Technical Specification DEFRA Richard Fairclough House, Knutsford Rd, Latchford, Warrington, WA4 1HT

Contents

1. General Conditions

Contract Documents

- This specification covers the design, supply, installation, testing and commissioning of the building engineering services works as described in the Contract Documents.

- The Contract Documents shall include the Main Contract, this Volume 1 – Building Engineering Services Particular Specification, Volume 2 - Standard Workmanship and Materials NES Specification and Tender Drawings as listed in Schedule 8 and shall form part of the Contract Documents.

- The purpose of this specification is to provide the design for the works and to enable the Contractor to develop the installation drawings to achieve the objectives of the project.

- **Definitions Used in This Document**

- Definitions and interpretations given in Main Contract Preliminaries apply to the whole of the Works, including the works described in this specification. In the case of conflicting statements, the Subcontract Preliminaries will prevail.

- Where used in the documentation the following definitions shall apply and shall be interpreted as such:

  Works: all services shown on the drawings and described in the specification shall be deemed to be included in the contract.

  Drawings: the tender drawings.

  Elsewhere: detailed or specified elsewhere in other clauses, sections, shown on the drawings or contained in the specification or conditions of contract.

  Services: services mean the inclusion of one or more system.

  System: all equipment, accessories, controls, supports and ancillary items, including supply, installation, connection, testing, commissioning, and setting to work necessary for that section of the Works to function.

  Design process: all the activities necessary to convert design input into design output

Review: give notice and submit details to the Engineer for his comment and review, which shall be granted in writing only. In the event of the Engineer not accepting that submitted, resubmit alternative details for review or modify that submitted in accordance with the Engineer comments. Review of any submittal by the Engineer shall not mean that the Engineer is responsible for the correctness of the submittal or its suitability for purpose and does not relieve any contract responsibilities.

Competent person: a person, by reason of theoretical and practical training or actual experience or both, is competent to perform the task or function or assume the responsibility in question and is authorised to perform such a task or function.

Duct: an enclosed space specifically intended for the distribution of services, with direct access for personnel.

Trench: a covered horizontal service space in the floor or ground with access from above

Cavity: a space enclosed within the elements of a building within which services are installed, e.g. the space between ceiling and floor above. See Building Regulations

Service Areas: includes areas within a building with limited finishes such as loading bays, car parks etc.

Concealed Services: includes installations within ducts, trenches, or cavities.

Exposed Services: includes installations outdoors or unprotected within service or occupied areas

Terminal Units: terminal units such as radiators, convectors, fan coil units, induction units, variable or constant volume air boxes and other like equipment.

Ancillaries: all specified fittings, accessories, inserts, test points, bracketing, terminal equipment connected to and installed in the engineering services system.

CIBSE: the Chartered Institution of Building Services Engineers

BSRIA: the Building Services Research and Information Association

IET: the Institution of Engineering and Technology

IOP: Institute of Plumbing

FRS: Fire Research Station

HSE: Health and Safety Executive

The definitions of technical terms associated with the engineering services installations are those included in:

CIBSE, IOP and BSRIA Technical Publications

Loss Prevention Council - Rules for Automatic Sprinkler Installations

BS 7671 - Requirements for Electrical Installations (IET Wiring Regulations).

British Standards, including Codes of Practice.

Associated Statutory Acts.

- The reference to the Contractor in this specification shall mean the Sub-Contractor in relation to the Terms and Conditions of the Main Contract. The Contractor shall adhere to all conditions of the Main Contract.
- The “Project Manager” as detailed in the Main Contract Documentation.
- The “Architect” shall mean as detailed in the Main Contract Documentation.
- The “Engineer” shall mean MEP as detailed in the Main Contract Documentation.

Checking Documents

The Contractor is required to check that all documents described in the Invitation to tender are received and to check the number of pages of the tender documents. Should the Contractor find any to be missing, or duplicated, or indistinct, the Contractor must inform the Engineer at once, similarly should the Contractor find a discrepancy between the tender drawings and the specification he must raise a query during the tender period. The Engineer’s response to the query will be issued to all Tenderers.

Interpretation of Specification

Should the Contractor be in any doubt about the precise meaning of any term, item or figure the Contractor must inform the Engineer in writing in order that the correct meaning may be decided before the date for submission of Tenders and accept such reply as the Engineer may give in writing. The Engineer's response to the query will be issued to all Tenderers.

The drawings supplied with this specification are intended to provide the tenderer with appropriate details of the installation to assist him in pricing the works. It shall be the Contractor's responsibility to mark and set out accurately his works and any unnecessary work executed by others and carried out through the inaccuracy on the part of the Contractor shall be made good at his expense.

Quality Standard

The works will be executed in accordance with the relevant current British and European Standards, Codes of Practise, Local Authority and this specification.

Materials will be incorporated into the works in accordance with the manufacturer's recommendations and requirements.

Provide all materials and works in accordance with the appropriate British Standard or Code of Practice and where no BS or CP is applicable the Agreement Certificate for the item.

Provide products in accordance with the Construction Products Regulations (CPR). Products covered by harmonised European product standards (hENs) must have a Declaration of Performance (DoP) certificate for the product and be CE marked. Manufacturers of products not fully covered by a hEN or which do not fall within the scope of a hEN shall provide Declaration of Performance documentation in accordance with one of the methods in the CPR.

Comply with all statutory instruments and regulations, relating to the area of the site current at the date of tender.

Comply with all Statutory Obligations arising from current legislation and regulations, together with other requirements, including, but not limited to, the following as applicable to particular projects:

• Comply with the requirements of the Local Authority Building Inspector.

• Statutory Obligations.

• Health and Safety at Work etc. Act 1974.

• HSE L8 Legionnaires' Disease. The Control of Legionella Bacteria in Water Systems. ACOP and all parts of HSG 274 (for technical guidance).

• HSE L5 Control of Substances Hazardous to Health. ACOP and guidance (sixth edition, 2013).

• Management of Health & Safety at Work Regulations 1999.

• Gas Safety (Installation and Use) Regulations 1998.

• HSE L56 Safety in the Installation and Use of Gas Systems and Appliances: Gas Safety (Installation and Use) Regulations 1998. ACOP.

• The Gas Appliances (Safety) Regulations 1995.

• The Gas (Meters) Regulations 1983.

• The Measuring Instruments (Gas Meters) Regulations 2006.

• The Control of Pollution (Oil Storage) Regulations 2001.

• The Pipelines Safety Regulations and amendments.

• HSE L82 Guide to the Pipelines Safety Regulations 1996.

• Pressure Systems Safety Regulations 2000.

• HSE L122 Safety of Pressure Systems. Pressure Systems Safety Regulations 2000. ACOP, 2nd Edition 2014.

• Pressure Equipment Regulations1999 and Amendment Regulations 2002.

• HSE L122 Safety of Pressure Systems. Pressure Systems Safety Regulations 2000. ACOP, 2nd Edition 2014.

• The Confined Spaces Regulations 1997.

• HSE L101 Safe Work in Confined Spaces. Confined Spaces Regulations. ACOP.

• Building Regulations and current amendments, and relevant Approved Documents in England and Wales.

• The Energy Performance of Buildings Regulations (England and Wales) Regulations and amendments.

• England and Wales - The Water Supply (Water Fittings) Regulations 1999, as amended by The Water Supply (Water Fittings)(Amendment) Regulations 1999, The Water Act 2003 (Consequential and Supplementary Provisions) Regulations 2005 and The Construction Products Regulations 2013.

• London Building Acts 1939 and/or Building (Inner London) Regulations 1985 and current amendments.

• Public Health Acts.

• Electricity Acts.

• The Electricity at Work Regulations 1989.

• HSE HSR25 Memorandum of Guidance on the Electricity at Work Regulations 1989.

• BS 7671 - Requirements for Electrical Installations (IET Wiring Regulations).

• BS EN 50110 -1:2013 Operation of electrical installations.

