SVM
BUILDING SERVICES DESIGN

MECHANICAL SERVICES SPECIFICATION FOR VENTILATION AND COMFORT COOLING PROJECT AT SAXILBY BOXING CLUB, CORBY, NORTHANTS

Contents

Specification Expert - Introduction

This document has been compiled using Specification Expert, which the copyright belongs to AMTECH Group.

The content incorporates that of the National Engineering Specification (NES).

NOTES FOR TENDERERS

Dependant on the nature of the works specified within this document, the specification shall contain some or all of the items below:-

1. PRELIMINARIES

The Preliminary clauses (‘A’ sections) included are those that relate to the Engineering Works in particular and must be read in conjunction with the "Preliminaries" of the "Main Contract".

2. SYSTEM SPECIFICATIONS

The system specifications are sub-divided into four parts:-

Part 1 System objectives:

The system objectives are clauses giving details of design information, system performance and description, together with lists of the system schematics and drawings.

Part 2 Selection schedules for the reference specifications:

These selection schedules specify items in the system that is contained in the Reference Specifications (Y group). Required Y group clauses are invoked by reference.

Part 3 Clauses specific to the system:

These specification clauses are specific to the system concerned and in general make no reference to the Y group clauses.

BS Appendix

The BS Appendix contains a list of all the British and European Standards referred to in the particular system specification.

3. APPENDICES

The appendices shall consist of some or all of the following:-

Tender Summary

A pricing schedule for the system specifications.

Equipment Schedules

Schedules for the equipment specified within the document.

Reference Specifications (Clauses from the Y Group).

All the reference specifications relevant to all the systems for the job. Required clauses are invoked in Part 2 (Selection schedules for the reference specifications) for each system.

4. NON-SPECIFICATION CLAUSES

User created, non Specification Expert, clauses may appear within the specification.

Project Revision Sheet

Saxilby Boxing Club, Corby
New Ventilation and Comfort Cooling

Revision T1

Date of issue 02/03/2020

Prepared by Shaun Gregory

Revision	Date	Details	Changes	Author	Checked
T1	02.03.20	Tender Issue		Shaun Gregory	02.03.20

A10 PROJECT PARTICULARS

110.000 THE PROJECT

- Particulars of the project as a whole are
  - The project comprises of the removal of the existing warm air heater from the store room/plant room, and the stripping out of the existing wall mounted extract fans
  - The new installation comprises of new electric heaters in the changing rooms/toilets/shower areas, new supplemental comfort cooling installation, new mechanical heat recovery ventilation and new toilet/changing/shower extract system
  - The servicing of the existing comfort cooling installation.

120.000 THE EMPLOYER:
Corby Borough Council

130.000 CONTRACT ADMINISTRATOR:
The term Contract Administrator (CA) is used throughout this specification and his duties will be carried out by

- Corby Borough Council

140.000 DESIGN TEAM:

- Contract Administrator/Project Manager

  Gareth Davis
  Corby Borough Council
  The Corby Cube
  George Street
  Parklands Gateway
  Corby
  NN17 1QG
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- Building Services Engineer

  Shaun Gregory
  SVM Building Services Design
  1 Weekley Wood Close
  Kettering
  Northamptonshire
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170.000 SUBCONTRACTOR:
The term Subcontractor is used throughout this specification and is deemed to be synonymous with the term Subtrader and the like which may be used elsewhere within the Contract Documentation. For the purposes of this document any reference to Main Contractor or Contractor shall be synonymous with the term Subcontractor.

180.000 THE SUBCONTRACT:
This document has been prepared using the Common Arrangement of Sections and this Subcontract comprises the following

- Mechanical Services Installations
- Electrical Services Installations

A11 TENDER AND CONTRACT DOCUMENTS

150.000 INSPECTION:
Drawings and other documents relating to the Contract generally maybe inspected, by appointment, prior to the submission of tender.

- Engineering Services documents may be inspected at the office of the building services engineer

A12 THE SITE EXISTING BUILDINGS

120.000 SITE LOCATION:
The site is located at Saxilby Centre, Saxilby Close, Corby Northants NN18 9BH

140.000 RISKS TO HEALTH AND SAFETY:
The accuracy and sufficiency of this information is not guaranteed by the Employer or the CA and the Subcontractor must ascertain for himself any information he may require to ensure the safety of all persons and the Works.
Comply with the requirements of the CDM Regulations by:-

- compiling risk assessments for the sub-contract works
- providing information on the sub-contract 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 file for the works.

150.000 SURVEY:

- Ascertain the nature of the site and all local conditions and restrictions likely to affect the execution of the Works.
- Examine all available drawings of the engineering services and report any discrepancies to the CA.

170.000 SITE VISIT:
Before tendering, ascertain the nature of the site, access thereto and all local conditions and restrictions likely to affect the execution of the Subcontract Works. Site visit may be made by the Subcontractor by prior agreement.

A13 DESCRIPTION OF THE WORKS

130.000 PREPARATORY WORK BY OTHERS:
Prior to any works being carried out the contractor MUST carry out validation checks (via load monitoring) on the spare electrical supply capacity available, and report the results to the consultant, prior to ordering any new plant/equipment.

140.000 THE SUBCONTRACT WORK:
Design, supply, install, balance, test and commission the building services installations defined in the following Sections:-

- U19, U60
- Drawings listed in Clause A11.110.000.

141.000 THE SUBCONTRACT WORK:
The contractor shall be aware that the contract is to be awarded on a design and build basis, utilizing the information contained within this performance specification and the indicative information indicated on the performance tender drawings.

Design, supply, install, balance, test and commission the services installations defined in the work sections and as indicated on the drawings listed in section A11 clause 110.00

Incorporate all equipment accessories controls, supports and ancillaries implicitly or explicitly required either by specification and/or the drawings or in accordance with accepted current practice and procedures which after assembly testing and commissioning will enable that section of works to function correctly and to achieve the specified performance.

The contractor shall be responsible for the submission of working drawings for comment. The approval period for these drawings shall be 5 working days from receipt of drawings, each drawing shall be given a status indicating how to proceed.

The contractor shall be responsible for the arrangement of all necessary cranage and scaffolding to carry out the services installation and for including such costs within his tender. The contractor shall allow within his tender for the provision of a 12months defects period. The contractor shall also include for the training of the employers maintenance staff on the use of the automatic controls and new equipment installed within the building.

The contractor is advised that the building services engineer shall require 3 clear days notification prior to the date of any commissioning witnessing.

The contractor shall be responsible for all elements of builderswork required to facilitate the new installation, including making good any penetrations where new services have been installed or existing services have been stripped out. The builderswork shall include any necessary fire stopping, making good and local decoration to match the existing local décor as close as possible.

The contractor shall also be responsible for all electrical work associated with the new installation.

240.000 ELECTRICAL SUPPLY:
Where systems are specified as being maintained 'under fire conditions' ensure wiring selected is suitable for the temperatures to be encountered.

240.000 ELECTRICAL SUPPLY:
Where systems are specified as being maintained 'under fire conditions' ensure wiring selected is suitable for the temperatures to be encountered.

250.000 PLANT OPERATING CONDITIONS:
Ensure all plant items are suitable for operation in the environment in which they are to be located.

- Ensure all plant, motors, starters and ancillary equipment etc. are suitable for operation at full capacity under the following conditions
  - Height above sea level not exceeding 1000m.
  - Air cooling at an average temperature over 24 hours not exceeding 35^{o}C dry bulb.
  - Maximum conditions of 40^{o}C dry bulb and 50 per cent relative humidity.
  - Supply voltage approximately sinusoidal

260.000 ROOM TERMINAL LOCATIONS:
The positions of all connection points, accessories, apparatus, equipment and other room terminals shown on the tender drawings are approximate and for guidance in the preparation of the tender.
Agree, with CA, which terminals are subject to final positioning onsite.
Allow for the movement of all such terminals up to a radius of 2.0m from the positions shown on the drawings.
Mounting heights indicated in tender documents are for tender purposes only. Confirm mounting heights with the CA before commencing work on site.

