems
• The layout, location and extent of all electrical and specialist services showing cable sizes, together with all accessories for isolation and other purposes.
• Location, identify, size and details of all equipment and controls equipment served by, or associated with, each of the various services.
• The layout, location and extent of all accessories, including those formed in builder's work or otherwise outside the contract, showing fire and acoustic treatments to services passing through barriers.
• The location and identity of each room including space housing electrical equipment.
• Detailed general arrangements of all electrical rooms, cupboards, and electrical switch-rooms illustrating the manfacturer's details, sizes and ratings of each item.
• All necessary sections, elevations, isometrics and schematics of the electrical spaces.
• Control and wiring diagrams shall be provided incorporating details of each system and equipment item and written description of the sequence of operation of each system. All diagrams shall include full details of internal panel wiring and connections to field mounted items.
• Layout, location and extent of electrical switchgear, distribution boards cables and termination points.
• Detailed general arrangements of all switch-rooms, riser cupboards, service trenches, transformer chambers, generator rooms and other plant or apparatus, including the location, identity, manufacturer, size and rating of each apparatus
• Details to show inter-connections between the works and equipment or systems provided by others to which wiring and connections are carried out as part of the works
• Detailed wiring drawings and diagrams for all systems showing origin, route, cable containment size, type and number of conductors, length termination size and

identification, and measured conductor and earth continuity resistance of each circuit. Indicate if cable/conduit is surface mounted, concealed in wall chase, in floor screed, cast in-situ, in false floor, above ceiling void, etc.
• Logic flow diagrams for each individual control or monitoring specification and for each engineering system to illustrate the logical basis of the software design

Builder's work drawing and information
Drawings and/or schedules, appropriate to the stage of design development showing the requirements for architectural and/or structural provisions necessary to facilitate the engineering services and allow their integration into the project. Such information includes the position and sizes of all access covers, panels and doors required in the building structure and fabric for proper safe access for and to plant for installation, maintenance, inspection and future replacement.

Design stage
A drawing and/or schedule to show the provisions required to accommodate the engineering services that significantly affect the design of the building structure, fabric and external works. The information also indicates the work to be carried out by building trades eg. plant bases, major openings and major structures for plant and equipment.
This will be appropriate to the stage of design development and maybe based on preliminary, non-manufacturer specific plant selection.

Installation stage
Drawings to show requirements for building works necessary to facilitate the installation of the engineering services and as described elsewhere.

Controls logic diagrams
Diagrams, drawings and/or schematic details of all control components and instruments showing the layout with each item uniquely identified together with a description of the controls operation and details of the associated interlocking.

Switchgear, starter and control instrumentation panel drawings
Drawings that show the construction and internal wiring diagrams of the starters, panels and/or other devices.

- **Technical information:** All calculations produced as part of the contractors design responsibilities must be co-ordinated and presented in a logical format that can be easily understood.

  All calculations shall be prepared to a recognised and agreed format and must be indexed.

  The use of computer programs in the preparation of designs shall be carefully controlled. All software programs shall be verified and their use agreed with the CA prior to commencement of design tasks. Where unverified software is used its use must be declared and the initial outputs justified by full and complete hand calculations.

  Calculations that are preliminary in nature, i.e. do not form part of the final submittal, are to be referenced independently and clearly indicated 'Preliminary'.

  Submittals shall clearly state the methodology, formulae, design criteria, assumptions and all design margins used in the calculations.

  Where necessary calculation sheets shall be accompanied by an annotated layout drawing identifying terminals, fittings and the particular sections of ductwork or pipework.

  Each calculation sheet, drawing or schedule shall clearly identify the originator, date of production, checker (who signs or initials) and date of check.

Each set of calculations shall further require the approval of a Chartered Engineer to verify that the design is in accordance with the specification and design intent.

Allow at least 21 working days from date of receipt by the engineer for examination of the calculations and submittals.

Incomplete submittals will not be examined until fully re-submitted, as they will be considered inadequate and misleading.

The costs for the preparation of all necessary calculation shall be included in the tender return.

- **Submittal Review:** The CA will examine the submittals for compliance, in principle, with the design intent.

  Such examination shall not relieve any responsibilities and obligations under the contract.

  Examination of any submittal by the CA shall not mean that the CA is responsible for the correctness of the drawing or submittal or its suitability for purpose. These responsibilities shall remain as defined elsewhere and as the contract.

  The drawings, calculations and submittals shall be issued progressively as agreed in advance with the CA to facilitate examination.

  Allow adequate time in the programme for submittals with due allowance for incorporation of comments and resubmission in order not to cause delays.

  Each package shall contain all drawings, design calculations, support information, manufacturer's literature, etc necessary to facilitate an independent review. All documents (excluding drawings) submitted for examination must be adequately bound.

  All documents shall be clearly identified with a 'status' during the course of the project.

  The following categories shall be used:

  • Preliminary Submittal presented for informal comment as appropriate. Any comment, or lack of comment, is not to be construed or implied as giving approval.
  • Information Submittal presented for information only and no comments required
  • For Review To be reviewed and examined by the CA
  • Construction For construction purposes

  Revised items on drawings shall be indicated by 'clouds' around the changes and annotated with a revision number/letter.

  All drawings shall require the approval of the installer's design manager to verify that the drawing has been developed from an approved design and that the information does not conflict with the requirements of other design disciplines.

  All documentation submitted shall be accompanied by a certificate indicating that it has been checked and approved by the installer's design manager.

  Only drawings that have been reviewed, and incorporate the comments by the CA may be progressed to 'Construction' status. Should it become necessary to revise the drawing its status must be changed to 'For Review' and be re-submitted.

  On receipt and examination of any submittal the following conditions shall apply:

  A Reviewed. Fabrication, manufacture or construction may proceed

B Reviewed. Fabrication, manufacture or construction may proceed subject to incorporation of comments indicated. If compliance with the comments cannot be achieved amend and re-submit.
C Rejected with or without comments. In this case the submittal does not comply and is to be re-submitted after correction.

Where drawings and submittals are reviewed subject to comments indicated, these comments shall be incorporated immediately and re-submitted to the CA prior to issue for construction.

Where drawings are revised and updated during construction these shall be issued to the CA for examination of the revision only, the revision being clearly marked.

Builder's work information and installation drawings shall not be reviewed in detail but shall be examined by the CA for general suitability.

Record drawings are to be prepared as the Works progress and shall be examined in the same manner as stated above unless stated otherwise.

Allow 10 working days from receipt by the Engineer for review and comment on any of the above.

- **Submittal date:** At least 4 weeks prior to work section commencing on site.

430 Proposed manufacturers/ suppliers

- **Scope:** List details of products, equipment and plant.
- **Content:** The tender drawings have been prepared based on the current catalogue information of the equipment specified elsewhere.

  Revisions or modifications of the physical characteristics of the equipment sometimes occur between the published catalogue information and the final information issued on the manufacturing drawings. When such revisions or modification arise incorporate these and their effects on other parts of Works onto the installation drawings and where necessary the final builder's work information.

  Review the manufacturer's references at the earliest opportunity and bring any anomalies to the attention of the CA in writing.

  No extra cost or claim or extension to the programme or delay will be allowed for such modifications to the drawings or the Works as a result of such manufacturing changes.

  The CA shall review all drawings and manufacturers details prior to any orders being placed.

  The final details including all technical aspects and calculations where applicable shall be submitted in a clear, definable and easily read format with the specified technical details, notes and performance data clearly shown in the English language. Where drawings are to be examined the manufacturers details (shown on the drawings) must have been previously reviewed or only partial approval/comment will be granted.

  Submit a separate compliance statement for each item of plant or equipment identifying all technical details and performance characteristics and that required to be achieved as specified.

  All reviews of submittals will be carried out in the offices of the engineer and include for all costs and make all necessary arrangements for reviews of submittals to be undertaken in this manner.

  All meetings in this respect shall be held in the offices of the engineer. Agree with the CA where samples of materials offered for review are to be sent.

The drawings, calculations and submittals shall be issued progressively as agreed in advance with the CA for review.

Each package shall contain all drawings, design calculations, support information, method statements, manufacturer's literature, builder's work information, etc necessary to facilitate an independent review. All documents (excluding drawings) submitted for review must be adequately bound.

All correspondence related to the examination and review procedure shall be directed through the office of the CA.

Allow **10 working days** from the date of receipt by the engineer for review or comment or otherwise on all submittals.

The number of copies and format of information to be provided shall be as follows:
• 1No. Electronic Copy.
• 1No. Paper Copy.

The review period shall not commence until all the information stated above has been submitted.

- **Submittal date:** Within one week of request

460 Health and safety statement

- **Content:** Comply with the requirements of all relevant health and safety legislation and regulations including the Construction (Design & Management) Regulations (CDM) 2015.

  Comply with the requirements of the project health and safety pre construction information.

  Allow for providing all necessary general health, safety and welfare facilities unless it has been specifically agreed that certain facilities will be provided by others.

  Appoint a "competent person" on the site to manage health and safety during construction.

  Where the design of any elements of the works is undertaken, cooperate with and provide information to the CDM Coordinator in accordance with the designer's duties under the CDM Regulations.

  Ensure, so far as is reasonably practicable, that all persons employed on, or visiting, the site are adequately informed, instructed, trained, supervised and equipped such that they are able to carry out their duties without risk to safety or health.

  Take all necessary steps to ensure that only authorised persons are allowed into any construction area.

  Ascertain the sufficiency and accuracy of information provided by, or on behalf of, the Client and advise where any additional information or clarification is required.

  Health and safety information provided in the tender documentation or within the pre construction information is limited to highlighting significant risks to health and safety identified during the design and is not intended to identify all health and safety risks with which a competent contractor should be familiar.

  Provide relevant information about the works that might affect the health and safety of any person.

  Provide all necessary information to the Principal Contractor to allow him to develop the construction health and safety plan in accordance with the requirements of the CDM Regulations

prior to the commencement of works on site.

Develop the construction health and safety plan in accordance with the requirements of the CDM Regulations prior to the commencement of works on site.
Review, and revise as necessary, the construction health and safety plan in line with any information received from sub-contractors or any changes in the requirements of the project. Any changes shall be promptly advised to all relevant sub-contractors, the Planning Supervisor and CA as appropriate.