• The Electricity Safety, Quality and Continuity Regulations 2002 and current amendments.

• Factories Act 1961 and current amendments.

• Clean Air Act 1993 and current amendments.

• The Environmental Protection Act and current amendments.

• The Control of Pollution Act 1974 and current amendments.

• Air Quality Standards Regulations 2010.

• The Fluorinated Greenhouse Gases Regulations 2015.

• The Workplace (Health, Safety and Welfare) Regulations 1992.

• The Regulatory Reform (Fire Safety) Order 2005.

• BS 5839-1:2013 Fire detection and fire alarm systems for buildings. Code of Practice for design, installation, commissioning and maintenance of systems in non-domestic premises.

• BS 5266-1:2016 Emergency lighting – Part 1: Code of Practice for emergency lighting of premises.

• HSE L24 Workplace health, safety and welfare ACOP and guidance.

• The Construction (Design and Management) Regulations 2015.

• The Health and Safety (Display Screen Equipment) Regulations 1992 as amended by the Health and Safety (Miscellaneous Amendments) Regulations 2002.

• HSE L26 Work with display screen equipment. Guidance on Regulations.

• The Clean Air (Arrestment Plant) (Exemption) Regulations 1969.

• The Control of Substances Hazardous to Health (COSHH) Regulations 2002.

• HSE L5 Control of Substances Hazardous to Health. ACOP and guidance (sixth edition, 2013).

• HSE L8 Legionnaires' Disease. The Control of Legionella Bacteria in Water Systems. ACOP and all parts of HSG 274 (for technical guidance).

• Dangerous Substances and Explosive Atmospheres Regulations 2002.

• HSE L138 Dangerous substances and explosive atmospheres. Dangerous Substances and Explosive Atmospheres Regulations 2002. ACOP and guidance.

• The CLP Regulation 2015.

• Control of Asbestos Regulations 2012.

• HSE L143 Managing and working with asbestos. Control of Asbestos Regulations 2012. ACOP and guidance.

• The Provision and Use of Work Equipment Regulations 1998 (PUWER).

• HSE L22 Safe use of work equipment. Provision and Use of Work Equipment Regulations 1998. ACOP and guidance.

• Personal Protective Equipment at Work Regulations 1992.

• HSE L25 The Electricity at Work Regulations 1989. Guidance on Regulations (Third edition, 2015).

• The Lifting Operations and Lifting Equipment Regulations 1998.

• HSE L113 Safe use of lifting equipment. Lifting Operations and Lifting Equipment Regulations 1998. ACOP and guidance.

• The Equality Act 2010 and current amendments.

• BS 8300:2009+A1:2010 Design of buildings and their approaches to meet the needs of disabled people – Code of Practise.

• Public Utility Company and/or Statutory Authority regulations, specifications, and requirements.

• Insurance Company Requirements.

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

1.22 Where no specific design, performance or installation standards are quoted the following shall apply.
• CIBSE Guide Books

- Guide A Environmental Design
- Guide B Heating, Ventilating, Air Conditioning and Refrigeration
- Guide C Reference Data
- CIBSE The SLL Code for Lighting.

• CIBSE Technical Memoranda.

• Institute of Plumbing, Plumbing Engineering Services Design Guide.

1.23 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 at the same location.

1.24 Supply plant and equipment to achieve the specified design conditions and to provide stable control.

1.25 For insulation: comply with online guide to check long term impact of material selection - www.thegreenguide.org.uk

1.26 The tender shall be based on the regulations current at the date for return of tenders. If these regulations are amended or new regulations enacted after the date for the return of tenders the Contractor shall immediately inform the Engineer.

Contractor's Responsibilities

1.27 The Contractor is required to develop the design to a construction level of documentation using competent persons. The design shall be verified as complying with the design intent by a Chartered Engineer or other suitably qualified engineer who is not responsible for the design.

1.28 The design relates to renewal and modification of the existing mechanical, electrical and public health services installations to suit the boiler room works as described in this specification.

1.29 The Contractor shall be responsible for the development of the design for the mechanical, electrical, and public health services as described in this specification and for the following:

• To undertake a detailed survey of the existing installations to confirm the extent of the strip out works and constraints of the building to be accommodated in the design of the new installations.

• The Contractor shall liaise and co-ordinate with the Facilities Team to identify and arrange for the Contractors works in respect of the isolation, modification and re-connection as required to the existing systems.

• The Contractor shall retain responsibility for any services design or selection activity passed onto specialist Contractors or suppliers.

• The detailing of all builder's work required for installation of the works.

• Technical submissions for approval of all final equipment selections to be submitted prior to purchase. Technical submittals shall include a description of the system, employer's requirements, design criteria, calculations, supporting drawings and manufacturer's data. No equipment shall be procured until the technical submissions have been approved.

• Fully co-ordinated installation drawings, supported where appropriate with manufacturers "shop" drawings defining how the works are to be installed.

• Detailed co-ordination, together with the other Contractors, of the complete works, both between

services and structure.

• Design, supply, installation, testing, commissioning and setting to work of all plant, services and materials detailed in this specification, drawings and tender documentation.

• Making all applications, giving all notices and paying all fees required by and to comply with the provisions of the statutory requirements.

• Temporary storage and protection, distribution and supervision of hoisting for all plant, equipment and materials.

• Provide a competent non-working senior engineer to supervise the works who shall be identified and agreed by the Engineer before the order is placed.

• Fixing and correctly installing all plant and equipment. Ensuring that associated work such as pipework, ductwork, containment, electrical wiring, controls, builders work, etc are properly executed.

• Commissioning the complete installation including and adjusting, calibrating and balancing as necessary inclusive of all site visits by specialists to achieve a working system, as detailed later in this section of this specification.

• Demonstrating to the complete satisfaction of the Engineer that the equipment is capable of the performance and method of operation specified.

• Carry out performance testing by way of ambient noise level survey, illuminance survey and temperature monitoring upon completion of the works and prior to Practical Completion.

• Providing identification labels on items of all equipment as specified. Providing and fixing valve labels in the plant rooms with identification in accordance with the Specification.

• Providing “As fitted” record drawings and operating and maintenance manuals.

• Instructing the Employer’s staff in the operation of the installations.

• Attendance before, during and after the building completion.

• Attend to defects in the time period detailed in the contract and all other remedial works during the maintenance period.

• Inspect the installations prior to the end of defects meeting and ensure all remedial items have been completed.

Health and Safety

1.30 The Contractor shall comply with the requirements of the Factories Act 1961, the Health and Safety at Work Act 1974 and sub-ordinate legislation made under the enabling acts, including the following regulations, the Management of Health and Safety at Work Regulations 1992 and the Construction (Design and Management) Regulations 2015 and any subsequent amendments.

1.31 Details of the Pre-Tender Health and Safety Plan are included in the Main Contract Preliminaries.

1.32 Submit a statement with the tender describing any significant and unavoidable risks which may arise because of carrying out the works and the measures proposed to safeguard the health and safety of operatives and of any person who may be affected by the works.

1.33 The Designers Risk Assessment for the current stage of the design is included in Appendix A.

1.34 Comply with the requirements of the CDM Regulations by:

• Compiling risk assessments for the works.

• Providing information on the works which might affect the health or safety of any person.

• Providing appropriate input to the Pre-Construction Information, Construction Phase Plan, and Health and Safety Files for the works.

The Site/Existing Building

1.35 The site is located at Richard Fairclough House, Knutsford Rd, Latchford, Warrington, WA4 1HT.

1.36 The works will take place within the main plant room located at ground floor level.

1.37 The existing services within the plant room comprise:

• Low temperature hot water (LTHW) generation via 4 No. ACV Solo Prestige 120 wall hung gas fired heat only boilers and 2 No. ACV Heatmaster 85 TC floor standing gas fired water heaters

• LTHW distribution circuits including pumps

• Hot water generation via the 2 No. ACV Heatmaster 85 TC floor standing gas fired water heaters

• Incoming mains cold water service and associated cold water service distribution

• Gas service distribution

• Automatic controls via Trend mechanical control panel

1.38 The nature and condition of the site/building(s) cannot be fully and certainly ascertained before opening up. The following risks are or may be present:

• The accuracy and sufficiency of this information is not guaranteed by the Client or the Engineer and the Contractor must ascertain for himself any information he may require to ensure the safety of all persons and the Works.