270.000 ELECTROMAGNETIC COMPATIBILITY:
Ensure all equipment and systems are installed to provide electromagnetic compatibility within the system and with any other systems installed in the same area. Ensure all systems and buildings are assessed for protection to, and that such protection meets the requirements of BS EN 62305. Ensure all equipment meets the requirements of the appropriate electromagnetic compatibility standard.

BS APPENDIX

BS 7649:1993
Guide to the design and preparation of documentation for users of application software

A30 TENDERING/SUB-SUBLETTING/SUPPLY

100.000 SUBCONTRACT TENDERING

110.000 SCOPE:
These conditions are supplementary to those stated in the invitation to tender and on the Form of Tender and Agreement.

130.000 EXCLUSIONS:
- If the Subcontractor cannot tender for any part(s) of the work as defined in the tender documents, he must inform the CA as soon as possible, defining the relevant part(s) and stating the reasons for his inability to tender.

140.000 ACCEPTANCE OF TENDER:
The Employer and his representatives:
- Offer no guarantee that the lowest, or any tender, will be recommended for acceptance or accepted.
- Will not be responsible for any cost incurred in the preparation of any tender.

150.000 PERIOD FOR ISSUE OF NOMINATION INSTRUCTIONS:
Where a minimum period has been stipulated by the CA in the Invitation to Tender, it must not be altered by the Subcontractor without the approval of the CA.

200.000 PRICING/SUBMISSION OF DOCUMENTS

230.000 PRICING OF PERFORMANCE SPECIFIED WORK:
Ensure tenders include for all work necessary to meet the requirements for the Performance Specified Work and its completion and proper integration with the Works generally.

270.000 QUANTITIES IN THE SUBCONTRACT SPECIFICATION:
- Where and to the extent that quantities are included in the specification, they have been prepared in accordance with SMM7 only where and to the extent stated. Where not so stated, the items, descriptions and measurements:
    - Must not be relied on as complying with SMM7.

Must be priced taking account of the information given elsewhere in the tender documents, including for all associated and ancillary work shown or clearly apparent as being necessary for the complete and proper execution of the work.

280.000 SUBCONTRACT SPECIFICATION WITHOUT QUANTITIES:
Where and to the extent that quantities are not included in the specification, tenders must include for all work shown or described in the tender documents as a whole or clearly apparent as being necessary for the complete and proper execution of the Works.

290.000 PRICING OF SUBCONTRACT SPECIFICATION:
Alterations and qualifications to the specification must not be made without the written consent of the CA. Tenders containing such alterations or qualifications may be rejected. Costs relating to items in the specification which are not priced will be deemed to have been included elsewhere in the tender.

300.000 SUBMISSION OF PRICED SUBCONTRACT SPECIFICATION:
The priced subcontract specification must be submitted
- with the Tender.

310.000 ERRORS IN THE PRICED SUBCONTRACT SPECIFICATION:
Errors in the priced subcontract specification will be dealt within accordance with the `Code of Procedure for Single Stage Selective Tendering' 1996.
- Alternative 1.

Alternative 2. (The word `specification' being substituted for `bills of quantities').

330.000 A SCHEDULE OF RATES:
A fully priced copy must be submitted
- with the Tender.
- The Subcontractor may, if he so wishes, add to this schedule.
- Rates to exclude Contractor's cash discount.

340.000 ATTENDANCES:
Where these have been listed by the CA in the Invitation to Tender, details of any changes must be listed in
- Form of Tender NSC/T Part 2.

350.000 DAYWORK PERCENTAGES:
For method of completing daywork percentages on page 3 of Form NSC/T Part 2, see clause A55.110.000.

360.000 PROGRAMME:
The Subcontractor's proposed programme as specified in Section A32 or a summary thereof showing the sequence and timing of the principal parts of the Works, periods for planning and design, and itemising any work which is excluded must be submitted within 1 week on request

370.000 TENDER STAGE METHOD STATEMENTS:
- Method statements must be submitted within one week of request describing health and safety considerations and how and when the subcontractor proposes and undertakes to carry out the following.
  - Resourcing for design duties.
  - Testing and commissioning.

The Subcontractor may, at his discretion and at the same time, submit method statements for other parts of the Works.

380.000 ALTERNATIVE TENDERS:
In addition to and at the same time as his tender for the Subcontract Works as defined in the tender documents, the Subcontractor may, at his discretion, submit alternative design proposals and/or method(s) of construction/installation for consideration. Alternatives which would involve significant changes to other work will not be considered.
Such alternative(s) must include all additional costs arising from necessary changes to the details of the installation, including changes to the design and drawings, as well as any associated ancillary equipment items.
Such alternative(s) is/are deemed to be alternative tender(s) and each must include a complete and precise statement of the effects on cost and programme.
- Full technical data for each such alternative must be submitted with the Tender together with details of any consequential amendments to the design and/or construction/ installation of other parts of the Works.

390.000 ALTERNATIVE MANUFACTURERS/SUPPLIERS:
In addition to and at the same time as the tender for the Subcontract Works as defined in the tender documents, the Subcontractor may, at his discretion, submit alternative manufacturers or suppliers for consideration. Alternatives which would involve significant changes to other work will not be considered.
Such alternative(s) must include all additional costs arising from necessary changes to the details of the installation, including changes to the design and drawings, as well as any associated ancillary equipment items.
Such alternative(s) is/are deemed to be alternative tender(s) and each must include a complete and precise statement of the effects on cost and programme.
- Full technical data for each such alternative must be submitted with the Tender together with details of any consequential amendments to the design and/or construction/installation of other parts of the Works.

400.000 SELECTION OF MANUFACTURERS/SUPPLIERS:
Where manufacturers, suppliers or installers of products are NOT identified by name select products that comply in all respects with the specification and, as and when requested, demonstrate such compliance.
Where manufacturers, suppliers or installers of products are identified by name, or names, but no reference is made to "Or approved" equivalent use these exclusively.

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

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

410.000 A LIST OF PROPOSED MANUFACTURERS/SUPPLIERS:
A list of 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.

420.000 TECHNICAL INFORMATION:
Technical information relating to the Subcontractor's tender must be submitted

- within one week of request.

430.000 QUALITY CONTROL RESOURCES:
A statement must be submitted describing the organisation and resources which the Subcontractor proposes and undertakes to provide to control the quality of the Subcontract Works. The statement must include the number and type of staff responsible for quality control, with details of their qualifications and duties.

- Within one week of request.

440.000 HEALTH AND SAFETY INFORMATION:
Submit a statement with the tender describing the organisation and resources which the Subcontractor proposes and undertakes to provide to safeguard the health and safety of operatives, and of any person who may be affected by the Subcontract works, including:

- A copy of the subcontractors health and safety policy document, including risk assessment procedures.
- Accident and illness records for the past five years.
- Records of previous Health and Safety Executive enforcement action.
- Records of training and training policy.
- The number and type of staff responsible for health and safety on this project with details of their qualifications and duties.

450.000 RISKS TO HEALTH AND SAFETY:
Submit a statement with the tender describing any significant and unavoidable risks which may arise as a result of carrying out the subcontract works and the measures proposed to safeguard the health and safety of operatives and of any person who may be affected by the Subcontract/works.

460.000 MAINTENANCE CONTRACT:
Provide a maintenance contract for twelve months, from the date of Practical Completion, for the following:
the entire mechanical and public health installation
Ensure that the maintenance recommendations set out in the appropriate standard can be achieved.

- Carry out the maintenance recommendations set out in the appropriate standard.
- Emergency maintenance response times 48 hours
- Include for maintaining the installation in efficient working order including routine checks, adjustments, lubrication and replacement of consumable spares, etc.