The development of the health and safety plan shall not be limited to those particular risks identified pre construction but shall include consideration of all reasonably foreseeable risks. The development of the health & safety plan shall include the arrangements for the management of the construction works and for monitoring compliance by all persons with the requirements of relevant statutory provisions.

The health and safety plan must be adequately developed, as far as is reasonably practicable allowing for any phasing of works, etc., in sufficient time to allow it to be submitted to the Client and/or CDM Coordinator for comment prior to the commencement of any works on site. In the case of phased works the plan relating to the work content of any phase must be adequately developed and submitted for approval prior to the commencement of any work within that phase of the project.

Supply to the Principal Contractor, any method statements, he or the client may request. Comply with all CDM procedures required by the CDM Coordinator and the Principal Contractor.

Ensure that all sub-contractors complete appropriate assessments of the risks to health and safety in respect of their works as required under applicable statutory legislation, including the latest.

Management of Health and Safety at Work Regulations and the Control of Substances Hazardous to Health Regulations and other relevant health and safety regulations.

Ensure, so far as is reasonably practicable, that all sub-contractors, employees and self employed persons under your control who are at work on the construction of the project comply with the requirements of the construction health and safety plan.

Prepare all necessary information for the production of a health and safety file for the works in accordance with the requirements of the CDM Regulations and in the format defined by, or agreed with, the CDM Coordinator and/or Client. Ensure and coordinate the provision of information for the health and safety file by all sub-contractors, specialists and suppliers. Provide the health and safety file information in adequate time to allow this to be coordinated and handed over to the Client at practical completion of the works, unless otherwise agreed.

Comply with latest edition of the Control of Substances Hazardous to Health Regulations. Undertake COSHH assessments for all activities and substances provided or used on site to assess their potential health hazards. Copies of all relevant COSHH assessments must be issued to the operatives concerned and strictly monitored. Particular attention must be given to the use of glues and sealant.

Labour saving lifting devices shall be used wherever possible and materials sized to allow easy manual lifting.

Consider the future replacement of plant and equipment and ensure no item of plant or equipment is installed in such a manner that it cannot be routinely and regularly maintained in a safe manner.

Ensure that all sub-contractors are issued with copies of the pre construction health and safety information including details of all identified significant hazards and relevant information prior to

the submission of their tenders and that they price for compliance.

Describe any significant and unavoidable hazards which may arise as a result of carrying out the work and the measures proposed to safeguard the health and safety of operatives and of any person who may be affected by the work.

- **Submit:** Prior to works commencing

480 Health and safety file information

- **Information:** Provide as required by Principal Designer.

650 Sub subcontractors

- **List:** Details of portions of subcontract works to be sublet and names and addresses of proposed sub subcontractors.
- **Submittal date:** With the tender.

INFORMATION

740 Proposed instructions

- **Estimates:** If a proposed instruction requests an estimate of cost, submit without delay and in any case within seven days.

750 Design and production information

- **General:** Complete the mechanical, electrical, and public health designs and detailing of parts of the Works as specified and shown on the outline tender drawings.
- **Provide:**
  - **Production information:** Based on the drawings, specification and other information.
- **Liaison:** Ensure coordination of the work with related building elements and services.
  - **Additional information:** Request as necessary and provide information in time to meet the programme.
- **Submission to Contractor:** Until confirmed that resubmission is not required, resubmit for further checking and comment, and incorporate necessary amendments.
- **Design and production information:** Submit two copies, one can be returned with comments. Ensure that necessary amendments are made without delay.
- **Subcontractor's changes:** Support request for substitution or variation to requirements with relevant information.
- **Contractor's amendments:** If considered to involve a variation to the requirements, which has not already been acknowledged as a variation, notify without delay (maximum period 7 days), and do not proceed until instructed. Claims for extra cost, if made after it has been carried out, may not be allowed.

780 Drawn and other information

- **Subcontractors design documents:** Drawings as described earlier within this specification.
  Sizes and scales required.
  Schedules of all mechanical equipment
  Specification for all mechanical equipment
  Calculations for all mechanical services / systems as detailed earlier within this specification.
  Names of manufacturers and suppliers, including certification of components and assemblies.
- **Format:** Electronic and paper copy
- **Builder's work information:** Take responsibility for confirming and amplifying such information.

800 Insurance

- **Documentary evidence:** Under the terms and conditions of the contract certain policies of insurance are required to be secured. Details, policies and receipts for the insurances required by the Conditions of Contract.

  Examine these policies and obtain such supplementary cover as shall be necessary to ensure that the Works and the materials, plant, tools and equipment brought onto the site for the purpose of the execution of the Works shall be protected for their full value against the risks defined in the contract conditions.

  The risk of injury to third parties and damage to third party property arising from the execution of the contract shall be insured up to the limit defined in the said conditions.
- **Submittal date:** Before starting work on site.

810 Professional indemnity insurance

- **Requirement:** Provide and maintain PI insurance in respect of Contractor Designed Work.
  - **Level of cover:** Is the aggregate amount for any one period of insurance.
  - **Period of insurance for these purposes:** 12 years
- **Amount of indemnity required:** £3,000,000
- **Documentary evidence:** Details and/ or policies and receipts for the insurances required.
- **Submittal date:** Before starting work on site.

820 Insurance claims

- **Notice:** If an event occurs which may give rise to a claim or proceeding in respect of loss or damage to the Works or injury or damage to persons or property arising out of the Works, immediately give notice to the Employer/ Client, the person administering the contract on their behalf and the Insurers.
- **Failure to notify:** Indemnify the Employer against loss, which may be caused by failure to give such notice.

840 Ownership of products

- **Ownership:** At the time of each valuation, supply details of those products not incorporated into the Works which are subject to reservation of title inconsistent with passing of property as required by the Conditions of Contract, together with their respective values.
- **Evidence:** When requested, provide evidence of freedom of reservation of title.

850 Products stored off site

- **Evidence of title:** Submit reasonable proof that the property in such items is vested in the Contractor.
- **Supplier:** For products purchased from a supplier include a copy of the contract of sale and a written statement from the supplier that conditions of the sale relating to the passing of property have been fulfilled and the products are not subject to encumbrance or charge.

880 Defects in existing work report

- **Undocumented defects:** When discovered, immediately give notice. Do not proceed with affected related work until response has been received.
- **Documented remedial work:** Do not execute work which may hinder access to defective products or executions, or be rendered abortive by the remedial work.

900 Commissioning programme

- **Submittal date:** Prepare comprehensive programmes for the pre-commissioning checks, setting to work, testing, commissioning, system proving and environmental testing of the contract works. Submit programme within 4 weeks of contract appointment.

  Review and update the commissioning programme at agreed intervals and if necessary revise and amend the programme to suit the progress of the contract works. Due account shall be taken of any phasing requirements.
- **Format:** Electronic and Hard Copy.

910 A Commissioning & testing

- **Requirements:** Where used in the specification the following definitions shall apply:

  • Commissioning - the advancement of an installation from the stage of static completion to working order to the specified requirements.
  • Testing - the measurement and recording of specified quantifiable characteristics of an installation or parts thereof. This includes off site testing.
  • Setting to work - the process of setting a static system in motion
  • Regulation - the process of adjusting the rates of fluid flow in a distribution system to achieve specified values
  • Environmental testing - the measurement and recording of internal environmental conditions
  • System proving - the measuring, recording, evaluating and reporting on the seasonal performance of the systems against their design values
  • System demonstration - demonstrating the capability of the installation to achieve and maintain the specified performance criteria
  • Fine-tuning - the adjustment of the system where usage and system proving has shown such a need. This may include the re-assessment of design values and control set points to achieve the required system performance.

  Notify the CA in writing when the Works or parts thereof are ready for testing and commissioning.

  Provide all necessary facilities to enable tests to be witnessed and inspections carried out including all necessary instruments and recorders to monitor systems during commissioning system proving and environmental testing.

  Appoint a "competent person" to supervise the whole of the testing, commissioning, system proving, system demonstration and instruction of the employer's staff.

  Co-ordinate the activities of all specialised personnel, including manufacturer's representatives, together with providing any attendance required.

  Indicate on drawings where access is required into ceiling voids, service risers etc and ensure these points are not closed up until the commissioning and testing is complete.

  The CA will examine, subsequent to setting to work and regulation of the Works the results of the commissioning and the documentary records thereof.

  The object of the witnessing stage is to enable the CA to establish a level of confidence in the commissioning results being presented. The extent and proportion of results to be witnessed by the CA will be at the discretion of the CA.

  The CA will only witness test proceedings, confirm recorded results and determine if the specified requirements have been satisfied.

  Should the tests fail to demonstrate that the plant and equipment are properly installed and

functioning correctly, the cause of the failure shall be investigated. Should the failure be due to incorrect or faulty work then without delay, carry out such remedial measures and adjustments as may be necessary and repeat the commissioning and testing procedure to the satisfaction of the CA.

Ensure all requirements such as cleanliness, protection from harmful external and internal elements are provided prior to commencement of commissioning

Where it is not possible at the particular time of commissioning and testing for full load conditions to be obtained or simulated, undertake to repeat such operations of full load or a simulation thereof at a time when this can be achieved.

The Works shall be fully tested, commissioned and be fully operational prior to witnessing and inspection by the CA.

Where portions of the work are required to be commissioned and tested separately, then upon final completion, demonstrate to the CA that all the several portions are capable of proper simultaneous operation in accordance with the requirements of the specification.
In cases where the construction programme is such that the commissioning, testing, balancing, adjustment, needs to be undertaken in an area of the building taken over and occupied by the

Employer, then take all necessary precautions against and be responsible for any damage caused whilst working in such areas for that purpose.

All certification documents shall be submitted to the CA for examination before any system is offered for final acceptance.

Provide a written statement to the CA confirming that each installation has been correctly tested and commissioned and that the performance requirements can be achieved.