1.39 The Contractor is recommended to visit site to:

• Ascertain the nature of the site and all local conditions and restrictions likely to affect the execution of the Works.

• Familiarise himself with the existing installations and the proposed services routes and associated building works.

1.40 Before commencing work, carry out a survey and examination of buildings, structure and engineering services affected by the works.

1.41 Examine all available drawings of the engineering services and report any discrepancies to the Project Manager / Engineer.

1.42 Before tendering, the Contractor shall ascertain the nature of the site, access there to and all local conditions and restrictions likely to affect the execution of the Works. Access to the site is to be arranged with Helen Oldfield/Peter Burrows

Schedule of Rates

1.43 The Contractor shall submit a Schedule of Rates within 5 working days of a Contract order being placed. This shall comprise a schedule of quantities of all items and materials included in the tender together with their unit prices, extended and totalled. Such totals shall agree with the lump sum figure of the tender. Sub-totals shall agree with those of the items in the Tender pricing schedule, and this applies to any specialist trade suppliers.

1.44 This schedule shall be part of the tender and the net rates in the said schedule shall be used for the valuation of any alteration in addition to, or omission from, the works as described in this specification and/or drawings.

1.45 Variation orders issued through the contract are to be priced in accordance with this schedule and submitted for agreement to the Engineer within 5 working days of issue of the variation Instruction.

Materials and Workmanship

1.46 Unless specifically stated to the contrary, all materials, plant or apparatus supplied or work done shall comply with the current British Standard where such exists.

1.47 Materials, equipment and workmanship required under this contract shall comply with this specification.

1.48 Where manufacturers, suppliers or installers of products are identified by name, or names, but reference is made to "Or approved" equivalent the submitted tender must include the named or one of the named suppliers. Alternatives may be selected and shall be submitted to the Engineer for approval, separately.

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

1.50 A list of the proposed manufacturers/supplies of products, equipment and plant, including all items for which the choice of manufacturer/supplier is at the discretion of the Subcontractor, must be submitted with the Tender.

1.51 Samples of all materials and components to be submitted to the Client for approval as required.

1.52 Provide an adequate and safe protection for all materials and products during transport to site.

1.53 Deliver all ductwork, tubes, conduit, trunking and associated equipment with open ends effectively plugged, capped or sealed.

1.54 Offload and transport about the Works all materials and products as recommended by manufacturers.

1.55 Store all materials and products as recommended by manufacturers.

1.56 Provide sufficient, safe and secure storage for all materials and products.

1.57 Provide racks to prevent distortion for storage of conduits, pipes and similar materials.

1.58 Store all fittings, accessories and sundry items in clean bins or bagged and stowed in racks and maintained under suitable weatherproof cover.

1.59 The workmanship shall be carried out to the entire satisfaction of the client or his representative; any unsatisfactory work is to be taken down and replaced at the Contractor’s own expense.

Programme and Progress

1.60 Provide detailed sub-programmes to assist the main contractor in producing a Master Programme for the Contract Works.

1.61 Due allowance is to be made in the programme(s) for the Works for, but not limited to, the following:

• Ordering and installation periods.

• The completion of drawing, etc. including the minimum working days for comment.

• Concurrent work by other trades.

• Any temporary works necessary for the completion of the engineering services installations.

• Pre-commissioning, commissioning and performance testing of the engineering services

installations.

• Preparation and provision of Record Drawings and Operating and Maintenance Manuals.

1.62 Provide a separate and detailed commissioning programme for agreement with the Engineer. Make

due allowance for the following:

• Commissioning, demonstration and instruction procedures.

• Provision of written notice before each (or series of) test, inspection, commissioning or

demonstration procedures are to be carried out, not less than.

• Demonstration to the Engineer that test instruments and equipment are accurate.

Contractor's Drawings

1.63 The Contractor shall provide design, installation and record drawings appropriate for RIBA Plan of Work Stage 3 developed design, Stage 4 technical design and Stage 5 construction as defined by BSRIA Guide BG6 2014 – "A Design Framework for Building Services"

1.64 A schedule of drawings shall be submitted for approval by the Contractor detailing a composite list of all design, builders work and working installation drawings that the Contractor proposes to produce for the contract together with a programme of their production for approval purposes within 5 working days of receipt of order.

1.65 The Contractor shall in the preparation of drawings co-ordinate fully with the structure, finishes and other services. It shall be the Contractor's responsibility to obtain the information, by means of Requests for Information if necessary, to enable him to comply with the programme for the issue of such drawings.

1.66 All drawings shall be prepared and submitted to comply with the programme which shall include a minimum of 5 working days for approval by the Engineer.

1.67 The Engineer's comments upon the drawings submitted by the Contractor shall not in any way relieve the Contractor neither from his responsibility in respect of the accuracy of such drawings nor from his responsibility to provide equipment suitable in dimensions, construction and finish for the location in which it is to be installed.

1.68 The Contractor shall produce a License to Alter package of information as required by the lease.

Drawing Definitions

1.69 Concept sketch drawings, concept schematics, developed design drawings, developed schematics, technical design drawings, builder's work information, co-ordination/co-ordinated working drawings, installation

drawings, builder's work details, manufacturer's drawings and record drawings are as defined in BSRIA BG 6/2014.

1.70 Concept sketch drawing - Line diagrams and layouts indicating basic proposals, location of main items of plant, routes of main pipes, air ducts and cable runs in such detail as to illustrate the incorporation of the engineering services within the project as a whole and with respect to any zoning.

1.71 Concept schematics - Line diagrams indicating main items of plant and their interrelationships in such detail as to illustrate the incorporation of the engineering services within the project as a whole.

1.72 Developed design drawing - A drawing showing the extent of the services installations. The main features of developed design drawings should be as follows:

• Plan layouts to a scale of at least 1:100.

• Show the extent and types of services terminals visible within the occupied space.

• Show approximate locations of horizontal and vertical service runs

• Show plant and distribution system sizes, particularly those affecting spatial allocation, while acknowledging that these may need some adjustment and refinement in the operation of the detailed design drawings and equipment schedules.

• Pipework and electrical containment represented by single line layouts. Ductwork represented by either double line or single line layouts as required to demonstrate that the routes indicated are feasible. Symbols and lines conventions in accordance with either a recognised standard (ISO of BS), or a supplied legend.

1.73 Developed schematic - A line diagram describing the interconnection of components in a complex system. The main features of a developed schematic drawing are as follows:

• The drawings should include all the functional components that make the system work, such as ducts, pipes, cables, busbars, plant items, pumps, fans, valves, dampers, control devices, terminals, electrical switchgear and components, security and fire sensors and control equipment.

• Symbols and line conventions in accordance with BS EN ISO 11091 recommendations for symbols and other graphic conventions.

• Label the drawings with appropriate pipe, duct, busbar and cable sizes, pressures and flow rates.

1.74 Indicate components which have a sensing, control or measurement function.

1.75 The major components indicated on the schematic drawings should be identified for crossreferencing purposes.

1.76 Technical 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 technical design drawings should be as follows:

• 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.

1.77 The drawing will not indicate the precise position of services, but it should nevertheless 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-routeing of the services.

1.78 Co-ordinated working drawings - Drawings showing the inter-relationship of 2 or more engineering services and their relation to the structure and building fabric. The main features of a co-ordinated drawing are as follows:

• 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 be spatially co-ordinated and there should be no physical clashes between the system components when installed. Critical dimensions, datum levels and invert levels should be provided.