470.000 PROPOSALS FOR ANNUAL MAINTENANCE CONTRACT:
Proposal

- Submit within one week of request a supplementary proposal for an annual maintenance contract for the following

the entire mechanical and public health installation

- 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 or Section thereof.
- The proposal will not necessarily be considered as part of the tender for the Subcontract Works and the Employer does not undertake to accept it.

500.000 SUB-SUBLETTING

511.000 `LISTED' SUB-SUBCONTRACTORS:
Where the Subcontract Documents provide that certain work must be carried out by a person of the Contractor's choice selected from a list of persons given therein:

- The selected person shall be a Sub-subcontractor as provided for in the Subcontract.
- The CA may add additional persons to the list at anytime prior to the execution of a binding Sub-subcontract agreement.
- With the consent of the CA, the Subcontractor may add additional persons to the list and shall, if requested, submit to the CA (in an approved form) evidence of the suitability of such additional persons to carry out the Sub-subcontract work.
- If at any time prior to the execution of a binding Sub-subcontract agreement none of the persons named in the list (including any persons added as provided above) is able and willing to carry out the relevant work, the Subcontractor must notify the CA without delay.

The CA will then forthwith add the name(s) of other person(s) as provided above, or confirm that he does not wish to do so within (weeks) one
If the CA fails to do either within this time of the Subcontractor's notification the work shall be carried out by the Subcontractor who may
Sub-subcontract in accordance with the Subcontract.

- Before the start of the work to which the list relates, the Subcontractor must enter into a binding Sub-subcontract agreement and confirm to the CA that this has been done, giving the name of the selected Sub-subcontractor.

520.000 SUB-SUBCONTRACTORS:
Where the Subcontractor proposes to sublet any portion(s) of the Subcontract Works a list must be submitted

- before the execution of the Subcontract

The list will define such portion(s) and give, for each, the name and address of the proposed Sub-subcontractor.

A31 PROVISION, CONTENT AND USE OF DOCUMENTS

100.000 DEFINITIONS AND INTERPRETATIONS

120.000 DEFINITIONS:
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 (IEE Wiring Regulations).
British Standards, including Codes of Practice.
Associated Statutory Acts.

Where used in the documentation the following definitions apply

- 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 within plant rooms, outdoors or unprotected within service or occupied areas.
- System: System means 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.
- Services: Services means the inclusion of one or more systems.

130.000 REFERENCES TO BSI DOCUMENTS:
References to BSI documents are to the versions and amendments listed in the British Standards Catalogue

- and in subsequent issues of BSI Update Standards up to and including that for August 2009

140.000 MANUFACTURERS' REFERENCES:
Manufacturers' references are those current at the time of tender
References mean the particular product as specified in the manufacturer's technical literature current at that time.

150.000 TENDER DRAWINGS:
Tender drawings means drawings listed in

- A11.110.000

The tender drawings show the general arrangement of the Engineering Services to be provided and the inter-relationship of the Works with work to be installed by others.

160.000 DRAWINGS:
Sketch drawings, schematic drawings, detailed design drawings, co-ordination drawings, installation drawings, installation wiring diagrams, shop drawings, manufacturer's drawings, manufacturer's certified drawings, record drawings, builder's work drawings are as defined in the BSRIA TN 21/97 Appendix A.

161.000 SKETCH DRAWINGS:
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.
164.000 CO-ORDINATION 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 a co-ordination 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.

- A spatially co-ordinated drawing, i.e. no physical clashes between the system components when installed at the scaled-off positions shown on the drawing. Provide dimensions in areas where tolerances are minimal.
- 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 those plant items specified by the designer and identified in the design specification.
- 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.
- Arrange the services so that it is possible to demonstrate a feasible sequence of installation.
- Support the drawing with individual services drawings for clarity.
- Plantroom layouts to a scale of at least 1:20, accompanied by cross-sections and elevations to a scale of at least 1:20.

165.000 INSTALLATION DRAWING:
A drawing based on the detailed drawing or co-ordination 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 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.
- A spatially co-ordinated drawing, i.e. 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 which are chosen as alternatives to the designers specified option.
- Provide dimensions where the positioning of services is considered to be important enough not to leave to the tradesmen onsite.
- Plantroom layouts to a scale of at least 1:20, accompanied by cross-sections and elevations to a scale of at least 1:20.

166.000 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.
Indicate the following; maximum electrical loading for each supply cable; cable termination facilities; and cable identification and all terminal numbers.

170.000 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:

- 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.

171.000 BUILDER'S WORK DRAWING:
Design stage

- A drawing to show the provisions required to accommodate the services which significantly affect the design of the building structure, fabric and external works. Also drawings (and schedules) of work to be carried out by building trade, and required to be costed at the design stage eg. plant bases.

Installation stage

- Drawing to show requirements for building works necessary to facilitate the installation of the engineering services (other than where it is appropriate to mark out on site).

182.000 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.

190.000 EXAMINATION OF DRAWINGS/INFORMATION:
The CA 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.

300.000 DOCUMENTS TO BE PROVIDED BY SUBCONTRACTOR

311.000 PRODUCTION INFORMATION:

- Liaise with the CA, Contractor and others as necessary to help ensure co-ordination of the work with related building elements and services.
- Provide drawings and other information as specified showing such details of the work as the CA may reasonably require.
- Submit to the CA for comment, make any necessary amendments and resubmit for further comment unless the CA confirms that this is not necessary.
- Submit sufficient copies of final information to the CA for distribution to the Contractor and all affected parties.

313.000 CO-ORDINATION OF ENGINEERING SERVICES:
Co-ordination of the Engineering Services Installations will be carried out

- as part of this contract
- under the direction of the main contractor

Agree principles of co-ordination with all parties concerned.

- Incorporate details provided by others into the Co-ordination Drawings.
- Provide all necessary details/drawings/schedules etc. required to enable the co-ordination drawings to be prepared by others.

Ensure the installation drawings make due allowance for all building elements, structure and other services.

- Prior to submission check and approve all drawings, schedules and any other information provided by manufacturers, nominated suppliers or specialist sub-subcontractors to ensure that all the requirements of the contract documentation have been incorporated. Accompany all documents submitted with a certificate indicating that they have been checked by the Subcontractor.

320.000 DRAWN AND OTHER INFORMATION:
Provide drawn information for the design team and client in the following forms:-

Initial copies for comment

- print form
- CAD format
  - Comply with BS EN ISO 13567-1.
  - Comply with BS EN ISO 13567-2.

Final copies for distribution

- print form
- CAD format
  - Comply with BS EN ISO 13567-1.
  - Comply with BS EN ISO 13567-2.

Provide drawn information for the design team and client in the following numbers
Sketch drawings

- Initial copies for comment (no) 1
- Final copies for design team (no) 1

Schematic drawings
- Initial copies for comment (no) 1
- Final copies for design team (no) 1

Detailed design drawings
- Initial copies for comment (no) 1
- Final copies for design team (no) 1

Co-ordination drawings
- Initial copies for comment (no) 1
- Final copies for design team (no) 1

Installation drawings
- Initial copies for comment (no) 1
- Final copies for design team (no) 1

Installation wiring drawings
- Initial copies for comment (no) 1
- Final copies for design team (no) 1

Builder's work information
- Initial copies for comment (no) 1
- Final copies for design team (no) 1

As-installed drawings
- Site record copy

Record drawings
- Initial copies for comment (no) 1
- 2 preliminary sets for use during commissioning.
- One reduced set incorporated into each Operating and Maintenance manual.

330.000 PREPARATION OF DOCUMENTS:
- Prepare drawings to commonly recognised scales generally on A1 sheets and details and schedules on A4 sheets.
- Agree scales, drawing sheet size and format with the CA before preparing any documents.
- Prepare electrical drawings in accordance with BS EN 61082-1.

350.000 DOCUMENT NUMBERING/REGISTRATION SYSTEM:
Agree with the CA the document numbering/registration system to be used before preparing any documents.