Undertake the following:

• Test, commission, regulate and set to work the Works
• Prepare comprehensive programmes, commissioning plans, schedules and method statements and procedures supported by risk assessments for the pre-commissioning checks, setting to work, commissioning, system proving and environmental testing of the Works
• Develop and complete the initial commissioning plan and submit to the CA
• Comply with the requirements of the Building Regulations for the inspection and commissioning of the building services systems. Prepare all necessary submittals including commissioning plans and reports. Obtain all compliance approvals from the building control bodies.
• Provide all specialist personnel including manufacturer's representatives and coordinate their activities, together with providing any attendance required.
• Provide and submit standard proforma for the various requirements for commissioning records and certification for agreement with the CA prior to commencement of the works
• Monitor progress against the program of works and provide weekly reports detailing progress of testing and commissioning activities
• Maintain a diary/log of significant commissioning and testing activities
• Measure and reconcile noise levels at agreed locations to verify compliance with design criteria
• Submit to the CA all certification documents prior to any system being offered for final acceptance
• Confirm in writing to the CA that each installation has been correctly tested and commissioned and that the performance requirements can be achieved.
• Ensure all certification is attained and witnessed as necessary for inclusion in the record documentation
• Provide and submit a report for every test, demonstration, balance or commissioning activity witnessed, together with an engineering appraisal on the performance, either on or off-site
• As necessary co-ordinate and liaise with the Employer's representative
• Maintain on site at all times full records of all testing, commissioning and performance testing

• Prepare a written report on the operational and performance testing
• A final commissioning report detailing the results of the commissioning and commenting on the performance of systems

Performance testing, system demonstration, system proving or environmental and capacity testing, until commissioning of the system is completed to the satisfaction of the CA.

Submit to the CA written reports signed by a "competent person" to confirm that:
• Prior installation - all system designs can be commissioned
• Post installation - installations complete and ready for commissioning
• System cleanliness - specified cleanliness has been achieved
• Pre-commissioning checks - completion of pre-commissioning checks
• Commissioning and testing - demonstrate compliance with specified requirements and confirm that each installation has been correctly tested and commissioned and achieving the specified performance
• All necessary checks and witnessing by the Local Authority, Government offices, Statutory Authorities etc have been undertaken
During the 12 months after practical completion and in consultation with the CA undertake to:
• Assess the need for fine tuning of the installations
• Ensure the requirements for fine tuning are incorporated in the commissioning specification
• Ensure that fine tuning activities are programmed, planned in advance and agreed with the CA and employer prior to commencement
• Arrange that the relevant parties are retained and appointed to provide input to fine tuning activities
• Ensure that fine tuning activities are planned with regard to the health and safety of occupants and such that any disturbance to them is minimised
• Provide a mechanism by which the employer can provide feedback on the performance of the building both before and after fine tuning
• Attended meetings as requested by the CA to deal with issues arising from fine-tuning of the Works.

- **Inspections and Tests:** Prior to commencement of the works submit schedules indicating those parts of the contract works for which inspections and tests are required to substantiate conformity with the specification.

  Should any alternative item be proposed that does not carry appropriate certification, ensure independent testing is carried out at no expense to the contract works to confirm compliance.

  Provide method statements supported by risk assessments detailing the procedures for carrying out all on site tests.

  Agree in advance with all parties procedures for inspections and tests including periods of notice.

  Where a test indicates non-compliance with the specification submit immediately details of the non-compliance and details for corrective action.

  Maintain records of all specified inspections and tests performed including third party and works testing and maintain copies of all records on site for inspection.
- **Static Testing:** Progressive static testing shall include the following tests, but other tests may be required and witnessed:
  • Insulation resistance
  • Earth fault loop impedance
  • Earth continuity
  • Pressure testing of hydraulic systems
  The CA shall be given the opportunity to witness all static tests. Advance notice of 5 working days shall be given to the CA.
- **Fuel for Testing:** Fuel for testing and operating the Works will be recoverable from the Client.

920 Maintenance instruction and guarantees

- **Components and equipment:** Obtain or retain copies, register with manufacturer and hand over when requested before completion of the Works.

00-80-70 Works Contract Completion

235 System Demonstrations

- **Requirements:** Subsequent to the completion of all testing and commissioning to the satisfaction of the CA, when directed by the CA operate the plant and demonstrate that the overall systems function correctly in accordance with the requirements of the specification.

  Full running and operation for a period of at least 1 week shall be considered reasonable for this demonstration and this period shall be allowed in the programme.

  During this period be responsible for the recording of results and the operation and maintenance of the plant. If appropriate, use this time to instruct the Employer's staff in the operation and maintenance of the systems.

  Provide an operational report of the demonstration and print out of the conditions maintained within the space for the required demonstration period.
- **Staff Training:** At a time to be agreed with the CA and prior to practical completion instruct the Employer's staff in the use, correct operation and general maintenance of the Works and be satisfied that such staffs are competent to take over the installation on completion.

  Include adequate periods to instruct the Employer's staff in the operating and maintenance of the Works. Submit to the CA for approval a detailed training programme and method statement for the training of the Employer's staff.

  During such periods of instruction undertake and be responsible for the correct operation and maintenance of the installations.

  Employ the services of relevant specialists and suppliers necessary for this purpose and provide each person with a comprehensive set of teaching notes and diagrams.

  All the associated training equipment required by the trainer(s) to enable the training to be demonstrated effectively shall be provided.

  For all instruction periods maintain training records which shall be submitted to the CA on completion. All attendee names shall be recorded and signatures obtained from all attendees confirming they have understood the training given. A schedule of names shall be provided within the operating and maintenance documentation.

  All health and safety issues relating to the Works shall be brought to the attention of all attendees.

  All attendees shall be provided with the appropriate Personal Protective Equipment (PPE).

  'Formal' presentations shall be carried out over 'half day' periods.

  As an indication, the training for operating staff should include, but not be limited to:

  • Building services system scope (demonstrated with the aid of schematics and/or other drawings/visual aids). To include an overview of the purpose and normal operating functions of the Works and explaining the philosophy and method of control used.
  • Demonstration and training (by controls Specialist) of the building control system.
  • An electronic projector style 'walk through' of the operation and maintenance manuals, highlighting important areas of health and safety together with all other items of importance.
  • Highlighting, demonstrating and providing delegate experience in all maintenance procedures identified in the O&M Manuals.

• Physical tour(s) of inspection of the Works illustrating aspects covered in the 'classroom' and the location of essential isolating points of all incoming services.
• Explaining and illustrating all operator alarms, their possible causes and actions required.
• Explaining all known and typical fault scenarios which are capable of being recognised and/ or rectified by the operators.
• Identifying and demonstrating all safety equipment and interlocks including all interlocks with other suppliers' systems /equipment.
• Identifying the noise levels in the various areas and highlighting the need for any protection required.
• Specifying and illustrating any hazards associated with the Works and the methods employed to deal with them.
• Providing instruction on the correct operation of plant items and the safe limits of their operation.
• Explaining the mode of operation and sequence of events resulting from both power failure and fire alarm conditions.
• Demonstrating any alarms and explaining they're meaning and possible causes.
• Highlighting any associated hazardous maintenance materials which may require special disposal considerations.
• Highlighting the signs, cause and effect of known/ possible breakdown or fault conditions.
• Indicate and demonstrate (where practicable) arrangements made for access and removal of specific items of equipment or key large or heavy subassemblies / components.
• Demonstration of the safe day to day running and maintenance of all systems, plant and equipment.
• Providing sufficient expertise to address delegate questions.

The training for the operation of the controls, monitoring or BMS installations shall include as a minimum:

• Initial training at the works of the controls supplier including hands on experience of equipment and software similar to the installation.
• Instruction on the procedures for testing and routine inspection of sensors and actuators to enable the operator to assess the nature of faults and extent of remedial action required.
• The provision of all appropriate reference and training manuals.
• Complete initial instruction prior to commissioning of the installed system.
• Site instruction on the installed system.

Together with the controls and commissioning specialists, be available for an agreed period as agreed with the CA to assist the Employer's personnel in the operation of the various systems following practical completion and occupation of the buildings.

All costs associated with the instruction of the Employer's staff and required attendance following practical completion shall be included in the contract price.

245 Operation & Maintenance Manuals

- **Test Certificates:** Ensure test certificates include:
  • Project title
  • Contractor's name
  • Specific location of the item n the Works, including plant identification, system etc
  • Details of the plant / equipment, including manufacturers' reference number
  • Date, time and duration of inspection / test
  • Weather conditions during the test, where applicable
  • Details of the test / inspection
  • Instruments used, serial numbers, and calibration dates, where applicable
  • Number and type of deficiencies found, where applicable
  • Any corrective action taken, where applicable
  • Itemised readings for all tests, where applicable
  • Name and signature of those inspecting / witnessing test / testing

• Other relevant particulars.

Test certificates must be issued in duplicate to the CA within 10 working days of the test. Maintain records of all specified inspections and tests performed including third party and copies of works test certificates on site.

- **Record Documentation:** Be advised that great importance will be placed upon quality, accuracy, clarity and completeness of the record documents and upon these being made available promptly.

  Practical completion will not be granted unless an approved copy of the record documentation has been prepared, and is available for handover to the Employer.

  Comply with the requirements of the CDM Regulations in providing the appropriate input to the health and safety file for the Works.

  Comply with the requirements of the Building Regulations in providing all necessary documentation and information.

  Provide record documentation, as detailed elsewhere, to include but not limited to:
  • Record drawings and schedules.
  • Plant room and switch room drawings, schedules and schematics.
  • Operating and maintenance manuals.
  • Blank maintenance logs.
  • Building log book information.

  Ensure record documents clearly record the arrangements of the various sections of the Works as actually installed and identify and locate all component parts.

  The record documents shall set out the extent to which maintenance and servicing is required and how, in detail, it should be executed. Sufficient, readily accessible and proper information shall be provided to enable spares and replacements to be ordered.

  Correlate record documents so that the terminology and the references used are consistent with those used in the physical identification of the component parts of the installations.

  Demonstrate as required throughout the execution of the contract works that complete and accurate records are being maintained and that the record documents are being progressively compiled as the work on site proceeds.

- **Operating and maintenance manuals:** Employ an independent company who specialises in the preparation of operation and maintenance manuals to provide the manuals in accordance with the requirements of this specification.

  Submit details of the proposed specialist to the CA for approval prior to commencement of the Works

  4 weeks before the contract completion date provide a draft copy of the operating and maintenance manual to the CA for comment.

  Retain a copy of all the delivered record documentation for at least one year after practical completion. If requested by the Employer or CA during this period, provide additional copies subject to a charge.