• The spaces between pipe and duct runs shown on the drawing should make allowance for the service at its widest point. Allow for insulation, standard fitting dimensions and joint widths on the drawing.

• Make allowance for installation working space and space to facilitate commissioning and maintenance.

• Indicate positions of main fixing points and supports where they have significance to the structural design or spatial constraints.

1.79 Installation drawing - A drawing based on the technical 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 should be as per co-ordinated working

drawings plus:

• Allowances for inclusion of all supports and fixings necessary to install the works.

• Allowances for installation details provided from manufacturers' drawings.

• Allowances for plant and equipment. This includes any alternatives to the designer's original

specified options that have been chosen.

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

1.81 Indicate the following: maximum electrical loading for each supply cable; cable termination facilities; and cable identification and all terminal numbers.

1.82 Builders work details - Drawings to show requirements for building works necessary to facilitate the installation of the engineering services.

1.83 Unless agreed otherwise, the following can be marked out on-site:

• Holes less than the threshold agreed by the team.

• Electrical socket and switch boxes.

• Openings that are best cut into block work or partitions.

1.84 Manufacturer's drawing - Drawing prepared by a manufacturer, fabricator or supplier for a particular project and which is unique to that project. Examples include drawings for ductwork, pre-fabricated pipework, sprinkler systems, control and switchgear panels and associated internal wiring, prefabricated plant, customised plant and equipment.

1.85 Record drawing - Drawing showing the building and services installations as installed at the date of practical completion. The main features of the record drawings should be as follows:
• Use a scale not less than that of the installation drawings.

• Include locations of all the mechanical, electrical and public health systems and components installed including ducts, pipes, cables, busbars, plant items, pumps, fans, valves, dampers, control devices, strainers, terminals, electrical switchgear and components, security and fire sensors and control components.

• Labelled with appropriate pipe, duct and cable sizes, pressures and flow rates.

• 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.

1.86 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 control's operation and details of the associated interlocking.

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

1.88 As installed drawings - Drawings/records retained on-site to record the progress of and any site modifications to the Works including any changes to software.

1.89 Plantroom schedules and schematics - Frame the following under glass and hang in each plant room and any other appropriate location.

• Schematic drawings of circuit layouts showing identification and duties of equipment, numbers and locations, controls and circuits.

• Valve schedules in the form of printed sheets showing the number, type, location, application/service and symbol, and normal operating position of each valve.

• Control schematics.

• Location of mechanical and electrical plant and equipment items.

• First aid instructions for treatment of persons after electric shock.

• Location of isolating switch for electricity supply.

• Location of main incoming gas valve serving gas meter.

• Location of sprinkler fire main control valve.

• Emergency operating procedures and telephone numbers for emergency call out service

applicable to any system or item of plant and equipment.

• All other items required under Statutory or other regulations.

Builders work Obligations and Responsibilities

1.90 Provide final builders work details based on the installation and manufacturer's drawings to facilitate the installation of the works. Provide fully dimensioned drawings showing both size and position of builder's work making due reference to the structural engineering and architectural final dimensioned detailed drawings.

1.91 Detail all access requirements including access to false ceilings and ducts for maintenance.

1.92 Provide fully dimensioned and annotated drawings.

1.93 Undertake the redesign of the associated builder's work for approved alternative equipment or materials which subsequently varies the works in any way whatsoever.

1.94 Detailed design and locations of brackets and supports:

• Submit details of all types of brackets and supports including fixing details.

• Submit load and thrust calculations.

1.95 Design, supply and installation of support for plant and services:

• Steelwork.

• Brackets.

• Hangers and clips etc.

• Plinths.

• Inertia bases.

1.96 Detail and supply sleeves, inserts, frames, fixing anchors etc. and any other items required to be cast or built into the structures by others, including coordination of positions to such extent and accuracy to allow structural construction to proceed.

1.97 Detail design, supply, installation and co-ordination of all access platforms, access covers, gratings, ladders, stairs, rails and protecting elements required for future maintenance and operation of plant/equipment. Provide fully dimensioned and annotated drawings.

1.98 Undertake and detail all fire stopping and sleeving systems for the Works where they pass through fire compartments.

1.99 Detail and install fire barriers where a fire rated partition is penetrated.

1.100 Undertake and detail the weatherproofing of all services passing through external elements of the building.

1.101 Undertake and detail all acoustic stopping associated with the Works.

1.102 Detail the final requirements for access to ceiling voids and builder's work ducts for maintenance and operation.

Technical Submissions

1.103 The engineer will examine the propositions submitted for compliance, in principle, with the design intent. Such an examination shall not relieve the originator of such documents of his responsibilities and obligations under the contract.

1.104 Upon acceptance of the Order to undertake the works the Contractor is to provide a programme detailing the period in which it is proposed that all technical submissions for equipment and materials will be submitted to the Engineer for approval.

1.105 A period of 7 working days will be allowed for the Engineer to comment on the submission. The overall time allowed for the material approval submissions will be reflected in the programme for the works, and the main Contractors Programme submitted with the tender.

1.106 The new works are to be carried out using only approved manufacturers equipment and materials. Should substandard equipment or materials be installed, then if so directed by the Engineer, this is to be removed and replaced with approved equipment or materials at no cost to the client. Such replacement works, if required, will not alter or affect the agreed programme of works or project

completion date.

1.107 The Contractor shall submit to the Engineer the samples as listed below:

Existing Services

1.108 The works will be carried whilst the building is occupied, and the Contractor shall ensure that the works do not disrupt the business activities of the residents or other commercial tenants. Where works impact on the life safety systems appropriate method statements and risk assessments shall be prepared and presented to the Facilities Team for approval.

1.109 A “permit to work” system shall be employed, and all relevant interested parties made aware of the works to be carried and their approval given in respect of the following activities:

• Hot work

• Working on electrical switchgear etc

• Fire alarm system

• Sprinklers

• Roof works

• Isolation and connection to the base building systems

• Working in risers

1.110 The Contractor shall where necessary liaise with the Facilities Team in respect to any works. The Contractor shall comply in all respects with the Lease and License to Alter. Specifically, the Contractor shall prepare a Risk Assessment and Method Statement for submitting to the Landlord to obtain a permit to work from the Landlord prior to undertaking any works to the landlord’s systems. Any works to the landlord’s systems that affect other tenants shall be carried out “out of hours” to minimise the disruption.

1.111 The Contractor shall take all proper measures to the satisfaction of the Engineer to minimise noise, vibration and the spread of dust, dirt, etc. and to prevent any nuisance arising from the carrying out of the Contractor works, also any protection of existing works shall be provided by the Contractor.

Protection of the Works

1.112 Provide adequate and safe protection for all materials and products after installation.

1.113 Ensure all items are protected against ingress of water and dust, formation of condensation, extremes and rapid changes of temperature, building works and operations of others.

1.114 Protect during erection all easily damaged materials with hardboard covers or heavy duty polythene sheet. Such items include but are not limited to:

• control panels,

• switchboards,

• distribution boards,

• heater batteries,

• finned pipework,

• gauge glasses,

1.115 Protect all finished items from damage and paint splashes.

1.116 Install items such as grilles, diffusers, lighting fittings, switches, accessories etc. as near to completion as practicable.

1.117 Only install filter media when the plant items concerned are being commissioned and tested.

1.118 Cover all plant items with polythene sheeting except when being worked upon.

1.119 Cap all open ends of pipes, ducts, conduit and trunking etc except when being worked upon.

1.120 Leave plant and equipment in a ready to paint condition where specified as part of the Works or to be carried out by others.

1.121 Paint parts liable to corrosion immediately after removal of any temporary protection.

1.122 Replace material, plant or equipment where deterioration or damage has occurred prior to handover.

Covering Up

1.123 Ensure no section of the Works are covered, concealed or insulated until completion of a witnessed satisfactory test.

1.124 Give notice when Works which are to be covered or concealed are ready for examination and/or measurement, not less than one week to the Engineer.