360.000 BUILDER'S WORK INFORMATION:
Confirm and amplify any information provided by the CA.
- Builder's work is excluded from the Subcontract.
- Builder's Work excludes drilling and/or plugging walls, floors, ceilings etc., for fixings for services and such work is included in the Subcontract.
- Provide Builder's Work Information, appropriate to the stage of design development, and include requirements for foundations, bases, and supporting structures for plant and equipment.
- Provide fully dimensioned drawings showing both size and position of builder's work.
- Mark out on site, all cut holes and chases required any pockets cast in concrete, any inserts, any built in sleeves or similar items.
- Holes may not be cut in steelwork, reinforced or precast concrete without written permission from the CA. Under no circumstances will holes be cut in pre-stressed concrete. Permitted holes in steelwork must be drilled - burning by means of welding equipment is prohibited.

370.000 TECHNICAL LITERATURE:
The Subcontractor is
- advised to keep copies of the following on site, readily accessible for reference by all supervisory personnel
- Manufacturer's current literature relating to all products to be used in the Works.
- Relevant BS Codes of Practice.

380.000 MAINTENANCE INSTRUCTIONS AND GUARANTEES:
Retain copies delivered with components and equipment (failing which, obtain), register with manufacturer as necessary and hand over to CA on or before Practical Completion.
Notify CA of telephone numbers for emergency services by Subcontractors after Practical Completion.

BS APPENDIX

BS 7671:2008
Requirements for electrical installations. IEE Wiring Regulations. Seventeenth edition

BS EN 61082-1:2006
Preparation of documents used in electrotechnology. Part 1 Rules

BS EN ISO 11091:1999
Construction drawings. Landscape drawing practice

BS EN ISO 13567-1:2002
Technical product documentation. Organization and naming of layers for CAD. Part 1 Overview and principles

BS EN ISO 13567-2:2002
Technical product documentation. Organization and naming of layers for CAD. Part 2 Concepts, format and codes used in construction documentation

A32 MANAGEMENT OF THE WORKS

120.000 CO-OPERATE:
Co-operate with the Contractor, other subcontractors, suppliers, local authorities and statutory undertakings in the execution of their work.

130.000 PROGRAMME/PROGRESS:
Provide detailed sub-programmes to assist the Contractor in producing a Master Programme for the Contract Works.
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 5
- Work resulting from instructions issued in respect to the expenditure of provisional sums.
- 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.

Provide programme information as
- simple bar chart type.

Provide a separate and detailed commissioning programme for agreement with the CA. 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 3 working days
- Demonstration to the CA that test instruments and equipment are accurate.

131.000 COMMISSIONING PROJECT MANAGEMENT:
- Compile a detailed commissioning programme and confirm/agree with the main contractor.
- Compile and submit to the project supervisor the appropriate health and safety method statements and risk assessments.
- Establish a means (such as checklists) of monitoring the progress of the commissioning.
- 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.

140.000 MONITORING:
Record progress of the Works weekly on a copy of the programme kept on site. Update or redraft programme without delay if any circumstances arise which affect the progress of the Works.
- Mark up "As Installed" details weekly and before any work is hidden from view.

150.000 INSPECTION AND MEASUREMENT OF WORK:
Provide all necessary assistance to enable CA to examine or measure the Works.

160.000 COVERING-UP:
Ensure no section of the Works are covered, concealed or insulated until completion of a witnessed satisfactory test.
Give notice when Works which are to be covered or concealed are ready for examination and/or measurement, not less than 3 working days
Give notice to
- CA.

180.000 TEST NOTICES:
Provide all formalities in connection with Test Notices, Agreement and Application for Supply Forms etc. Ensure all documents requiring the Employer's signature are forwarded to the CA in time to meet the building programme in order for the necessary test and supply arrangements to be made. No additional payments will be made for expenses incurred due to reconnections, re-visits etc., by Supply Authorities or any other officials.

A33 QUALITY STANDARDS/CONTROL

130.000 SUBCONTRACTOR'S PERSON-IN-CHARGE:
Appoint a foreman-in-charge and/or site agent to ensure constant management and supervision of the Subcontract Works.
Give maximum possible notice to the Contractor and CA before changing the foreman-in-charge or site agent.

140.000 DIMENSIONS:
Where installations are dependent upon site dimensions ensure that these are available before proceeding with the Works.
Do not take dimensions by scaling from the drawings.
Where dimensions are indicated on drawings check these on site, as appropriate, to ensure building construction and manufacturing tolerances can be accommodated.

- Do not order or manufacture equipment using dimensions indicated on the Tender drawings, specification or schedules.

160.000 SITE MODIFICATIONS:
Do not make site modifications to assemblies without authorisation.
Where site modifications to assemblies are authorised make in accordance with manufacturer's certified drawings and instructions.
Ensure that modifications made comply with any type test certificate obtained for arrangement of components.

171.000 STANDARDS AND REGULATIONS:
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 particular item.
Comply with all statutory instruments and regulations, relating to the area of the site current at

- the date of tender.

Comply with the requirements of the Local Authority Building Inspector.
Comply with all Statutory Obligations arising from current legislation and regulations, together with other requirements, including, but not limited to, the following:-

- Statutory Obligations
  - Health and Safety at Work etc Act 1974
  - Management of Health & Safety at Work Regulations 1999
  - The Working Time Regulations 1998
  - Building Regulations 2000 and current amendments
  - Public Health Acts
  - Electricity Acts
  - Electricity at Work Regulations 1989
  - Factories Act 1961
  - The Workplace (Health, Safety and Welfare) Regulations 1992
  - The Construction (Design and Management) Regulations 2007The Construction (Design and Management) Regulations 2007
  - The Health and Safety (Display Screen Equipment) Regulations 1992
  - The Clean Air (Arrestment Plant) (Exemption) Regulations 1969
  - The Control of Substances Hazardous to Health (COSHH) Regulations 2002
  - The Control of Substances Hazardous to Health (Amendment) Regulations 2003
  - The Provision and Use of Work Equipment Regulations 1998
  - Personal Protective Equipment at Work Regulations 1992
  - The Construction (General Provisions) Regulations 1961
  - The Lifting Operations and Lifting Equipment Regulations 1998
  - Other relevant Safety Regulations
- Public Utility Company and/or Statutory Authority regulations, specifications, and requirements.
- Other Requirements
  - British Standards and Codes of Practice.
  - BS 7671 - Requirements for Electrical Installations (IEE Wiring Regulations).

  - BS EN 50110.
  - Insurance Company Requirements.
  - IEC Standards.
- Notify all authorities in accordance with their regulations and obtain any required approvals for the installation.
- 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 Code for Lighting.
  - CIBSE Technical Memoranda.
  - Institute of Plumbing - Plumbing Engineering Services Design Guide.
- 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.
- Supply plant and equipment to achieve the specified design conditions and to provide stable control.

190.000 TEST CERTIFICATES:
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.

200.000 INSPECTION AND TESTS - ON OR OFF-SITE:
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.
Should any alternative item be proposed which does not carry appropriate certification, ensure independent testing is carried out at no expense to the Employer to confirm compliance.
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.
Where a test indicates non-compliance with the Specification submit immediately details of the non-compliance and proposals for corrective action.
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.
Attendance or otherwise of the supervisory personnel during specified inspections or tests will not reduce the obligations or restrictions of the Contract.
Carry out all tests required by legislation under the direction of a competent person.

210.000 INSPECTIONS AND TEST RECORDS:
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.
Test results with itemised readings including records of all other checks and tests.
Maintain records of all specified inspections and tests performed including third party and works test certificates.
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.

Maintain all records on site for inspection. On completion of the Works, include copies in the operating and maintenance manuals.
Submit copies of records within one week of request.

220.000 TESTING AND COMMISSIONING OF SERVICES:
Agree with the Contractor a programme for pre-commissioning checks, setting to work, commissioning and performance testing, and allow for all costs incurred.
Where required, provide formal method statements supported by risk assessments detailing all commissioning procedures.
Give notice to the Contractor and CA and state any requirements for the attendance and co-operation of others.