  Undertake the following activities with respect to the preparation of the operation and maintenance manual:

  • Liaison with the Planning Supervisor and any other parties associated with the production of the Health and Safety File, to ensure that the required information is complete and that the method of

presentation and terms used are consistent.
• Liaison with designated members of the design team to obtain all information necessary to convey a thorough understanding of the design intent and operating principles of the installations.
• Liaison with designated contractors and specialist subcontractors to obtain all necessary details of the installed systems and equipment to enable safe and proper operation and maintenance.
• Laison with specialist equipment suppliers as necessary to ensure that clear operating and maintenance instructions are included in the Manual.
• Preparation of additional written, diagrammatic and/ or pictorial information as necessary for the operation and maintenance of the engineering services installations;
• Re-drafting and restructuring information provided by others as necessary so as to ensure consistency with other parts of the manual and other sections of the Health and Safety File.
• Submitting periodic reports to the CA on the progress of the preparation of operation and maintenance manuals.
• Collating all the information into a co-ordinated, indexed and cross-referenced document.
• Providing all stationery, printed material and binders required for the production of the draft and final editions of the operation and maintenance manuals.
The manual supplier shall be responsible for the correction of any errors or omissions in the manual.

General requirements:

• All documentation shall be in English as spoken and written in the United Kingdom.
• All units of measurement shall be metric, conforming to the SI system.
• The text of descriptive sections shall be concise and complete avoiding possible ambiguity or misunderstanding. All information shall be pertinent to the specific installations. Irrelevant material or material of a general nature shall not be acceptable. Where generic standard clauses are used as the basis for certain parts of the manual, they shall be edited to ensure that all text is relevant to the Works.
• Jargon shall be avoided. All new terms shall be defined when first introduced. Abbreviations shall only be used if they have been defined or their meaning is clear from the text.
• The imperative mode shall be used for instructions regarding operation, maintenance, disassembly etc.
• Illustrations, drawings and diagrams incorporated into the manual shall be easily read in conjunction with the relevant text.

All aspects of the manual shall comply with relevant requirements of the CDM Regulations for the provision of information for the Health and Safety File.

Where appropriate, the maintenance procedures and frequencies detailed in the manual shall be in accordance with details provided by the manufacturer for specific items of equipment.

Where specific requirements are not pertinent, the procedures and frequencies shall be as recommended in HVCA Standard Maintenance Specifications for Services in Buildings.

Care shall be exercised to ensure that maintenance procedures and frequencies described in manufacturers' printed details are accurately reflected in the text of the manual.

The manual supplier shall identify, from the CA, the intended maintenance strategy for the Works and the level of technical competence and user ability of the personnel likely to be employed. The manual shall be written in a style to suit the abilities of all users. Where necessary, prepare separate sections to suit the following levels of competence:
• non-technical - eg building manager or caretaker requiring simple directions for basic operations.
• general technical - with broad-based maintenance skills required for routine maintenance, inspections etc and detailed analysis of system operation.
• specialist - in individual fields and with respect to particular items of equipment.

The manual shall have an alphabetical index or indexes. The indexing and cross-referencing in

other parts of the manual shall be arranged to provide easy access to required information.
Content and layout

The manual shall be arranged as follows unless an alternative format and contents are agreed with the CA prior to issue of the draft document:

Outline of contents;
• Front cover and fly sheet
• General details to be shown on all volumes
• Document title - Operating and Maintenance Manual
• Employer name and logo
• Premises name
• Services referred to in the manual
• Volume reference where the manual runs to more than one volume
• Description of contents (eg General Information and Design Details)
• Spine details to be shown on all volumes
• Services referred to in the manual
• Volume reference where the manual runs to more than one volume
• Description of contents (eg General Information and Design Details)

Title pages;
• Premises name and address (authenticated postal address, phone, fax, e-mail etc)
• Services referred to in the manual
• Full name and address of the Employer
• Date of completion and date of handover of the services to the Employer
• Date of issue
• The author's reference number of the manual
• Name and address of the author of the manual

Contents and index;
• Contents list for the whole manual. To comprise a master list of main headings of each section for each volume of the manual, for cross reference. (Copies of this master contents list to be included in the master contents list for the Health and Safety File)
• Detailed contents for the particular volume. To include a structured contents list showing main headings and details of contents of each section in that volume, with paragraph numbers and page numbers.
• Detailed contents for each section. To be located at the front of each section of the manual, giving a detailed, structured list of the contents of the respective section.
• Index comprising a comprehensive alphabetical index for all sections of the manual

Section 1 General information and introductory overview;
• Full name, address, telephone and facsimile numbers, website address and email address of the design team and all installing contractors, sub-contractors and specialists for the Works
• Full name, address, telephone and facsimile numbers, website address and email address of all public utilities and local authorities
• Any limitations on the use of the manual
Record of amendments to manual schedule (including space for future records)
• Description of how to use the manual
• List of all supplementary documents
• Distribution list and locations of all copies of the manual
• Scope including a brief description of which systems and details are included in the manual

Section 2 Contractual and legal information;
• Details of ownership, leases etc defining areas of responsibility for operation and maintenance
• Construction / handover dates including installation start date(s), practical completion date and end of defects liability date
• Details and copies of all manufacturers' guarantees or warranties together with maintenance agreements offered by sub-contractors or manufacturers. Include expiry dates.

• Insurance inspection reports. Documents pertinent to Employer's / User's liability
• Local and public authority consents. To include permissions required for access, alterations etc
• Safety and fire certificates. Certificates confirming that the premises and installed systems may be safely utilised. These shall include examination certificates by competent persons for pressure systems etc, together with written schemes of examination for pressure systems.
• Software licence information.

Section 3 Health and safety;
• Features or characteristics that may produce a hazard. Flammable, toxic or otherwise deleterious substances necessary for the operation of systems; restricted access; pressure systems etc
• Known hazards against which protection can be provided
• Mandatory requirements relating to safety. To include details of all systems and equipment requiring periodic inspection/ examination/ testing to comply with relevant regulations, approved codes of practice etc
• Relevant safety precautions. To include procedures to minimise the risk of damage or injury from recognised hazards. Requirements for special manual procedures, permits to work etc.
• Details of recommended first aid equipment to be maintained on the premises.

Section 4 Emergency information;
• Contact information for:
• Utility supplier emergency services (gas, water, electricity)
• Provider of emergency call out service
• Installer's emergency staff
• Security/fire systems
• Location of first aid equipment
• Emergency control locations
• Water main stopcock(s)
• Gas shut -offs
• Electricity isolation points
• Specific systems/plant

Section 5 Description of services and design intent;
•A schedule of the floor areas of each of the building zones categorised by environmental servicing type
• Description of the whole building and intended use
• Design philosophy including all design criteria
• A full description of each of the installed systems and items of equipment. To include as a minimum a written explanation of the following:
• Scope
• Intended purpose
• Plant and distribution locations; divisions of main zones; etc, cross-referenced to schematics
• Function
• General design parameters
• Installed capacities
• System capacities (based on commissioning results)
• Restrictions of the systems
• Planned operational efficiency and most economic mode of operation
• Expected service life
• Manufacturers information concerning correct operation

Section 6 Equipment schedules;
• System by system schedules of all plant, equipment, valves, distribution boards etc stating as minimum:
• Component type
• Unique asset number
• System
• Location

• Number off
• Duty and size
• Performance figures
• Manufacturer and supplier
• Manufacturer's model and/or reference number
• Manufacturer's serial number and nameplate details
• Original order number for the particular plant/equipment item
• Each item of plant/equipment must have a unique asset number cross-referenced to the record drawings and schedules.

Section 7 Systems operation;
• Descriptions of the operational and control strategies to include:
• Control and operating strategy for each system
• Outline of general operating mode including summer and winter operation
• Start-up and shut down procedures. Description of procedures for whole system and individual items of plant, from fully off to fully operational, including interlocks etc.
• Interlocks and inter-dependencies between plant and systems.
• Procedures for emergency shut down and operating procedures for standby plant.
• Means of making safe potentially dangerous plant
• Precautions necessary to overcome known hazards when operating each system, bringing into operation all standby equipment included in each system
• Instructions on fault finding and emergency in case of plant malfunction or equipment failure control sequences for all systems installed
• Details of all software provided and procedures for updating and/or modifying software operating systems and control programs
• Instructions for the creation of control procedure routines and graphic diagrams where applicable.

Section 8 Energy management;
• Energy management strategy to enable energy consumption to be monitored and controlled.
• Metering philosophy. To include a schedule of the building's energy supply meters and sub-meters, indicating for each meter, the fuel type, its location, identification and description, and instructions on their use.
• Carbon emissions and the comparable performance benchmarks / target figures for energy consumption and energy costs. (Design assessments to be in accordance with Building Regulations)
• The measured air permeability of the building
• Forms for recording plant running hours, energy consumption and energy costs.

Section 9 Maintenance;
• Maintenance instructions for each item of plant, co-ordinated from manufacturer's details and recognised industry guidelines including frequency and recommended routine maintenance activities guidance on the nature of deterioration and defects look for dismantling and re-assembly
adjustment , calibration and testing special tools needed for maintenance (cross referenced to the particular item) test equipment and auxiliary services
• Reference to spare parts / replacements
• Programme / frequencies for planned preventive maintenance.
• Comprehensive schedules identifying:
- routine periodic checks on plant / system status and condition.
- periodic verification of accuracy of controls, instruments etc.
- routine visual and physical checks, measurements and certification of continuing fitness for purpose and safety.
- routine checks / changes to plant / system components / settings to compensate for wear, operational requirements, experience in use etc so as to ensure continuing optimum performance.
Recommended frequencies and procedures for routine lubrication of moving parts, including generic specification for lubricants.

• Procedures for fault finding and identifying causes of abnormal operation of plant / equipment.

Section 10 Spares and tools;
• Schedule of types of replaceable assemblies, components etc particular to specific plant.
• Schedule of specialist tools / equipment particular for specific plant and necessary for undertaking work at height etc.
• Separate parts lists shall be provided for each item detailed in the equipment schedule.
• Schedule of normal consumable items
• Recommended stocking levels
• Schedule of personal protective equipment necessary for operation / maintenance activities / tasks

Section 11 Drawings;
• A schedule of all engineering services record drawings for the Works. The information to include drawing title, number, source, revision, date, system detail, file/storage location. The schedule to include space to record future modifications and dates.
• An A3 size reduced copy of all record drawings together with an index.
• An A3 size reduced copy of all plantroom and switchroom drawings, schematics and schedules
• Legend for all colour-coded services
• Schematic drawings of each system, indicating principal items of plant, equipment, valves, etc.
• A schedule of all manufacturers' drawings for the Works. The information to include drawing title, number, source, revision, date, system detail, file/storage location. Schedule to include space to record future modifications and dates.