Inspections and Tests

1.125 Submit schedules showing those parts of the Works for which inspections and tests are required in the specifications, to substantiate conformity with the Specification and for which records are required to be maintained.

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

1.127 Where required, provide formal method statements supported by risk assessments detailing the procedures for carrying-out on-site tests. Agree in advance with all parties procedures for inspections and tests including periods of notice.

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

1.129 Arrange access for personnel who require to be in attendance, to manufacturer's or other off site premises when any inspections and tests carried out.

1.130 Attendance or otherwise of the supervisory personnel during specified inspections or tests will not reduce the obligations or restrictions of the Contract.

1.131 Carry out all tests required by legislation under the direction of a competent person.

Inspections and Test Records

1.132 Prepare a set of drawings and/or report sheets to record accurately the test and inspection information including the following:

• Plant identification, section and installation under test.

• Manufacturer's reference number.

• Date, time, duration of test, weather conditions.

1.133 Test results with itemised readings including records of all other checks and tests.

1.134 Maintain records of all specified inspections and tests performed including third party and works test certificates.

1.135 Include in records, as appropriate, details of the element, item, batch or lot, the nature, number and date of the inspections and tests, the number and type of deficiencies found, any corrective action taken and other relevant particulars.

1.136 Maintain all records on-site for inspection. On completion of the Works, include copies in the operating and maintenance manuals.

1.137 Submit copies of records within one week of request.

Testing and Commissioning

1.138 Compile a detailed commissioning programme and confirm/agree with the main contractor.

1.139 Compile and submit to the project supervisor the appropriate health and safety method statements and risk assessments.

1.140 Establish a means (such as checklists) of monitoring the progress of the commissioning.

1.141 Ensure that all parties involved on the commissioning process have documentation procedures for dealing with variations to contract. Ensure that a control mechanism is set up which includes documentary back-up of what has been changed, how and why.

1.142 Establish a consistent numbering system to identify work items.

1.143 Ensure the consistent use of mnemonics to identify all BMS components and devices.

1.144 Ensure regular database and configuration back-ups are made throughout all stages of the commissioning process.

1.145 Ensure attendance of all appropriate and responsible parties for interface pre-commissioning tests (interface between BMS and other plant items/systems).

1.146 The Contractor shall test and commission all the installed services and systems in order to provide an effective working installation to the satisfaction of the Engineer.

1.147 The Contractor shall provide a detailed commissioning programme for the works identifying testing, witness testing and training dates. The programme shall allow sufficient time for testing and commissioning to be completed before the systems are offered for witness testing.

1.148 Testing and commissioning of the installations and systems shall be in accordance with recognised industry methods and the appropriate standards, in particular the BSRIA and CIBSE Commissioning Codes and BS 7671.

1.149 The Contractor shall notify the Engineer in writing when, in his opinion, the Contractor’s works or parts thereof are ready for commissioning and testing.

1.150 The Contractor shall issue the Engineer with his own list of remedial items to be completed.

1.151 Should the plant tests fail to demonstrate that the plant and equipment are properly installed and functioning correctly, the cause of the failure shall be investigated and should this be due to incorrect or faulty work by the Contractor, or his Suppliers, then the Contractor shall without delay and at his own cost carry out such remedial measure and adjustments as may be necessary and repeat the commissioning and testing procedure to the satisfaction of the Engineer.

1.152 In the event of commissioning tests and inspections failing to meet the required standards, all abortive costs so arising incurred by the Engineer, or other parties shall be paid by the Contractor and these shall be in accordance with the appropriate time charge rates and expenses incurred.

1.153 Where portions of the work are commissioned and tested separately, the Contractor shall upon final completion demonstrate to the Engineer that all the several portions are capable of proper simultaneous operation in accordance with the requirements of the Contract.

1.154 For the purposes of commissioning and testing of the installation the Contractor shall provide all necessary materials, labour and all necessary instruments and testing equipment.

Testing and Completion Certificates

1.155 Provide certificates of verification of type tests. Ensure that drawings and other documents forming part of the certificate are available prior to any order being placed.

1.156 Where testing specific to the project is required, ensure test certificates include

• Project title.

• Details and date of test.

• Instruments used, serial numbers, calibration dates.

• Signature of those witnessing test.

• Contractor's name.

• Specific location of the item in the Works.

1.158 The Contractor shall be responsible for collating and presenting the following test results and

completion certificates:

• Test result for air and water volumes and flows

• Water chlorination certificate

• VRF cooling systems completion certificate

• Electrical installation completion certificate

• Emergency lighting test certificate

• Fire alarm test certificate

• Any other system completion or test certificate

Record Documents

1.159 To satisfy the provisions of the Health and Safety at Work Act the Client will not accept handover of the installations until full and adequate information concerning the installations is in the possession of his operating and maintenance staff.

1.160 Provide Record Documents - being part of the Works - prior, and as a prerequisite, to Practical Completion to the satisfaction of the Project Manager.

1.161 Prepare manuals in draft as the Works progress and make suitable arrangements where the Works are subject to Partial Possession or Sectional Completion.

1.162 Submit draft Record Documents to the Engineer for comment prior to commissioning.

1.163 Prepare two temporary Manuals with provisional record drawings and preliminary performance data available at commencement of commissioning to enable Employer's staff to familiarise themselves

with the installation. These should be of the same format as the final Manuals with temporary insertions for items which cannot be finalized until the installations are commissioned and performance tested.

1.164 Provide the Project Manager with copies of the final Manual prior to Practical Completion.

Record Drawings

1.165 Prepare Record Drawings as defined in BSRIA BG 6/2014 and Schedules. Drawings to be a scale not less than 1:50 from the Installation Drawings maintained on-site as the Works progress. Endorse all such documents 'RECORD DRAWINGS'. Where agreed with the Engineer certain detailed information may be provided in schedule form. Prepare electrical drawings in accordance with BS EN 61082-1.

1.166 Provide reduced scale copies for inclusion in the operating and maintenance manuals.

1.167 Record Drawings and Schedules must include, but are not limited to:

• Location, including level if buried, of Utility Service connections, including those provided by the appropriate Authority, indicating points of origin and termination, size and material of service, pressure and/or other relevant information.

• Disposition and depth of all underground systems.

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

• Details of the principles of application of automatic controls and instrumentation.

• Diagrammatic dimensioned plans and sections of each system or service showing sizes and locations of all ancillaries, plant, equipment controls, test points, and means of isolation etc. including any items forming an integral part of the engineering systems provided by others (such as plenum ceilings, builders' work shafts, chimneys etc.).

• Identification of all terminals/cables etc. by size/type and duty/rating as recorded from the approved commissioning results.

• Detailed wiring drawings/diagrams/schedules for all systems, including controls, showing origin, route, cable/conduit size, type, number of conductors, length, termination size and identification, and measured conductor and earth continuity resistance of each circuit.

• Ensure routes indicate if cable/conduit is surface mounted, concealed in wall chase, in floor screed, cast in-situ, above false ceiling etc.

• Details of co-ordination of wiring and connections with cable core identification, notation of fire alarm, security, control and instrumentation and similar systems provided as part of the Works.

• 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.

1.168 Location and identity of each room or space housing plant, machinery or apparatus.

1.169 Dimensioned plans and sections at a scale of 1:20 of plantrooms, service subways, trenches, ducts and other congested areas where in the opinion of the CA smaller scale drawings cannot provide an adequate record. Indicate the location, identity, size and details of each piece of apparatus.

1.170 Manufacturers' drawings of equipment indicating:

• general arrangement and assembly of component parts which may require servicing.

• internal wiring diagrams together with sufficient physical arrangement details to locate and

identify component parts.

• schedules as required to locate, reference and provide details of ratings and duty of all items incorporated into the Works together with all fixed and variable equipment settings established during commissioning.