- Not less than fourteen working days.

Provide all necessary facilities to enable tests to be witnessed and inspections carried out either on site or at manufacturer's works.
The CA will only witness test proceedings, confirm recorded results and determine if the specified requirements have been satisfied.
If following test or inspection any plant or part thereof is shown to be defective or not conforming to the specification the CA will reject such defective parts by written notice, within reasonable time, indicating area of dispute.

- Appoint an "approved engineer", to supervise the whole of the testing, commissioning, performance testing and instruction of client's staff.

Provide all specialised personnel (including manufacturer's representatives) and co-ordinate their activities.
Test all equipment, material and systems as detailed in Sections. If an inspection or test fails, repeat the procedure, until satisfactory results are obtained.

- Complete all tests before any paint, cladding or similar materials are applied or before services are concealed.
- Ensure all requirements such as cleanliness, protection from harmful external and internal elements etc. are provided prior to commencement of commissioning.
- Following satisfactory completion of testing and when the installations are in a safe and satisfactory condition, set to work, regulate and adjust, as necessary, to meet the specified design requirements.
- Provide all necessary instruments and recorders to monitor systems during commissioning and performance testing.
- Provide test equipment subject to a quality assurance procedure complying with BS EN ISO 10012.
- Do not start performance testing, including system demonstration, system proving or environmental and capacity testing, until commissioning of the system is completed to the satisfaction of the CA.

Maintain on site full records of all commissioning and performance testing, cross referenced to system components and on completion of the Works include a copy in each Operating and Maintenance Manual.
Provide all certification documents for approval by the CA before any system is offered for final acceptance.

- Gas, fuel oil, electricity and water for testing and commissioning will be provided by
  - the main contractor.

230.000 COMMISSIONING PROCEDURES:
Observe the following requirements when commissioning the Engineering Services.

- Progressive static testing will be witnessed by the CA when work is presented for testing. This will include:
  - Insulation resistance tests.
  - Earth fault loop impedance tests.
  - Earth continuity tests.
  - Pipeline pressure tests.

  Pre-commissioning examination and testing to ensure that each system or item of equipment is complete, in a safe condition and all notices are displayed. Completion for operational purposes implies the bulk of snagging has been offered to the CA and that remedial work has been

completed. All fans, pumps etc. tested for operation, polarity, phase sequence and impedance etc.
Finalise commissioning programme, taking into account site progress and availability of related services, with CA and Contractor and agree access required for controls etc.

240.000 OPERATIONAL DEMONSTRATION:
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.
Demonstrate to the CA that all system components are operating correctly, and the completely integrated installation will function in accordance with the specified performance requirements.

- Run each plant for 1 hour
  Provide a log book and record all hours run.
- Carry out performance testing in both summer and winter conditions.

250.000 OUTSTANDING ACCEPTANCE TESTS:
Any items which have failed their acceptance tests or where such tests are delayed by the client are to be listed and dates agreed, during the defects liability period when reasonable demands for consumer requirements are available.

260.000 SYSTEMS USED BEFORE PRACTICAL COMPLETION:
Systems may not, without the prior written approval of the CA be used before Practical Completion. Systems to be used before practical completion for the benefit of the Contractor and/or Subcontractor must have all defective consumable elements (including lamps and tubes) replaced by new not more than seven days prior to Practical Completion.
No system shall be put into use prior to handover to the employer, except for testing and commissioning, unless in accordance with the following procedure:
Following the receipt of written instructions, the Subcontractor shall operate designated parts of the Subcontract Works, provided that such operation is practicable and does not prejudice the Subcontractor's responsibilities and obligations under the Subcontract.
Additionally and with adjustment to the Subcontract sum, the Subcontractor, shall if instructed, provide:

- comprehensive insurance including indirect loss for any plant being operated
- maintenance of the installation
- re-instatement of the installation to as new condition prior to handover to the Employer
- allow the defects liability period to commence on handover.

300.000 OPERATION OF SYSTEMS BEFORE THE PRODUCTION OF DRAWINGS AND/OR OPERATING AND MAINTENANCE MANUALS:
Provide attendance, at no expense to the Employer, to put into service, operate 24 hours a day and maintain the systems to the Employer's requirements, including the provision of suitable competent labour, in the event that the Record Drawings and/or Maintenance Manuals are not available when the Works would, in the opinion of the CA, otherwise qualify for Practical Completion.
In the event of the Subcontractor failing to provide this service satisfactorily the Employer shall be entitled to make his own arrangements and recover the full cost through the Contract.

310.000 INSPECTION BY EMPLOYER'S INSURANCE COMPANY:
Where indicated in the Work Sections items are to be inspected by a competent person acting for the Employer's Insurance Company appointed under the provisions of the Factories Act or other relevant legislation. The installations concerned shall satisfy the Insurance Company's requirements in all respects.
Agree a programme for inspection and certification of specified equipment.
Inform the CA when equipment is to be ready for examination.
The Employer will place an order with the Insurance Company. Details and nature of the order will be provided to all interested parties.
Provide all detailed drawings etc. of the equipment to enable the Insurance Company to approve design before manufacture.
Arrange for the attendance of the Insurance Company's Engineer/Surveyor at each stage of manufacture and installation and provide all necessary access and facilities for inspecting and testing as may be required.

No plant which is subject to inspection will be accepted on behalf of the employer until a satisfactory certificate has been received by the Employer from the Insurance Company.
All Insurance Company charges for examination and approval of drawing, inspection of works during construction and inspection and certification of the completed work will be paid by

- The Employer.

BS APPENDIX

BS 7671:2008
Requirements for electrical installations. IEE Wiring Regulations. Seventeenth edition

BS EN ISO 10012:2003
Measurement management systems. Requirements for measurement processes and measuring equipment

A34 SECURITY/SAFETY/PROTECTION

110.000 MAIN CONTRACT PRELIMINARIES:
- Security/safety/protection

Applies to the whole of the Works, including this Subcontract. Comply with the requirements stated therein insofar as they relate or apply to the Subcontract Works, and co-operate with and assist the Main Contractor in complying with them generally.

115.000 CDM REGULATIONS:
Comply with the requirements of the CDM Regulations by
- adhering to the rules of the Pre-Construction Information and Construction Phase Plan.
- reporting accidents, injuries or dangerous occurrences to the main contractor.
- providing the main contractor with appropriate input to the health and safety plan, including risk assessments, and to the health and safety file.
- providing the main contractor with information on the subcontract works which might affect the health or safety of any person.

120.000 DELIVERY:
Provide an adequate and safe protection for all materials and products during transport to site.
- Deliver all tubes, conduit, trunking and associated equipment with open ends effectively plugged, capped or sealed.
- Deliver all ductwork, tubes, conduit, trunking and associated equipment with open ends effectively plugged, capped or sealed.

130.000 HANDLING:
Offload and transport about the Works all materials and products as recommended by manufacturers.

140.000 STORAGE:
Store all materials and products as recommended by manufacturers.
- Provide sufficient, safe and secure storage for all materials and products.
- Provide racks to prevent distortion for storage of conduits, pipes and similar materials.
- Store all fittings, accessories and sundry items in clean bins or bagged and stowed in racks and maintained under suitable weatherproof cover.

151.000 PROTECTION OF SUBCONTRACT WORKS:
Provide adequate and safe protection for all materials and products after installation.
- 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.
- 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,
  - gauge glasses,
- Protect all finished items from damage and paint splashes.
- Install items such as grilles, diffusers, lighting fittings, switches, accessories etc. as near to completion as practicable.
- Only install filter media when the plant items concerned are being commissioned and tested.
- Cover all plant items with polythene sheeting except when being worked upon.
- Cap all open ends of pipes, ducts, conduit and trunking etc except when being worked upon.
- Leave plant and equipment in a ready to paint condition where specified as part of the Works or to be carried out by others.
- Paint parts liable to corrosion immediately after removal of any temporary protection.
- Replace material, plant or equipment where deterioration or damage has occurred prior to handover.