Section 12 Testing and commissioning data;
• Copy of report(s) confirming that the Works were satisfactorily commissioned signed by a competent person(s)
• Copies of all test certificates, records, commissioning and performance test records for the Works. All certification shall be signed and witnessed.
• Method statements for the testing and commissioning procedures undertaken including description of equipment used.
• Copies of calibration certificates for all test equipment.
Schedules of all fixed and variable equipment settings established during commissioning.

Section 13 Manufacturers' data;
• Schedule of all manufacturers and suppliers indicating company name, address, telephone and facsimile numbers, email address(es), website address and equipment unique asset number. (Sorted in company order alphabetically)
• Product (manufacturer's) data/ literature for all items of equipment and plant installed. The information to be project specific and include detail drawings, electric circuit details and operating and maintenance instructions.

Section 14 Materials and substances;
• Register of harmful substances. Details of any materials that could be hazardous to health, used in connection with or otherwise relevant to operational or maintenance activities.
• COSHH details
• Register of recyclable materials
• Methods for safe disposal or destruction of any parts, materials or components. Provide a data sheet for each material known to constitute a potential hazard, with detailed procedures for its safe, authorized disposal.

Section 15 Modification information;
• Details of allowances made by plant manufacturer or system designer for modifications
• Provide space in manual to record future modifications.

The manual shall conform to the following minimum standards:
• The covers shall be substantial, of adequate size, distinctive and of sufficient strength to protect the contents for the life of the installation. The method of binding shall give a permanent

anchorage along the left-hand side whilst allowing the text to be flat without damage to the spine.
• The manuals shall be prepared on an approved typeface on top quality A4 suitable for direct insertion into the manuals
• The front cover and where appropriate the spine, shall have the information clearly displayed in permanent lettering.
• Dividers between sections shall be stepped, overlapping printed card. The divider shall be labelled to identify the section of the manual that it proceeds.
• All pages comprising the manual shall be subsequently numbered according to each section (i.e. section 1 pages numbered 1/1, 1/2,etc., section pages numbered 2 2/1, 2/2etc.).

Checking of drafts
A draft copy of the operating and maintenance instruction manuals contained in a temporary loose leaf binder(s) shall be issued to the CA for examination prior to the testing and commissioning.

The draft copy of the manual shall conform to the required format and contain all the information identified in this specification with the exception of any information not available at that time (such as commissioning results).

Draft versions of the manual shall clearly display the word "DRAFT".

Final documentation
Once approved a draft copy shall be handed over prior to instructing the employer's staff in the operation and use of the services installations. This copy shall contain all testing and commissioning data and test results, actual control set points and the like in draft form.

Prior to practical completion provide the following copies of the final manual which shall include all testing and commissioning results and final plant duties and control settings, etc. in a typed form.
• The number of paper format copies shall be three number.
• The number of copies in electronic format on CD shall be three number.

All CD's and other electronic forms of delivery media associated with the manual shall be clearly labelled with:
• A heading stating "O&M manual" and disc number if more than one disc
• Details of the premises and systems covered
• The issue number of the manual and date of release

Copyright
The Employer shall have sole copyright to all documents produced specifically for the manual. The Employer shall be entitled to produce copies of all parts of the manual for his own use.

If the Employer transfers ownership or responsibility of the installations he shall be entitled to transfer his copyright of documents included in the manual.

250 Handover

- **Requirements:** This section details the requirements and procedures for completion and handover.

  As a pre-requisite to Practical Completion in respect of the contract works or part thereof, demonstrate to the satisfaction of the CA that:

  • All the contract works are complete. With the exception of minor snags or limited defects as agreed with the CA that could be reasonably completed within an agreed programme without causing disruption to the Employer's use of the building or part thereof.
  • All spares, keys, tools and other consumables as stated elsewhere have been supplied and handed over to the Employer.

• The instruction of the Employer's staff in the use and correct operation of the installation has been completed satisfactorily. In particular, safety devices and controls demonstration.
• All commissioning and testing completed including the issue of a final commissioning reports signed by an approved competent person
• A complete demonstration of the contract works including fully functional operational controls tests undertaken in the presence and to the satisfaction of the CA.
• All necessary certification by the Employer's insurers has been completed.
• All approved record documentation including record drawings, operation and maintenance manuals, etc is approved and issued
• All information required for the health and safety file is issued to the satisfaction of the Planning Supervisor.
• All necessary Statutory Authority approvals have been undertaken and written confirmation established
• Completion and issue of building log book information in accordance with Building Regulations.

Should adequate record documentation not be available Practical Completion will not be granted.

304433

Outline Specification

28/05/2019 - 14:23

Outline Specification

55-40-40 Hot & cold water supply systems

110 Incoming water supply

The contractor shall be responsible for coordinating and interfacing with the utility provider to provide a new water supply to Plant Room 3 at Level 03 of the main Museum building. The initial application has been made via Harley Haddow MEP Consultants (Thames Water reference DR4071446).

For the avoidance of doubt the MEP Consultant is responsible for obtaining the scope of works and receiving the quotation only. The contractor shall be responsible for all liaising with Thames Water directly to arrange, coordinate and programme their works appropriately and ensure that their requirements are met for construction.

The new supply shall be supplied from Thames Water from the existing main located within London Road. The contractor shall provide a valve chamber/man hole at the site boundary where Thames Water shall connect to the on-site pipework. The contractor shall ensure the connection valve arrangment meets Thames Water requirements and that the water meter installed by Thames Water is minimum 25mm diameter. The contractor shall provide all onsite trenching and ensure that all surfaces are reinstated to match the existing finishes i.e pathways.

The new water mains shall be run in MDPE barrier pipe and buried at a minimum depth of 900mm up to the point where the pipework rises to above ground .Alternatively the mains water could be run in Rehau Rauthermex pre-insulated pipe buried to a reduced depth if approved by Thames Water.

Above ground level the mains water pipework shall convert to copper pipework (insulated and finished with venture clad jacketing) and rise to high level on the exterior of the museum (following the route of the existing gas supply) where it shall penetrate the façade and directly enter Plant Room 3 on Level 03.

A method statement relating to the BWIC required to penetrate the structural steel shall be provided by the contractor for approval by the client before commencement of the works.

All exposed external pipework shall be trace heated along its entire length. The trace heating shall be provided with a 230V power supply from the Plant Room 3 MCB.

The new mains colds water supply upon entry to the plantroom shall distribute at high level and connect to the existing cold water storage tank, replacing the 28mm diameter mains water supply from existing site supply.

130 Pumped cold water supply system

Provision of a new mains colds water supply the existing cold water storage tank within Plant Room 3 on Level 03. The existing float valve shall be removed and the contractor shall install a 35mm Keraflow Aylesbury Type 'K' float valve with raised inspection chamber.

The existing supply pipework branch serving the tank shall be disconnected,stripped out and capped back to the main supply pipework to avoid dead legs.

Prior to filling the tank from the new supply the contractor shall clean, disinfect and thoroughly rinse the cold water storage tank following WRAS guidelines and Thames Water By laws.

The existing outlets from the tank shall be combined in a header arrangement and shall be boosted via a fully inverter speed controlled electronic booster set complete with low water sensor, anti vibration kit and

flexible hose connections supplied on its own frame with control panel (part of the packaged boosters set) and provide fault alarm to the BMS. The booster set shall be commissioned by the manufacturer.

The booster pump set shall be provided with 400V 3 Phase power supply from the plant room MCB via a TP&N 32A rotary isolator.

A HydroMag water conditioner shall be provided after the booster pump, suitably mounted and provided with a 230V Single Phase power supply via the plantroom MCB via a 13Amp fused connection unit.

Before the tank the mains water supply shall be provided with a 35mm diameter water meter with pulsed output to the BMS for monitoring of water use. The contractor shall ensure that the meter is of a suitable bore not to add resistance to the incoming supply.

The contractor shall employ a controls specialist to connect both the booster pump fault alarm and water meter pulsed output (for logging of water use) to the site BMS system.

The internal pipework within Plant Room 3 shall be reconfigured to ensure all sanitary fittings and plant currently served from the mains fed system are connected to the new boosted cold water system. This applies but not limited to;

Level 01 Toilets
Level 02 Education Toilets
Café Toilets
Café Kitchen
Gallery Humidifiers
2No Direct Electric Water Heaters

The contractor shall validate the gallery humidifiers and electric water heaters and install pressure reducing valves if required to ensure the increased water pressure is within the operating limits of the equipment.

The contractor shall ensure all WCs are checked for compatibility with increased water pressure.

The contractor shall investigate all water services pipework systems served from the exsiting 2No main supplies before commencement of the works. Upon installation of the new supply the 2No supplies currently serving the plantroom are to be isolated and terminated at low level in the Level 01 Plant Room, at high level (in the same plant room) the 2No supplies are to be connected to together. Within Plant Room 3 the existing 35mm main water service shall be connected to boosted supply to connect all circuits currently served by the mains fed system onto the boosted system.

The isolated mains supplies shall be traced back to the connections to existing site mains water supply (at high level in the corridor outside the South Plant Room) and any connections identified back to this point. The contractor shall isolate and strip back to this point to remove any deadlegs on the remaining mains water service. Special attention is to be made in the plantroom and aquarium areas to ensure that no supplies to plant in these areas are affected.

Works shall include the disconnection of the existing cold water tanks located in the Clock Tower, these are currently fed from the existing mains water supply. The main tank is too large to be striped out and shall be disconnected, drained and suitably sealed and vented using insect mesh to prevent vermin and ingress. The WCs currently served from the tank are to be connected directly to existing main water supply. Pipe work serving the tank shall be isolated and stripped back to a suitable point to avoid dead legs. The 3No redundant tanks are to stripped out and removed and any pipework isolated and removed back to the main supply, again to remove dead legs in the system.

The contractor will carry out a full investigation of the works prior to commencement. The proposed works shall be fully discussed and recorded in a method statement agreed with the consultant prior to the strip out commencing.

In advance of periods in which the water supplies to the museum are to be interrupted specific times are to be arranged and confirmed with all parties prior to the commencement of the works.