1.171 For each programmable control item, schedules indicating for each input and output point connected, full data in respect of that point including reference, type of input/output, connected equipment reference, set values of temperature or pressure etc., set values of start/stop/speed change times, alarm priority, control specification reference and any other such parameters as are applicable.

1.172 Each spare input and output point including reference, type of input/output and space for future entry of appropriate parameters as listed above.

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

1.174 Schedules setting out details of all initial values of user-defined variables, text statements for alarm messages etc.Plantroom and Switchroom Drawings, Schedules and Schematics

1.175 Provide good quality plant and switch room drawings, schedules and schematics.

1.176 Hang the following in each plant room and switch room, any other appropriate location or where directed by the Engineer:

• Schematic drawings of circuit layouts showing identification and duties of equipment, numbers and locations, controls and circuits.

• Schedules in the form of printed sheets showing the number, type, location, application/service and symbol, and normal operating position of each means of isolation.

• Control schematics.

• Location of all plant and equipment items including plans and elevations of main switchgear showing physical disposition of switches.

• First aid instructions for treatment of persons after electrical shock.

• All other items required under Statutory or other regulations.

• Location of all incoming service isolating and metering facilities.

• Emergency operating procedures and telephone numbers for emergency call out service applicable to any system or item of plant and equipment.

1.177 Prepare electrical drawings in accordance with BS EN 61082-1.

1.178 Protect surface of drawings by:

• pressure lamination

• framing under glass or other rigid, transparent, cleanable and protective surface.

Operating and Maintenance Manuals

1.179 The operating and maintenance manuals shall be prepared in the following format:

• Proprietary electronic operation and maintenance manual writing software tool.

• PC based word processing software tool.

1.180 Prepare the O&M manuals following the guidance, pro-formas and model specification for O&M manuals in BSRIA Guide BG1/2007: Handover, O&M Manuals and Project Feedback.

1.181 Arrange the O&M manuals in a logical hierarchical structure in line with BS EN 82079-1.

1.182 The operating and maintenance manuals must include as a minimum:

• A full description of each of the systems installed, written to ensure that the Employer's staff fully

understand the scope and facilities provided.

• A description of the mode of operation of all systems including services capacity and restrictions.

• Diagrammatic drawings of each system indicating principal items of plant, equipment, valves etc.

• Details of how to re-commission so that complex plant services within the building can be re-commissioned by an engineer without any historic knowledge of the systems.

• A photo-reduction of all record drawings together with an index. Reduced size.

• Schedules (system by system) of plant, equipment, valves, etc., stating their locations, duties and performance figures. Each item must have a unique number cross-referenced to the record and diagrammatic drawings and schedules.

• The name, address and telephone number of the manufacturer of every item of plant and equipment together with catalogue list numbers.

• Manufacturer's technical literature for all items of plant and equipment, assembled specifically for the project, excluding irrelevant matter and including detailed drawings, electrical circuit details and operating and maintenance instructions.

• A copy of all Test Certificates, Inspection and Test Records, Commissioning and Performance Test Records (including, but not limited to, electrical circuit tests, corrosion tests, type tests, start and commissioning tests) for the installations and plant, equipment, valves, etc., used in the installations.

• A copy of all manufacturers' guarantees or warranties, together with maintenance agreements offered by subcontractors and manufacturers.

• Copies of Insurance & Inspecting Authority Certificates and Reports.

• Starting up, operating and shutting down instructions for all equipment and systems installed.

• Control sequences for all systems installed.

• Schedules of all fixed and variable equipment settings established during commissioning.

• Procedures for seasonal change-overs and/or precautions necessary for the care of apparatus subject to seasonal disuse.

• Detailed recommendations for the preventative maintenance frequency and procedures which should be adopted by the Employer to ensure the most efficient operation of the systems.

• Details of lubrication systems and lubrication schedules for all lubricated items.

• Details of regular tests to be carried out (e.g. water cooling towers etc.)

• Details of procedures to maintain plant in safe working conditions.

• Details of the disposal requirements for all items in the works.

• A list of normal consumable items.

• A list of recommended spares to be kept in stock by the Client, being those items subject to wear or deterioration and which may involve the Employer in extended deliveries when replacements are required at some future date.

• A list of any special tools needed for maintenance cross referenced to the particular item for which required.

• Procedures for fault finding.

• Emergency procedures, including telephone numbers for emergency services.

• Back-up copies of any system software.

• Documentation of the procedures for updating and/or modifying software operating systems and control programmes.

• Instructions for the creation of control procedure routines and graphic diagrams.

• Details of the software revision for all programmes provided.

• Two back-up copies of all software items, as commissioned.

• Contractual and legal information including but not limited to details of local and public authority consents; details of design team, consultants, installation contractors and associated subcontractors; start date for installation, date of practical completion and expiry date for the defects liability period; details of warranties for plant and systems including expiry dates, addresses and telephone numbers.

1.183 Encase the Manuals in A4 size, plastic-covered, loose leaf, four ring binders with hard covers, each indexed, divided and appropriately cover- titled. Fold drawings larger than A4 and include in the binder so that they may be unfolded without being detached from the rings.

• Dividers between sections to use stepped, overlapping printed card.

• Paper weight to be at least 100gsm.

• Electronic format stored on USB memory stick.

Recommended Spares and Tools

1.184 Before practical completion submit to the Engineer a schedule of spare parts as called for in individual sections and any others that the Contractor recommends should be obtained and kept in stock by the Client for maintenance of the services installations included in the works.

1.185 Before practical completion submit to the CA a schedule of tools and portable instruments as called for in individual Sections and any others that the Subcontractor recommends should be obtained and kept in stock by the Employer for maintenance of the services installations included in the works.

Training of Clients Staff

1.186 Before practical completion explain and demonstrate the purpose, function and operation of the installations including all items and procedures listed in the Operation and Maintenance Manual:

• to the Client's maintenance staff.

• to the operational staff.

1.187 Include for the training of:

Training of Clients Staff

1.186 Before practical completion explain and demonstrate the purpose, function and operation of the installations including all items and procedures listed in the Operation and Maintenance Manual:

• to the Client's maintenance staff.

• to the operational staff.

1.187 Include for the training of:

• Ventilation systems

• Fan coil system

• Electrical installations

• Lighting control

• Fire alarms

• Security / access control

1.188 Include for one day for this purpose and demonstrate the safe day to day running and maintenance

of all systems, plant and equipment.

1.189 Provide training for the operation of the controls, monitoring or BMS installations for one or more

levels of operator as required.

Handover

1.190 One full working week before practical completion the Contractor shall:

• Inspect and witness the operation of any remaining controls or systems.

• Prepare a list of defects for review by the Engineer, any works not listed, outstanding or not completed to the satisfaction of the Engineer will be cleared for inspection before the handover meeting.

• Issue of the three approved completed copies of the Operating and Maintenance manuals and Record Drawings.

• Completed to the satisfaction of the Client a practical demonstration and instruction on the operation of the system.

Practical Completion

1.191 Practical completion shall be subject to the Contractor successfully demonstrating/providing the following:

• Achieved completion of the works and commissioned the same to the satisfaction of the Engineer.

• Made, in the presence of the Engineer, the tests specified or reasonably required by him.

• Handed to the Engineer the record documents in accordance with this specification.

• Instructed the Client staff in the use and correct operation of the installation.

Proposals for Annual maintenance Contract

1.192 Submit before the execution of the Works a supplementary proposal for an annual maintenance contract for the following:

• The proposal should include for maintaining the installation in efficient working order including routine checks, adjustments, lubrication and replacement of consumable spares, etc.

• It should set out the terms of the offer, the work to be carried out, the guarantees of performance and the price of the first 12 months after Practical Completion of the Works.

• The proposal will not necessarily be considered as part of the tender for the Works and the Client does not undertake to accept it.

2. Scope of Works General

2.1 This specification describes the proposed works for the mechanical, electrical and public health services installations forming part of the main plant room boiler replacement.