160.000 IDENTIFICATION:
Where appropriate, ensure that materials, plant and equipment bear the brand name, serial/batch number and any other data required to identify their nature in relation to the Works.

170.000 ROTATING PLANT:

Immediately prior to Practical Completion adjust, ease and lubricate moving parts as necessary to ensure easy and efficient operation.

- Ensure that, whenever necessary, temporary supplies are provided to enable motive plant items delivered and/or installed to be run at regular intervals to avoid damage or deterioration.
- Ensure that rotating plant is hand-turned periodically if temporary supplies are not available.

A35 SPECIFIC LIMITATIONS ON METHOD/SEQUENCE/TIMING

130.000 ORDERING OF MATERIALS AND PRODUCTS:

- Ensure that procurement details of materials are incorporated in the Subcontract programme.
- Avoid delays by submitting details of alternative manufacturers or types of materials/products to the CA in time to comply with the agreed programme of the Works.
- Order all materials/products necessary for the completion of the Works immediately after receipt of comments received and/or instructions to proceed. No delay to practical completion, or completion of any part thereof caused by delays in ordering will be accepted.

A37 OPERATION/MAINTENANCE OF THE FINISHED BUILDING

101.000 SUBMISSION OF RECORD DOCUMENTS:
To satisfy the provisions of the Health and Safety at Work Act the Employer 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.
Provide Record Documents - being part of the Works - prior, and as a prerequisite, to Practical Completion to the satisfaction of the CA.
Prepare manuals in draft as the Works progress and make suitable arrangements where the Works are subject to Partial Possession or Sectional Completion.

- Submit draft Record Documents to the CA for comment prior to commissioning.
- 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.
- Provide the CA with copies of the final Manual prior to Practical Completion. Number of weeks prior 2

102.000 SUBMISSION OF DOCUMENTS FOR HEALTH AND SAFETY FILE:
To satisfy the provisions of the Health and Safety at Work Act the Employer 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.
Provide Record Documents - being part of the Works - prior, and as a prerequisite, to Practical Completion to the satisfaction of the CA.
Prepare manuals in draft as the Works progress and make suitable arrangements where the Works are subject to Partial Possession or Sectional Completion.

- Submit draft Record Documents to the CA for comment prior to commissioning.
- 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 finalised until the installations are commissioned and performance tested.
- Provide the CA with copies of the final Manual prior to Practical Completion. Number of weeks before 2
- Prepare electrical record drawings in accordance with BS EN 61082-1.
- Prepare Operating and Maintenance Manuals for heating systems not requiring a trained operator in accordance with BS EN 12171.

110.000 RECORD DOCUMENTS:
Provide

- Record Drawings and Schedules.
- Operating and Maintenance Manuals.
- Ensure record documents clearly record the arrangements of the various sections of the Works as actually installed and identify and locate all component parts.
- Ensure record documents make it possible to comprehend the extent and purpose of the Works and the method of operation thereof.
- Ensure record documents set out the extent to which maintenance and servicing is required and how, in detail, it should be executed.
- Ensure record documents provide sufficient, readily accessible and proper information 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 Works that complete and accurate records are being maintained and that the record documents are being progressively compiled as the work on site proceeds.

120.000 RECORD DRAWINGS AND SCHEDULES:
Prepare Record Drawings and Schedules to a scale not less than 1:50 from the "As Installed Drawings" maintained on site as the Works progress. Endorse all such documents 'RECORD DRAWINGS'. Where agreed with the CA certain detailed information may be provided in schedule form. Prepare electrical drawings in accordance with BS EN 61082-1.
Provide reduced scale copies for inclusion in the operating and maintenance manuals as detailed in clause A37.150.000.
Record Drawings and Schedules must include, but are not limited to:

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

145.000 OPERATING AND MAINTENANCE MANUAL FORMAT:
The operating and maintenance manuals shall be prepared in the following format:

- PC based word processing software tool.

150.000 OPERATING AND MAINTENANCE MANUALS:
The operating and maintenance manuals must include:

- 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.
- 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 A3

Legend of all colour-coded services.

- 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.
- 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.

160.000 PRESENTATION OF THE OPERATING AND MAINTENANCE MANUALS:

- Agree format and contents with the CA.
- 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.

190.000 TRAINING OF EMPLOYER'S STAFF:

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 Employer's maintenance staff.
- to the operational staff.

Training:

- Include for the training of 3 members of employers staff for 1 whole day
- Include for not less than indicated number of operating days for this purpose and demonstrate the safe day to day running and maintenance of all systems, plant and equipment.

210.000 OBLIGATIONS DURING DEFECTS LIABILITY PERIOD:

Prepare and submit records of failures or malfunctions of any part of the Subcontract Works during the Defects Liability Period, together with details of remedial action taken, subsequent re-testing and the results.

Notify the Main Contractor of damage, failures or malfunctions to the Subcontract Works demonstrably caused by incorrect operation of the installations, vandalism or other actions by a third party.

Inform the CA, via the Main Contractor, in writing when all defects are finally rectified so that an inspection may be carried out prior to the issue of a Final Certificate.

BS APPENDIX

BS EN 12171:2002

Heating systems in buildings. Procedure for the preparation of documents for operation, maintenance and use. Heating systems not requiring a trained operator

BS EN 61082-1:2006

Preparation of documents used in electrotechnology. Part 1 Rules

C90 ALTERATIONS - SPOT ITEMS

PART 1 SYSTEM OBJECTIVES

100.030 SYSTEM DESCRIPTION

Isolate, disconnect, strip out and remove the existing gas fired warm air heater from within the store/plantroom adjacent to the front entrance of the building.

Strip out to include isolating the gas main at the meter and stripping back to this point, Removal of redundant flue and warm air ductwork, removal of warm air heater and associated electrics.

The contractor shall be responsible for carrying out proper licensed disposal of all plant and equipment stripped out.

Isolate, disconnect, strip out and remove the existing wall mounted extract fans and controllers, including any associated ductwork, electrics and wall louvres.

The contractor shall be responsible for the making good of all internal and external walls where plant and equipment has been removed as part of this contract.

The contractor shall make due allowance within the tender for the removal/repositioning of existing plant/equipment/lighting/conduit/fire alarm equipment etc. to facilitate the new installation. The contractor shall ascertain the extent of this during the site visit within the tender period. No claims for any additional costs will be considered for removal/repositioning of existing services to facilitate and form the new installation.

The contractor shall include for repositioning existing light fittings and associated wiring.

The contractor shall include for repositioning existing smoke detectors and associated wiring.

The contractor shall include for repositioning exiting comfort cooling units and associated refrigerant pipework, condensate drains and associated electrical supplies.

S32 NATURAL GAS

PART 1 SYSTEM OBJECTIVES

100.010 PERFORMANCE OBJECTIVES

The contractor shall provide a new gas supply from the existing gas meter within the building, to route to serve the gas fired heater (externally) on the air handling unit.

Works to include gas solenoid valve and emergency knock-off button to be installed inside the building, and gas cock (with handle removed) on the supply adjacent to the air handling unit.

The gas pipework shall be given 2 cover coats of yellow ochre paint.

300.000 GENERAL

300.001 PRESSURE EQUIPMENT DIRECTIVE/PRESSURE EQUIPMENT REGULATIONS:
All equipment and assemblies which fall within the scope of the Pressure Equipment Directive (PED) 97/23/EC, implemented in the UK through the Pressure Equipment Regulations 1999, must be tested by the manufacturers, and be certified as compliant with the Directive. Such compliance shall be evidenced by displaying the appropriate CE Mark on the equipment and assemblies.
Only relevant equipment and assemblies (i.e. those with a maximum allowable) certified as compliant will be permitted under this specification, and any substitution put forward must also be compliant with the Directive.