304433

Specification

28/05/2019 - 14:23

55-40-40/110 Incoming water supply

System outline

55-40-40/110 Incoming water supply

- **Water company:** Thames Water
- **Position of incoming mains water supply:** Refer to Mechanical Drawings
- **Valves:** 90-10-90/310 Draw off taps and stop valves;
  90-10-90/314 Stop valves for potable water;
  90-10-90/316 Underground stop valves;
  and 90-10-90/318 Backflow prevention devices type B.
- **System completion:** 55-40-40/850 Water quality tests type A.

Products

90-10-90/305 Connections for accessories type C

- **Capillary:** To BS EN 1254-1.
- **Compression for copper tubes:** To BS EN 1254-2.
- **Compression for plastics pipes:** To BS EN 1254-3.
- **Flanged for cast iron:** To BS EN 1092-2.
- **Flanged for copper alloy:** To BS EN 1092-3.
- **Threaded:**
  - **Where pressure-tight joints are made on the threads:** To BS 21 or BS EN 10226-1.
  - **Where pressure-tight joints are not made on the threads:** To BS EN ISO 228-1.

90-10-90/305 Connections for accessories type D

- **Capillary:** To BS EN 1254-1.
- **Compression for copper tubes:** To BS EN 1254-2.
- **Compression for plastics pipes:** To BS EN 1254-3.
- **Flanged for cast iron:** To BS EN 1092-2.
- **Flanged for copper alloy:** To BS EN 1092-3.
- **Threaded:**
  - **Where pressure-tight joints are made on the threads:** To BS 21 or BS EN 10226-1.
  - **Where pressure-tight joints are not made on the threads:** To BS EN ISO 228-1.

90-10-90/305 Connections for accessories type E

- **Capillary:** To BS EN 1254-1.
- **Compression for copper tubes:** To BS EN 1254-2.
- **Compression for plastics pipes:** To BS EN 1254-3.
- **Flanged for cast iron:** To BS EN 1092-2.
- **Flanged for copper alloy:** To BS EN 1092-3.
- **Threaded:**
  - **Where pressure-tight joints are made on the threads:** To BS 21 or BS EN 10226-1.

- **Where pressure-tight joints are not made on the threads:** To BS EN ISO 228-1.

90-10-90/305 Connections for accessories type F

- **Capillary:** To BS EN 1254-1.
- **Compression for copper tubes:** To BS EN 1254-2.
- **Compression for plastics pipes:** To BS EN 1254-3.
- **Flanged for cast iron:** To BS EN 1092-2.
- **Flanged for copper alloy:** To BS EN 1092-3.
- **Threaded:**
  - **Where pressure-tight joints are made on the threads:** To BS 21 or BS EN 10226-1.
  - **Where pressure-tight joints are not made on the threads:** To BS EN ISO 228-1.

90-10-90/310 Draw off taps and stop valves

- **General requirements:** 90-10-90/305 Connections for accessories type D.
- **Manufacturer:** Contractor's choice.
- **Standard:** To BS 1010-2.
- **Arrangement:** Straight pattern.
- **Material:** Dezincification resistant brass (DZR) copper alloy.
- **Connections:** Capillary.
- **Execution:** 90-10-90/610 Installation of valves generally and 90-10-90/670 Valve tests type C.

90-10-90/314 Stop valves for potable water

- **General requirements:** 90-10-90/305 Connections for accessories type E.
- **Manufacturer:** Contractor's choice.
- **Standard:** To BS EN 1213.
- **Arrangement:** Straight.
- **Material:** Copper alloy.
- **Connections:** Capillary.
- **Execution:** 90-10-90/610 Installation of valves generally and 90-10-90/670 Valve tests, type D.

90-10-90/316 Underground stop valves

- **General requirements:** 90-10-90/305 Connections for accessories type F.
- **Manufacturer:** Contractor's choice.
- **Standard:** To BS 5433.
- **Connections:** Threaded and Union ends.
- **Execution:** 90-10-90/610 Installation of valves generally and 90-10-90/670 Valve tests type E.

90-10-90/318 Backflow prevention devices type B

Shared by: 55-40-40/110 Incoming water supply; and 55-40-40/130 Pumped cold water supply system.

- **General requirements:** 90-10-90/305 Connections for accessories type C.
- **Manufacturer:** Heating Appliance Services Ltd (HASL)
- **Standards:**
  - **Anti-pollution check valves:** To BS EN 13959.
  - **Check valves:** To BS 6282-1.
  - **Combined check and anti-vacuum valves:** To BS 6282-4.

    - **Hose union:** To BS EN 14454.
    - **In-line anti-vacuum valves:** To BS EN 14451.
    - **Terminal anti-vacuum valves:** To BS 6282-2.
- **Arrangement:** Manufacturer's standard.
- **Material:** Copper alloy.
- **Connections:** Compression.
- **Execution:** 90-10-90/610 Installation of valves generally and 90-10-90/670 Valve tests, type B.

Execution

90-10-90/610 Installation of valves generally

Shared by: 90-10-90/310 Draw off taps and stop valves; 90-10-90/314 Stop valves for potable water; 90-10-90/316 Underground stop valves; 90-10-90/318 Backflow prevention devices type A and type B; 90-10-90/330 Ball valves; 90-10-90/352 Lift type check valves; and 90-10-90/374 Draining taps.

- **Installation:** In accordance with BS 6683.
- **Position:** As detailed on mechanical drawings and schematics
- **Isolation and regulation valves:** Provide at equipment and on sub-circuits.
- **Access:** Locate valves so they can be readily operated and maintained. Locate next to equipment which is to be isolated.
- **Connection to pipework:** Fit with joints that suit the pipe material.

90-10-90/670 Valve tests, type B

- **Standard:** To BS EN 12266-1.

90-10-90/670 Valve tests type C

- **Standard:** To BS EN 12266-1.

90-10-90/670 Valve tests, type D

- **Standard:** To BS EN 12266-1.

90-10-90/670 Valve tests type E

- **Standard:** To BS EN 12266-1.

System completion

55-40-40/850 Water quality tests type A

Shared by: 55-40-40/110 Incoming water supply; and 55-40-40/130 Pumped cold water supply system.

- **Standard:** To BS EN 806-4.
- **Samples:**
    - **Sample points:** Main supply to site;
    - **Samples for analysis:** Submit samples for bacteriological analysis.
- **Water temperature:** Record at each sampling point at the time of taking the sample.
- **Test results:**
    - **Record:** Details of all analyses.
    - **Submit:** On completion.

- **Number of copies:** One.

Ω End of system

55-40-40/130 Pumped cold water supply system

System outline

55-40-40/130 Pumped cold water supply system

- **System performance:** 55-40-40/220 Cold water supply.
- **Arrangement:** Flooded suction or suction lift to directly pressurize hot and cold water systems.
- **Water meters:** 90-65-55/470 Water meters.
- **Pressure booster sets:** 90-10-70/390 Pressure booster sets.
- **Pumps:** Refer to mechanical schedules
- **Storage tank or cistern:** Refer to mechanical schedules
- **Pipelines:**
  - **Below ground:** 90-10-65/365 Polyethylene (PE) pipelines for water supply.
  - **Above ground:** 90-10-65/310 Copper pipelines.
- **Pipeline accessories:**
  - **Gauges:** 90-10-60/370 Pressure gauges and 90-10-60/380 Temperature gauges.
  - **Accessories:** 90-10-60/395 Masking plates;
    90-10-60/405 Pipe sleeves type A;
    and 90-10-60/405 Pipe sleeves type B.
- **Valves:**
  - **Float valves:** Keraflow Aylesbury type A float valve
  - **Isolating valves:** 90-10-90/330 Ball valves.
  - **Check valves:** 90-10-90/352 Lift type check valves.
  - **Regulating valves:** Arrow Valves AFL service valve with automatic flow limiting cartridge:

    Wash Hand Basin (0.13l/s) White AFLC13
    Kitchen Sink (0.17l/s) Blue AFLC17
    Cleaners Sink (0.25l/s) Lime Green AFLC25
    WC Cistern (0.1l/s) Black AFLC10 (plus strainer)
    Urinal Cistern (0.1l/s) Black AFLC10 (plus strainer)
    Shower Use "Equi-Flow"- AFLE, which fits onto shower hose.
    Washing Machine/Dish Washer (0.2l/s) Red AFLC20
  - **Draining devices:** 90-10-90/374 Draining taps.
  - **Accessories:** 90-10-90/318 Backflow prevention devices type B and 90-10-90/318 Backflow prevention devices type A.
- **Thermal insulation:**
  - **Pipelines:** 90-90-40/360 Phenolic foam insulation.
  - **Tanks:** Maunfacturers standard insulation
- **Vibration isolation:** 90-90-95/370 Isolation hangers;
  90-90-95/360 Inertia bases;
  and 90-90-95/390 Rubber bellows.
- **Sanitary appliances:** Refer to Architects Specification
- **Flush control devices:** 90-15-35/470 Flush control devices.
- **Controls:** 75-75-50/202 Boost fixed time.
- **Accessories:** 90-90-60/390 Services supports.

- **Plant and equipment identification:** 90-90-55/430 Identifying pipework and 90-90-55/480 Mechanical plant and equipment identification labels generally.
- **Execution:** 55-40-40/620 Installing hot and cold water systems generally;
  55-40-40/650 Hydraulic pressure testing of hot and cold water supply systems;
  55-40-40/660 Flushing hot and cold water systems;
  and 55-40-40/670 Disinfection of hot and cold water systems.
- **System completion:** 55-40-40/850 Water quality tests type A;
  55-40-40/810 Commissioning of hot and cold water supply systems;
  55-40-40/820 Inspection and test records;
  55-40-40/830 Demonstrations;
  55-40-40/840 Documentation;
  55-40-40/850 Water quality tests type B;
  55-40-40/860 Spares;
  55-40-40/870 Operating tools;
  and 55-40-40/880 Maintenance.

System performance

55-40-40/220 Cold water supply

- **Incoming mains water supply:**
  - **Site factors:** Identify possible problems and submit report.
- **Type of system:** Pumped from a break cistern or storage provision.
- **Design parameters:** To BS 8558 and To BS EN 806-2.
- **Storage capacity:** Refer to mechanical schedules

Products

90-10-60/370 Pressure gauges

- **Manufacturer:** Contractor's choice.
- **Standard:** To BS EN 837-1.
- **Diameter:** 50 mm.
- **Scale subdivisions:** 20 kPa (0.2 bar) for a maximum scale value of 1000 kPa (10 bar).
- **Material:** Stainless steel.
- **Connections:** Manufacturer's standard.
- **Execution:** 90-10-60/630 Installing pressure gauges.