2.2 The Contractor shall design, supply, install, test and set to work all necessary equipment required for the complete building engineering services installations as described in this Specification.

- The contractor should ensure to work to the standard workmanship and materials NES technical specification.

2.3 The works shall include, but not be limited to, the following :

- Familiarisation with the site and areas of works.

- Familiarisation with existing drawings and record information.

- Liaison and co-ordination as necessary with Client and the site facilities team

- Preparation of site risk assessments, method statements and construction phase health and safety plan as required.

- Liaison with Client to agree phasing of works prior to start on site and to agree strategy

- Temporary mechanical and electrical supplies necessary for the execution of the works.

- Co-ordination of all site works

- Co-ordination of works with incumbent BMS Contractor

- Allow for lead time associated with materials, plan and equipment.

- Site survey and tracing out of existing gas service

- Site survey out of all services within the plant room

- Survey and validation of existing Heating circuits that are served from the boiler plant, prior to any strip out or modifications

- Survey and validation of existing gas safety systems within plant room prior to any strip out or modifications

- Provision of design, working and construction drawings for approval by engineer prior to start on site.

- Provision of all equipment schedules, technical submittals etc. for approval by engineer prior to start on site and prior to order of any materials

- Strip out of existing floor standing water heaters

- Supply and installation 2 No. replacement water heaters

- Alteration of gas pipework to serve water heaters.

- Alteration of heating pipework from new water heaters to the primary heating headers including provision of new valves, commissioning station and shunt pumps

- Alteration of existing cold-water service to suit new water heaters

- Local modification of existing hot water distribution to suit new water heaters

- Local modification of existing waste and condensate drainages to suit water heaters

- Employ services of flue specialist to carry out supply, installation and full design of flues

- Water treatment of LTHW heating system including flushing, wash, chemical clean and final water treatments

- Supply and installation of thermal and acoustic insulation.

- Engage the services of the incumbent controls contractor to carry out all electrical and controls work as required

- All builders work attributable to the services installation

- Testing, commissioning, proving, and demonstrating of all the mechanical services

- Client demonstration

- O&Ms including provision of new “As-Fitted” record service drawings to include plant room schematic and plant room layout

- Following practical completion provide a 24-month fully inclusive (parts and labour) scheduled maintenance plan. Maintenance shall be carried out in full accordance with manufacturers recommendations.

- All items required to provide a fully functioning system

- All other items mentioned within this specification

2.4 The following scope of works is excluded from this specification documents:-

- Below ground drainage

- Surface water drainage

3. Design Criteria

3.1 The Contractor shall adopt and use the following design criteria in developing the detailed design of the mechanical, electrical, and public health services.

3.2 The Contractor shall advise the Engineer should the provisions or allowances made in the existing systems be insufficient to meet the design requirements.

3.3 External and Internal comfort conditions shall be as follows:

External Design Conditions

3.4

ELEMENT	**W/m2**
Winter	4°C, 100% saturated
Summer	29°C db, 20°C wb

Internal Design Conditions

3.5

SPACE	**WINTER**	**SUMMER**
Internal Spaces	21°C +/-2°C	24°C +/-2°C

Note: No Relative Humidity control

Building Fabric

3.6

ELEMENT	**U Value**
Ground Floor	0.25 W/m2K
External Walls	0.35 W/m2K
Glazing	1.6 W/m2K : g value – 0.4
External doors	2.2 W/m2
Roof	0.25 W/m2K

3.7 Glazing shall have a g value of 0.4.

ventilation

3.8 Ventilation shall comply with Part F of the Building Regulations.

Internal Noise Criteria

ROOM	NOISE RATING
Meeting rooms	NR45

3.10 - External noise from plant shall not exceed 50dBA at 3m from boundary of the site or in accordance with Environmental Health Officer's requirements. The Contractor shall liaise with The Local Authority and Building Control is respect of locating the condensers on the roof and make applications as necessary.

4. MEP installations

Cold water service

4.1 The site mains cold water service supply enters the plant room in MDPE and converts to copper where its s fitted with a United Utilities water meter.

4.2 The water supply serves heating plant, hot water plant and the cold-water outlets within the building.

4.3 The contractor shall include within their tender for the provision of a new strainer, pressure reducing valve, non-return valve and isolating valves to the cold-water feed to the new water heaters.

4.4 The contractor shall allow for local modification of the cold-water pipework connections to suit the new water heaters.

Natural GAS service

4.5 The site natural gas service enters within the basement store where it is complete with a G100 natural gas meter.

4.6 A 90mm diameter connection from the gas meter is routed to the plant room at ground floor level.

4.7 The gas service enters the ground floor plant room and is provided with an isolating valve, gas meter and solenoid valve. The supply serves the plant room and the annexe building via a metered branch connection.

4.8 The contractor shall fully survey and trace out the gas pipework in its entirety prior to any works.

4.9 The contractor shall fully survey and validate the existing gas safety systems within the plant room prior to any strip out or modifications. The validation works shall include for providing a report with photographic evidence, the validations themselves shall include validation of the isolation valves, solenoid valve, emergency stop and heat alarms.

4.10 The contractor shall isolate the gas connection to the water heaters, and strip these back to the gas header. The contractor shall provide new gas pipework from the gas header to each water heater, this shall include for provision of new gas isolating valves and new pressure test and purge points.

4.11 The contractor shall provide a gas schematic drawing as part of their O&M's, a framed copy shall also be provided and mounted on the wall near the gas meter.

Heating services

4.12 The main ground floor plant room heating installation is dated to 2009, the floor standing heaters are ACV Heatmaster 85 TC units

4.13 The existing ACV Solo Prestige 120 boilers and AC Heatmaster 85 TC units generate low temperature hot water (LTHW) which serve two outgoing secondary heating circuits via a low loss header. The Heatmaster units generate domestic hot water to serve sanitaryware and outlets throughout the building.

4.14 There are two secondary heating circuits which are served via a low loss header. The extent of the heating circuits was not surveyed however it is understood these circuits serve radiators.

4.15 The contractor shall carry out a full site survey of all services within the plant room.

4.16 The contractor shall carry out a full survey and validation of the existing heating circuits that are served from heating plant prior to any strip out or modification works. The validations work shall include for engaging the services of a specialist commissioning engineer to carry out and record existing LTHW flow rates which shall be reported back to the Engineer and Client prior to any work being carried out.

4.17 The contractor shall allow for isolating and draining down the existing LTHW heating system as required and on completion allow for refilling the system and carrying out pressure testing.

4.18 The contractor shall include for water treatment of the LTHW heating system, to be carried out by a water treatment specialist. This shall include flashing, wash, chemical clean and application of final water treatments for ongoing protection. The water treatment works shall be carried out in accordance with BSRIA Guide BG50/2013 Water Treatment for Closed Heating and Cooling Systems.

4.19 The contractor shall strip out the isolate, strip out and remove existing water heaters from site.

4.20 The contractor shall supply and install replacement water heaters. The contractor shall allow for commissioning to be carried out by the water heater manufactures.

4.21 The contractor shall ensure the replacement water heaters need to be compatible with all existing pipework and plant.

4.22 The new water heaters shall be provided with all recommended manufacturers ancillaries and equipment.

4.23 The water heaters shall each be provided with an expansion vessel pack to include 25litre expansion vessel, temperature and pressure relief valve, tundish, pressure control valve, flexi hose and expansion vessel mounting bracket.

4.24 The ACV equipment is provided with 5-year warranty, the contractor shall ensure all works are undertaken to ensure this warranty is protected. The contractor shall arrange for the warranty to be transferred to the client, if required.

4.25 The contractor shall isolate the low temperature hot water (LTHW) connections to the water heaters and strip these back to the LTHW headers. The contractor shall provide new LTHW pipework from each gas-fired boiler and water heater to the LTHW headers. These new LTHW connections shall include for new isolation valves, check valves, commissioning stations and shunt pumps.

4.26 The contractor shall allow for local modifications to the waste and condensate pipework as required to suit the new water heaters.