300.010 REGULATIONS:
- Supply and install equipment in accordance with
  - HSE L56 - Safety in the installation and use of gas systems and appliances. Approved Code of Practice and Guidance. Gas Safety (Installation and Use) Regulations 1998.
  - HSE L81 - Design, construction and installation of gas services pipes. Approved Code of Practice and Guidance. Pipelines Safety Regulations 1996.
  - The Gas (Meters) Regulations 1983, SI 684 (as amended)
  - The Measuring Instruments (Gas Meters) Regulations 2006, SI 2647

300.020 STANDARDS:
- Install in accordance with the following as appropriate to the application
- Safety and control devices for gas burners and gas-burning appliances - general requirements to BS EN 13611.
- Gas Safety (Installation and Use) Regulations 1998 - Safety in the installation and use of gas systems and appliances, L56.
- Pipelines Safety Regulations 1996 - Design, construction and installation of gas service pipes, L81.
- IGE/TD/3 Steel and PE pipelines for gas distribution.
- IGE/TD/4 PE and steel gas services and service pipework.
- IGE/UP/1 Strength testing, tightness testing and purging of industrial and commercial gas installations.
- IGE/UP/2 Installation pipework on industrial and commercial premises.
- IGE/UP/4 Commissioning of gas fired plant on industrial and commercial premises.
- IGE/UP/10 Installation of gas appliance in industrial and commercial premises.

310.000 PRODUCTS/MATERIALS

310.055 MANUALLY OPERATED VALVES FOR GAS INSTALLATIONS IN BUILDINGS:
- Standard - BS EN 331.
- Valve
  - Closed bottom taper plug valve.
- Material

  - Forged and cast steel.
- Connections
  - Threaded to BS 21 and BS EN 10226-1.
  - Flanged to BS EN 1092-1 PN
  - Flanged to BS EN 1092-2 PN
  - Flanged to BS EN 1092-3 PN
  - Flanged to BS EN 1092-4 PN
  - Weld ends.

320.000 WORKMANSHIP

320.010 INSTALLATION:
Install gas pipework and equipment in accordance with IGE/UP/2 and manufacturer's recommendations.
- Comply with IGE/UP/10 Installation of gas appliances in industrial and commercial premises.
- Comply with Building and Engineering Services Association (B&ES) TR 20/9 Natural Gas.

320.020 TESTING AND PURGING:
- Comply with IGE/UP/1 Strength and tightness testing and direct purging of industrial and commercial gas installations.
- Comply with IGE/UP/1A Strength and tightness testing and direct purging of small low pressure industrial and commercial Natural Gas installations.

320.030 COMMISSIONING:
Commission gas fired plant on industrial and commercial premises in accordance with IGE/UP/4.

BS APPENDIX

BS 1552:1995
Specification for open bottomed taper plug valves for 1st, 2nd and 3rd family gases up to 200mbar

BS 21:1985
Specification for pipe threads for tubes and fittings where pressure-tight joints are made on the threads (metric dimensions).

BS EN 10226-1:2004
Pipe threads where pressure tight joints are made on the threads. Part 1 Taper external threads and parallel internal threads. Dimensions, tolerances and designation

BS EN 1092-1:2007
Flanges and their joints. Circular flanges for pipes, valves, fittings and accessories, PN designated. Part 1 Steel flanges

BS EN 1092-2:1997
Flanges and their joints. Circular flanges for pipes, valves, fittings and accessories, PN designated. Part 2 cast iron flange

T42 LOCAL HEATING UNITS

PART 1 SYSTEM OBJECTIVES

100.030 SYSTEM DESCRIPTION
Provide and install new electric ceramic radiant heaters at high level within the male and female changing rooms, as per the model specified on the tender drawing.

The contractor shall include for the necessary fused spur and power wiring to serve each heater from the local distribution board.

The electric heaters are to be supplied complete with 24 hour and 7day time control.

PART 3 SPECIFICATION CLAUSES SPECIFIC TO T42

300.000 PRODUCTS/MATERIALS

310.000 WORKMANSHIP

310.010 INSTALLATION OF SPACE HEATERS:
- Install space heaters in accordance with manufacturer's recommendations.

U19 VENTILATION (SELF CONTAINED SPECIFICATION)

100.000 SYSTEM DETAILS

100.010 SYSTEM DESCRIPTION
For all works associated with the new ventilation installation, the contractor shall be responsible for providing all elements of necessary builderswork to include forming of holes, making good of holes and fire stopping and local decoration. If required, the contractor shall include for providing a new concrete base for the new air handling unit to be sited upon.

The contractor shall also be responsible for the repositioning of existing smoke detectors to facilitate the new ventilation installation, and the repositioning of any existing light fittings to facilitate the installation.

The contractor shall be responsible for removing the existing light fittings from the store, where the new twin extract fan shall be located, and for replacing these lights with new 2D fittings which can be wall mounted if needed. The contractor shall be responsible for the wiring of the new lights to the existing circuits.

The contractor shall be responsible for the provision of new rotary isolators, sub-mains/power wiring from local distribution board to the new air handling unit and toilet extract fan. The contractor shall also be responsible for all control wiring.

Gym Ventilation
Provide and install an external heat recovery ventilation system to serve the gymnasium. The system shall comprise of an external air handling unit, floor mounted in the approximate location indicated on the tender drawing. The air handling unit shall be a stacked, heat recovery air handling unit, which shall have supply and extract ductwork entering the building via the existing plant room/store before routing at high level to serve the gym, as indicated on the tender drawing. The air handling unit shall have an integral plate heat exchanger which shall be supplied complete with face and bypass dampers and a direct gas fired heater battery to provide tempered fresh air in the winter. The air handling unit filters shall be a G4 grade on the supply and on the exhaust. Refer to VES quote ref. Q1178297.

Supply air ductwork serving the gym shall convert from galvanised mild steel as it exits the plantroom to fabric ductwork as manufactured by K E Fibertec. K. E. Fibertec have produced a design and quotation for the project, utilising semi-circular fabric ductwork to maximise headroom within the gymnasium, refer to quote ref. 3205351. The fabric ductwork will provide an even distribution of air throughout the gym due to the design of it’s perforations.

Extract ductwork serving the gym shall route from the plantroom and run down the side of the gym immediately adjacent to the entrance (to prevent cross-overs with the restricted height of the building). Exhaust air grilles shall be fitted into the underside of the ductwork, and be supplied complete with integral opposed blade dampers, again to minimise impeding the restrictive headroom in the gym.

The ventilation to the gym shall be time clock controlled, and the air handling unit shall be inverter driven, capable of operating at minimum turn-down ratio to ensure that the gym is continually ventilated when not in use

All extract ductwork and some supply ductwork shall be carried out in galvanised mild steel.

Provide and install thermal insulation on the internal supply and extract ductwork within the plantroom/store and where ductwork routes externally, including VentureClad or similar weatherproof covering on the external ductwork.

The new air handling unit shall be supplied complete with attenuators (if necessary) capable of maintaining external ambient noise levels at NR45.

The air handling unit shall be provided with a fire alarm interface as part of this contract, to shut-down

the AHU in the event of a signal from the fire alarm panel.

Toilet/Changing Room Extract System
Provide and install a new toilet/changing room extract ventilation system to ventilate the existing toilets, changing rooms and showers. The system shall comprise of an in-line duct mounted twin extract fan unit which shall be located in the room adjacent to the male changing rooms (as indicated on the tender drawing).

Provide and install duct mounted extract grilles to exhaust the stale air from the toilets/changing rooms etc. into the ductwork system.

Provide and install a new polyester powder coated, weather louvre within the external wall, for the discharge of the stale exhaust air from the toilets. The weather louvre shall be supplied complete with a bird guard.

All ductwork shall be carried out in galvanised mild steel, and each extract grille shall be supplied complete with an integral opposed blade damper for balancing purposes.

The new toilet extract fan shall (if required) be supplied complete with an attenuator capable of maintaining noise levels on the discharge side of the fan at NR45.