90-10-60/380 Temperature gauges

- **Manufacturer:** Contractor's choice.
- **Standard:** To BS EN 13190.
- **Format:** Vapour pressure.
- **Diameter:** 50.
- **Case:** Brass.
- **Connections:** Straight stem.
- **Integral accessories:** 100 mm immersion length pocket.

90-10-60/405 Pipe sleeves type A

- **Type:** A
- **Manufacturer:** FloPlast Ltd.
- **Product reference:** FloPlast Intumescent Wrap Ref: FW110.

90-10-60/405 Pipe sleeves type B

- **Manufacturer:**
- **Material:**
- **Form:**

90-10-65/310 Copper pipelines

- **General requirements:** 90-10-65/320 Copper pipeline jointing materials and 90-10-65/315 Copper pipeline fittings.
- **Manufacturer:** Yorkshire Copper Tube
- **Standard:** To BS EN 1057.
- **Grade:** R250 (up to 42mm) and R290(> 42mm).
- **Finish:** Chrome-plated to BS EN ISO 1456 (were exposed) and Plain (Where concealed).
- **Options:** 90-10-65/450 Pipeline supports.
- **Execution:** 90-10-65/630 Installing copper pipelines and 90-10-65/635 Brazed joints in copper and copper alloy pipes.

90-10-65/315 Copper pipeline fittings

- **Manufacturer:** Yorkshire Copper Tube
- **Standards:**
  - **Capillary:** To BS EN 1254-1.
  - **Compression:** To BS EN 1254-2

90-10-65/320 Copper pipeline jointing materials

- **Standards:**
  - **Lead free solder for capillary fittings:** To BS EN ISO 9453.
  - **Brazing filling:** To BS EN ISO 17672.

90-10-65/365 Polyethylene (PE) pipelines for water supply

- **General requirements:** 90-10-65/380 Jointing materials for plastics tubes.
- **Manufacturer:** Contractor's choice.
- **Standards:**
  - **Pipes:** Refer to mechanical drawings
- **Colour:** Blue.
- **Execution:** 90-10-65/645 Jointing plastics pipelines;
  90-10-65/700 Installing buried pipelines;
  and 90-10-65/705 Protection of buried pipelines.

90-10-65/380 Jointing materials for plastics tubes

- **Standards:**
  - **Compression:** To BS EN 1254-3.

- **Electrofusion:** To BS EN 12201-3.
- **Socket and spigot:** To BS EN 12201-3.
- **Solvent cement:** To BS EN ISO 1452-3.
- **Elastomeric ring seal:** To BS EN ISO 1452-3.

90-10-65/450 Pipeline supports

- **Manufacturer:** Contractor's choice.
- **Arrangement:** Manufacturer's standard.
- **Material:** Brass and Steel.
- **Execution:** 90-10-65/695 Installing pipeline supports.

90-10-70/320 Pumps generally

- **General safety standard:** To BS EN 809.
- **Electrical safety:** To BS EN 60335-1 and BS EN 60335-2-51.
- **Dynamic balance:** To BS ISO 21940-21.
- **Test standards:** To BS EN ISO 9906 and in accordance with BS EN ISO 5198.
- **Belts and pulleys:** To BS 3790.
- **Rotodynamic pumps:** To BS EN 16297-1 and BS EN 16644.
- **Connections:**
  - **Flanged, copper alloy and composite:** To BS EN 1092-3.
  - **Flanged, cast iron:** To BS EN 1092-2.
  - **Threaded:** To BS EN 10226-1.

90-10-70/390 Pressure booster sets

- **General requirements:** Pump selection and 90-10-70/320 Pumps generally.
- **Manufacturer:** Duty Point
- **Duties:**
  - **Reference:** Refer to Mechanical schedules for details

90-10-90/305 Connections for accessories type C

- **Capillary:** To BS EN 1254-1.
- **Compression for copper tubes:** To BS EN 1254-2.
- **Compression for plastics pipes:** To BS EN 1254-3.
- **Flanged for cast iron:** To BS EN 1092-2.
- **Flanged for copper alloy:** To BS EN 1092-3.
- **Threaded:**
  - **Where pressure-tight joints are made on the threads:** To BS 21 or BS EN 10226-1.
  - **Where pressure-tight joints are not made on the threads:** To BS EN ISO 228-1.

90-10-90/318 Backflow prevention devices type A

- **General requirements:** Connections for accessories .
- **Manufacturer:** Contractor's choice.
- **Standards:**
  - **Anti-pollution check valves:** To BS EN 13959.
  - **Check valves:** To BS 6282-1.

    - **Combined check and anti-vacuum valves:** To BS 6282-4.
    - **Hose union:** To BS EN 14454.
    - **In-line anti-vacuum valves:** To BS EN 14451.
    - **Terminal anti-vacuum valves:** To BS 6282-2.
- **Arrangement:** Manufacturer's standard.
- **Material:** Copper alloy.
- **Connections:** Compression.
- **Execution:** 90-10-90/610 Installation of valves generally and Valve tests.

90-10-90/318 Backflow prevention devices type B

Shared by: 55-40-40/110 Incoming water supply; and 55-40-40/130 Pumped cold water supply system.

- **General requirements:** 90-10-90/305 Connections for accessories type C.
- **Manufacturer:** Heating Appliance Services Ltd (HASL)
- **Standards:**
    - **Anti-pollution check valves:** To BS EN 13959.
    - **Check valves:** To BS 6282-1.
    - **Combined check and anti-vacuum valves:** To BS 6282-4.
    - **Hose union:** To BS EN 14454.
    - **In-line anti-vacuum valves:** To BS EN 14451.
    - **Terminal anti-vacuum valves:** To BS 6282-2.
- **Arrangement:** Manufacturer's standard.
- **Material:** Copper alloy.
- **Connections:** Compression.
- **Execution:** 90-10-90/610 Installation of valves generally and 90-10-90/670 Valve tests, type B.

90-10-90/330 Ball valves

- **Manufacturer:** Contractor's choice.
- **Material:** Brass copper alloy and Bronze.
- **Connections:** Compression.
- **Finish:** Chrome plated (Where exposed) and Natural (where concealed).
- **Execution:** 90-10-90/610 Installation of valves generally and .

90-10-90/352 Lift type check valves

- **Manufacturer:** Contractor's choice.
- **Standard:** To BS 5154.
- **Arrangement:**
    - **Design:** Piston.
    - **Body pattern:** Straight.
- **Series:** Manufacturer's standard.
- **Material:** Copper alloy.
- **Connections:** Capillary and Compression.
- **Operation:** Manufacturer's standard.
- **Execution:** 90-10-90/610 Installation of valves generally and .

90-10-90/374 Draining taps

- **Manufacturer:** Contractor's choice.
- **Standard:** To BS 2879.
- **Arrangement:** 1.
- **Material:** Bronze.
- **Connections:** Threaded.
- **Accessories:** Lever pattern key and Spare hose union.
- **Execution:** 90-10-90/610 Installation of valves generally and .

90-15-35/470 Flush control devices

- **Manufacturer:** Armitage Shanks.
- **Product reference:** Urinal control valve
- **Water supply valve:** WRC approved solenoid valve with 15 mm compression fittings and Integral stainless steel filter.
- **Sensor unit material:** Stainless steel.
- **Movement detector:** Manufacturer's standard.
- **Power supply:** Battery, including LED battery low indicator.

90-65-55/470 Water meters

- **Manufacturer:** Submit proposals.
- **Standard:** To BS EN 14154-1 and To ISO 4064-1.
- **Format:** In-line meters.
- **Connections:** Male threads.
- **Indicating device:** Type 1 - analogue.
- **Features:** Pulsed output for remote monitoring.
- **Accessories:** To BS EN 14154-2.
- **Execution:** 90-65-55/670 Installing water meters.

90-90-40/360 Phenolic foam insulation

- **Manufacturer:** Isover
- **Product reference:** Glasswool & ULTIMATE faced sections
- **Execution:** 90-90-40/640 Installing phenolic foam insulation on pipelines and 90-90-40/755 Installing at non-loadbearing pipelines supports.

90-90-55/430 Identifying pipework

- **Standards:** To BS 1710.
- **Identification type:** Adhesive colour bands.
- **Execution:** 90-90-55/660 Installing identification on pipework.

90-90-55/480 Mechanical plant and equipment identification labels generally

- **Material:** Face engraved rigid plastic laminate.
- **Label size:** Manufacturer's standard.
- **Colour:**
    - **Background:** White.

    - **Lettering:** Black.
- **Typography:**
    - **Font:** Helvetica medium.
    - **Size:** Manufacturer's standard.
- **Information to be included:** Equipment name;
  Equipment reference number;
  and Service.
- **Execution:** 90-90-55/610 Installing plant and equipment identification generally.

90-90-60/390 Services supports

- **Manufacturer:** Submit proposals. Contractor Design.
- **Support type:** Submit proposals.

90-90-95/360 Inertia bases

- **General requirements:** Mountings generally.
- **Manufacturer:** Manufacturers proprietry inertia base
- **Inertia bases type:** Manufacturer's standard.
- **Material:** Welded steel channel perimeter frame.
- **Execution:** 90-90-95/610 Cast in situ bases.

90-90-95/370 Isolation hangers

- **General requirements:** Mountings generally.
- **Manufacturer:** Contractor's choice.
- **Isolation hangers type:** Spring and neoprene rubber.
- **Colour code:** Manufacturer's standard.

90-90-95/390 Rubber bellows

- **General requirements:** Mountings generally.
- **Manufacturer:** Heating Appliances & Services Ltd (HASL)
- **Execution:** 90-90-95/620 Installation of flexible hoses and rubber bellows.

Execution

55-40-40/620 Installing hot and cold water systems generally

- **Standard:** To BS 8558 and BS EN 806-4.
- **Performance:** Free from leaks and the audible effects of expansion, vibration and water hammer.
- **Fixing of equipment, components and accessories:** Fix securely, parallel or perpendicular to the structure of the building.
- **Preparation:** Immediately before installing tanks and cisterns on a floor or platform, clear the surface completely of debris and projections.
- **Corrosion resistance:** In locations where moisture is present or may occur, avoid contact between dissimilar metals by use of suitable washers, gaskets, and the like.