4.27 The existing plant flue systems appear to be conventional flue systems. The contractor shall include for the provision of new flue connections from the water heaters to the existing flue headers and alterations as required.

4.28 The contractor shall employ the services of a flue specialist to provide the final design to the flue system ensuring it complies with current guidelines and regulations.

4.29 Where new pipework is installed, the contractor shall allow for supply and installation of new insulation and identification labelling.

4.30 The contractor shall allow for all builderswork associated with the installation

4.31 The contractor shall engage the services of the incumbent controls contractor to carry out all electrical and controls work as required within the existing plantroom and with connection to the existing control panel.

4.32 The contractor shall allow for all wiring associated with the installation of the mechanical services.

4.33 The contractor shall provide an option cost for the installation of thermal insulation to the existing domestic hot water flow and mains cold water service pipework where the insulation has been removed.

4.34 On completion of the installation, the contractor shall engage the services of a specialist commissioning engineer to carry out all re-balancing, testing and commissioning work. The balancing shall be based on the pre-validation figures recorded. All re-balancing, testing and commissioning work shall be carried out in accordance with the manufacturer’s requirements, British Standards, CIBSE guides and BSRIA guides.

4.35 Prior to balancing and commissioning the contractor shall present the proposals for the re-balancing and commissioning process – this shall be provided 2 weeks (Minimum) prior to the works being carried out.

4.36 The contractor shall be responsible for the full testing, commissioning, handover and demonstration of the whole installation works and for providing signed and witnessed test and commissioning sheets for inclusion within the operating and maintenance manuals.

4.37 The contractor shall provide O&M's including provision of a new 'As-Fitted' record service drawings to include gas schematic, plant room schematic and plant room layout.

5. Tender Summary

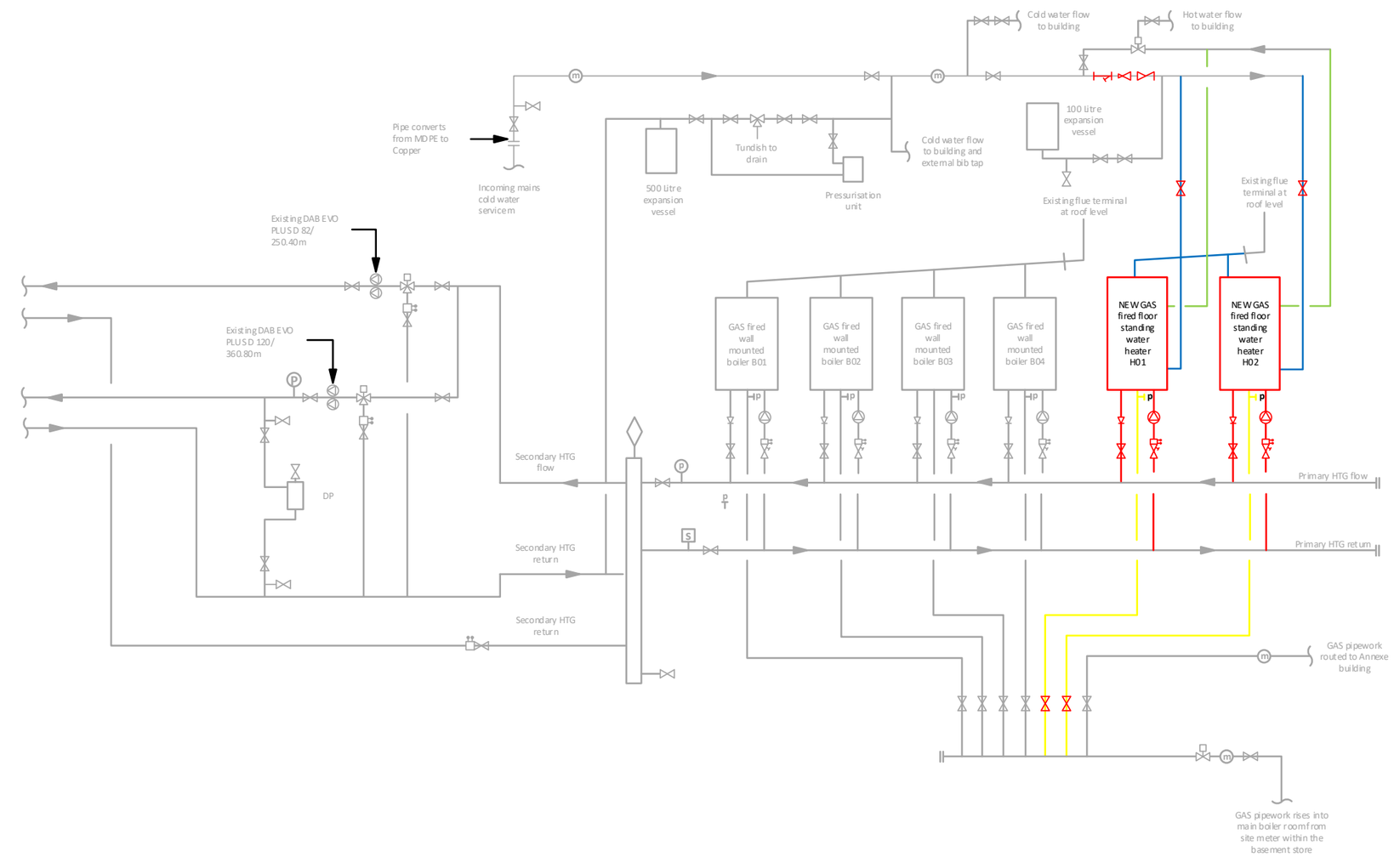
	Item	Cost £
	Preliminary and general items	100
	Liaison with client	100
	Survey and Validations of plantroom including of heating circuits	500
	Survey of natural gas service	500
	Survey and validations of existing gas safety systems	500
	Provision of design, working and construction drawings	1000
	Strip out existing floor standing water heaters including all ancillaries to allow for installation of new plant, equipment and piped distribution services	3500
	Supply and install 2 no. replacement water heaters	13000
	Alterations to gas pipework including new valves	2000
	Alterations to heating pipework including new valves and commissioning stations.	2000
	Alterations to cold water service to suit new water heaters	1000
	Local modifications of existing hot water distribution to suit new water heaters	1000
	Local modifications of waste and condensate	500
	Employ services of flue specialist to carry out supply, installation and full design of flues	2500
	Water treatment	500
	Supply and installation of thermal and acoustic installation	2500
	Testing, commissioning, proving and demonstrating of mechanical systems	1000
	Client demonstration	250
	As built drawings, user guides and O&M's	500
	Provision of gas schematic to gas meter room	500
	Building logbook	500
	All items required to provide a fully functioning system	-
	All other items mentioned within the specification	1000
	Additional items not mentioned above (contractor to specify)	-
	Estimated Total	**£35000 est**

Provisional options – *To be expended only on instruction and approval of the engineer*

	Item	Cost £
	Provision for replacing any existing faulty valves	£4000
	Provision for unforeseen works associated with the mechanical, electrical or public health installations	£3000
	Provision for replacing any gas safety system components	£2500
	Provision for remedial works to the existing flue systems should they be required	£2500
	Estimated total	**£12000 est**

Client: DEFRA

Content



Key

- Existing pipework
- New/modified heating pipework
- New/modified GAS pipework
- New modified cold water pipework
- New/modified hot water pipework
- Existing valves
- Proposed new valves
- P — Pressure test and purge point

Legend

- Isolation valve
- Check valve
- Commissioning station
- Non return valve
- Strainer
- Shunt pump
- Pressure reducing valve

Project name: *Water heater replacement*

Drawing title & version: *Water heater replacement RFH.01*

Address: *Richard Fairclough House, Knutsford Road, Warrington, WA4 1HT*

Location: *Main boiler room*

Drawn by: *P.Burrows*
Date: *May 2023*
Scale: *Not to scale*