55-40-40/650 Hydraulic pressure testing of hot and cold water supply systems

- **Standard:** To BS 8558 and BS EN 806-4.

- **Notice (minimum):** 1 week.
- **Pressure:** 680 kPa.
- **Duration of test:** 1 h.

55-40-40/660 Flushing hot and cold water systems

- **Standard:** To BS EN 806-4.
- **Water analysis:** Analyse water samples before treatment.
- **Preliminary checks:** Thoroughly inspect pipework. Complete pressure tests before cleaning or chemical treatment.
- **Waste products:** Neutralize, and dispose of to drain. Preferably direct to manhole.

55-40-40/670 Disinfection of hot and cold water systems

- **Standard:** To BS EN 806-4.
- **Samples for analysis:** Provide after disinfection and flushing.

90-10-60/630 Installing pressure gauges

- **Position:** Downstream of outlet check valve and upstream of outlet stop valve on pump supply.

90-10-65/610 Pipelines installation generally

Shared by: 90-10-65/630 Installing copper pipelines; and 90-10-65/645 Jointing plastics pipelines.

- **Standard:** HVCA TR/20/4 and HVCA TR/20/5.
- **Dissimilar metals:** Prevent electrolytic corrosion.

90-10-65/615 Installing pipeline fittings

Shared by: 90-10-65/630 Installing copper pipelines; and 90-10-65/645 Jointing plastics pipelines.

90-10-65/630 Installing copper pipelines

- **General requirements:** 90-10-65/690 Spacing of pipelines;
  90-10-65/615 Installing pipeline fittings;
  90-10-65/610 Pipelines installation generally;
  and 90-10-65/710 General inspection and testing.
- **Standard:** In accordance with CDA publications 88 Copper tube in buildings and 149 Large diameter copper tubes.
- **Jointing method:**
  - **Permanently concealed joints:** Brazed.
  - **Accessible joints:** Compression, up to 54 mm;
    Press fit;
    and Push fit.

90-10-65/635 Brazed joints in copper and copper alloy pipes

- **Preparation, marking and sealing:** In accordance with BS EN 14324.

90-10-65/645 Jointing plastics pipelines

- **General requirements:** 90-10-65/690 Spacing of pipelines;
  90-10-65/615 Installing pipeline fittings;
  90-10-65/610 Pipelines installation generally;
  and 90-10-65/710 General inspection and testing.

- **Pipeline material:** Unplasticized polyvinylchloride.
- **Jointing method:** To suit tube.

90-10-65/695 Installing pipeline supports

- **Position:**
  - **In plant rooms:** One piece strap, sling rod, washer and nuts.
  - **Distribution corridors and risers:** All pipework outwith plantrooms to be exposed and mounted on cable trays.
  - **Surface mountings:** Split ring, spacer nipple and backplate.

90-10-65/700 Installing buried pipelines

- **Set out:** Lay in straight lines.
- **Concealment:** Do not lay under surfaced footpaths or drives.
- **Trench excavations:** Carefully prepare to a firm even base. Remove sharp objects and replace with pea gravel to give 100 mm (minimum) cover above and below the pipe.
- **Installation:** Thoroughly clean lengths of pipe internally before laying. Temporarily cap until jointing takes place. After laying and jointing keep leading end capped.
- **Thrust blocks:** Install at changes of direction and blank ends.
- **Backfilling:** Excavated material free from large stones and sharp objects. Leave joints exposed until after pipeline pressure test. Lay and compact in 300 mm maximum layers. Do not use heavy compactors before backfill is 600 mm deep.

90-10-65/705 Protection of buried pipelines

- **Earth cover (minimum):**
  - **Water pipework:** 900 mm, 1200 mm maximum.
  - **Under roadways:** 900 mm.
- **Protection:** Apply an anticorrosive, non- cracking, non-hardening, waterproof sealing tape.
- **Application:** After cleaning pipework wrap two layers contrawise spirally around the pipe, with 50% minimum overlap.
- **Marker tape:** Required.

90-10-65/710 General inspection and testing

Shared by: 90-10-65/630 Installing copper pipelines; and 90-10-65/645 Jointing plastics pipelines.

- **Safety precautions:** In accordance with HSE GS 4.

90-10-90/610 Installation of valves generally

Shared by: 90-10-90/310 Draw off taps and stop valves; 90-10-90/314 Stop valves for potable water; 90-10-90/316 Underground stop valves; 90-10-90/318 Backflow prevention devices type A and type B; 90-10-90/330 Ball valves; 90-10-90/352 Lift type check valves; and 90-10-90/374 Draining taps.

- **Installation:** In accordance with BS 6683.
- **Position:** As detailed on mechanical drawings and schematics
- **Isolation and regulation valves:** Provide at equipment and on sub-circuits.
- **Access:** Locate valves so they can be readily operated and maintained. Locate next to equipment which is to be isolated.
- **Connection to pipework:** Fit with joints that suit the pipe material.

90-10-90/670 Valve tests, type B

- **Standard:** To BS EN 12266-1.

90-65-55/670 Installing water meters

- **Standards:** To BS EN ISO 4064-5.

90-90-40/610 Installing insulation and protection products generally

- **Standard:** In accordance with BS 5970.
- **Timing:** Insulate after installed system has been fully tested and joints proved sound.
- **Insulation:** Do not enclose adjacent units together.
- **Clearance:** Maintain between pipes.
- **Finish:** Neatly finish joints, corners, edges and overlaps.

90-90-40/640 Installing phenolic foam insulation on pipelines

- **General requirements:** 90-90-40/610 Installing insulation and protection products generally.
- **Joints:** Close butt, seal with 50 mm wide class 0 tape on both longitudinal and circumferential joints.
- **At fittings:** Mitre. Secure with tape.
- **Vapour seal:** Tape exposed insulation membrane. Seal vapour barrier at pipe support with class 0 tape.

90-90-40/755 Installing at non-loadbearing pipelines supports

- **Insulation:** Carry through pipe support.

90-90-55/610 Installing plant and equipment identification generally

- **Fixing:** Fix with adhesive to equipment.
- **Position:** On equipment.

90-90-55/660 Installing identification on pipework

- **Application of basic identification colour:** Coloured bands as BS 1710 clause 3.3 and Over the whole length of the pipe.
- **Safety colour identification:** On or next to the colour bands.
- **Information:** Colour bands as BS 1710 appendix D.
- **Direction of flow:** Indication arrow and the word FLOW or the letter F and Indication arrow and the word RETURN or the letter R.

90-90-95/610 Cast in situ bases

- **Supported equipment:** Arrange equipment on base to distribute load evenly.

90-90-95/620 Installation of flexible hoses and rubber bellows

- **Position:** Close to the source of vibration.

System completion

55-40-40/810 Commissioning of hot and cold water supply systems

- **Pre-commissioning:** In accordance with BSRIA 2/89.3 and CIBSE Commissioning Code W.
- **Commissioning:** In accordance with BS EN 806-4, BSRIA 2/89.3 and CIBSE Commissioning Code W.

- **Notice (minimum):** One week.
- **Equipment:** Check and adjust operation of equipment, controls and safety devices.
- **Outlets:** Check operation of outlets for satisfactory rate of flow and temperature.

55-40-40/820 Inspection and test records

- **Reports:**
  - **Construction phase:** System design is commissionable;
    Post-installation;
    System cleanliness;
    and System commissionable.
- **Records for water systems:** In accordance with BSRIA 2/89.3.
- **Record sheets:**
  - **Submission:** On completion.
  - **Number of copies:** Three.

55-40-40/830 Demonstrations

- **Running of plant:**
  - **Operation:** Run, maintain and supervise the installations under normal working conditions.
  - **Duration:** Two weeks.
- **Instruction:** Instruct and demonstrate the purpose, function and operation of the installations.

55-40-40/840 Documentation

- **Operating and maintenance instructions:**
  - **Scope:** Submit for the system giving optimum settings for controls.
  - **Product information:** Include product description, date of purchase, performance characteristics, application (suitability for use), method of operation and control, and cleaning and maintenance requirements.
  - **Format:** Paper copy.
  - **Number of copies:** Two.
- **Record drawings:**
  - **Content:** Location and arrangement of plant in plant rooms;
    Location, size and route of hot and cold water services;
    Location, route and depth of underground services;
    Location and identification of regulating, isolation and control valves;
    and Location of outlets.
  - **Format:** A1 paper print and Electronic.
  - **Number of copies:** Two.
- **Submittal date:** At handover.
- **Wholesome water consumption notice:** Submit within five days.

55-40-40/850 Water quality tests type A

Shared by: 55-40-40/110 Incoming water supply; and 55-40-40/130 Pumped cold water supply system.

- **Standard:** To BS EN 806-4.
- **Samples:**
  - **Sample points:** Main supply to site;
  - **Samples for analysis:** Submit samples for bacteriological analysis.
- **Water temperature:** Record at each sampling point at the time of taking the sample.

- **Test results:**
  - **Record:** Details of all analyses.
  - **Submit:** On completion.
  - **Number of copies:** One.

55-40-40/850 Water quality tests type B

- **Standard:** To BS EN 806-4.
- **Samples:**
  - **Sample points:** Cold water storage cistern.
  - **Samples for analysis:** Submit samples for bacteriological analysis.
- **Water temperature:** Record at each sampling point at the time of taking the sample.
- **Test results:**
  - **Record:** Details of all analyses.
  - **Submit:** On completion.
  - **Number of copies:** One.

55-40-40/860 Spares

- **Pipeline ancillaries:**
  - **Keys:** Two of each type.
  - **Hose unions:** Two of each type.
- **Pumps:**
  - **Belts and pulleys:** Two of each type.

55-40-40/870 Operating tools

- **Tools:** Supply tools for operation, maintenance and cleaning purposes.
- **Keys:** Supply keys for valves and vents.

55-40-40/880 Maintenance

- **Servicing and maintenance:** Undertake for 12 months after completion.

Ω End of system

HARLEY HADDOW

The Multi-disciplinary Engineering Consultancy

London | Glasgow | Edinburgh

Contact
45 Great Guildford Street
Ground Floor
London
SE1 0ES
enquiries@harleyhaddow.com