Control of the toilet extract fan shall be via a timeclock with auto-changeover provided by the compatible control panel to be supplied with the fan unit.

100.020 DESIGN PARAMETERS
- Toilets/Changing rooms/Showers 10 air changes per hour
- Gym 70 people @ 20l/s/p

100.030 CONTROL REQUIREMENTS
Under normal mode of operation all heat recovery AHUs and extract fans shall be time clock controlled to operate during the hours of operation of the building. The contractor shall be responsible for the provision of all power and control wiring associated with the installation of the new air handling unit and toilet extract fan.

200.000 PLANT AND EQUIPMENT

200.001 PRESSURE EQUIPMENT DIRECTIVE/PRESSURE EQUIPMENT REGULATIONS:
All equipment and assemblies which fall within the scope of the Pressure Equipment Directive (PED) 97/23/EC, implemented in the UK through the Pressure Equipment Regulations 1999, must be tested by the manufacturers, and be certified as compliant with the Directive. Such compliance shall be evidenced by displaying the appropriate CE Mark on the equipment and assemblies.
Only relevant equipment and assemblies certified as compliant will be permitted under this specification, and any substitution put forward must also be compliant with the Directive.

200.010 AIR HANDLING UNITS:
- Type External heat recovery
- Application mechanical ventilation to gym
- Manufacturer and reference VES Andover
  - Or approved equivalent
  - No. Off 1
- Double skin unit.
- Panel material
  - Manufacturer's standard.
- Casing Finish
  - Manufacturer's standard.
- Air handling unit construction
  - General construction
    Construct unit to withstand maximum fan static pressure without plastic deformation.

- Casing Insulation
  Ensure insulation complies with BS 476-7.
  Ensure insulation is fixed securely to panel, and protected to prevent migration of fibre into air flow.
  - Insulation to provide
    - thermal treatment.
    - acoustic treatment.
    - Insulation material
      Provide insulation that is inorganic, vermin proof and non-hygroscopic.
      - Mineral fibre
        - Thickness (mm) 25 minimum
- Framework
  Ensure framework is rigid enough to prevent distortion during transportation and after final assembly on site.
- Base
  Provide continuous channel base

- Air handling unit access
  Provide access openings and covers complete with opening devices, and sealed to prevent air leakage. Ensure seals are designed for normal maintenance operations for a minimum of 10 years.
- Fan
  - Centrifugal, double inlet double width
    - Forward curve.
- Motor
  - Electrical supply to BS 7697
- Vibration isolation required
- Fan section
  Provide frame for motor and fan and comply with fire regulations.
  Ensure frame is isolated from casing.
  - Mount motor
    - internally.
- Panel filter
  Ensure filter media is retained in frame.
  - Filter Media
    - Disposable - glass fibre with scrim.
    - Disposable - composite fibre materials.
  - Filter frames
    - Aluminium.
    - Light gauge mild steel with corrosion resistant coating.
- Heat recovery element

Installation

Ensure air is straightened as it leaves unit discharge.
Ensure ductwork connection is long enough to maintain the aerodynamic performance of the fan.
Seal panels around electrical cable and pipework service entry points to prevent air leakage.
Provide flexible cables between fan motor and local isolator.

200.020 CENTRIFUGAL FANS:

- Type External twin fan
- Application Toilet extract system
- Manufacturer and reference VES Andover Colourfan Twin Extract Acoustic
  - Select fans from Quality Assured firms registered under CAME scheme.
  - Or approved equivalent
- Bearings
- Casing
  - Single inlet single width.
  - Double inlet double width.
- Mounting
  - Channel frame.

- Drain - fit 20mm drain connection at lowest point of scroll.
- Inspection doors - fit air-tight doors in scroll and cover.
- Materials
  - Construct casing entirely rigid and free from drumming under operating conditions.
- Drive
  - Direct drive.
- Electrical safety to BS EN 60335-2-80.
- Motor
  - Electrical supply to BS 7697
- Accessories
  - Vibration isolation
  - Control panel
- Testing
  - Where fans approved under CAME scheme are used provide certified data for type.
  - Where fans are not approved under CAME scheme provide results of aerodynamic performance tests in accordance with BS ISO 14695.

200.070 ATTENUATORS:
- Type Inline to meet required noise criteria
- Application roomside and atmosphere side of air handling unit and extract fan
- Manufacturer and reference Caice
  - Or approved equivalent
- Rectangular attenuator.
- Fire properties
  Use non-flammable adhesives. Ensure that all insulating materials and coverings are
  - non-combustible material covered with a material that complies with flame spread requirements of BS 476-7, Class 1.
  - Class O surface rating of Building Regulations.
- Infill
  Provide infill that is inert, fire proof, inorganic, vermin proof, non-hygroscopic.
- Casing
  - Construct casing to DW 144.

200.080 GRILLES AND DIFFUSERS:
- Application supply and exhaust diffusers
- Manufacturer and reference Waterloo
  - Or approved equivalent

200.090 PLANT AND EQUIPMENT WORKMANSHIP:
Install all plant and equipment in accordance with manufacturer's instructions.

300.000 DUCTLINES AND ANCILLARIES

300.010 DUCTWORK FABRICATION:
Prepare fabrication drawings and carry out fabrication of ductwork in accordance with DW 144 and DW 154 as appropriate.

300.020 DUCTWORK DIMENSIONS:
Sizes of ductwork are internal dimensions. Where applicable make allowance for any internal lining.

300.030 INSTALLER SELECTION:
- Use a member of the HVCA specialising in the trade of manufacturing and installing ductwork.

300.040 DUCTWORK AND FITTINGS:
Application supply and extract ventilation
- Design Information
  Supply ductwork in accordance with classification in DW 144 Table 1.
  Ductwork Classification and Air Leakage limits
  - Low pressure - Class A - Positive.
  - Low pressure - Class A - Negative.

- Ductwork air leakage testing
  - Carry out ductwork air leakage testing on high pressure ductwork in accordance with DW 144 as procedures set out in DW 143.
  - Test medium pressure ductwork in accordance with DW 144, A5.
  - Test low pressure ductwork
  - Testing plant items, DW 144, Part 8, A.8.
- Plant connections.
  Make connection between air handling assembly and ductwork system in accordance with DW 144.
- Flanged connections.
  Provide bolted flanged joints for connecting ductwork to flanged items of plant, builder's work frames and where removable sections of ductwork are required.

300.050 DUCTWORK TO DW 144:
- Application supply and extract ventilation
- Material, DW 144 Part 2 - Standards, paragraph 7.
  - Zinc-coated steel.
  - Mild steel.
- Protective finishes - DW 144 Part 7 - General, Section 27.
  - Galvanizing after manufacture.
- Construction
  - Rectangular ductwork - DW 144 Part 3.
  - Circular ductwork - DW 144 Part 4.
    - Spirally wound.
    - Straight seamed.

300.060 FLEXIBLE DUCTS:
- Application final connections to grille/diffusers
- Supply and fasten flexible duct connections as DW 144 Part 7 Section 25. Use flexible duct connections in applications listed in DW 144 paragraph 25.1.
- Material
  - Metal
    - Coated steel.
    - Stainless Steel.
    - Aluminium.
  - Fabric
    - P.V.C/Polyester laminate.
    - Aluminium/Polyester laminate encapsulating high tensile steel wire helix.

300.080 ACCESSORIES - METAL DUCTWORK:

- Access openings
  - Provide access openings in accordance with DW 144 Part 7 Section 20.
  - Provide access for cleaning in accordance with DW 144 Part 7, paragraph 20.8 and
    - Appendix M Table 25 Level 2.
    - Appendix M Table 25 Level 3.
- Provide hangers and supports throughout in accordance with DW 144 Part 6.
- Use proprietary system of ductwork supports
- Regulating dampers
  Provide regulating dampers in accordance with DW 144 Part 7 Section 21.
  - Locations as shown on drawings
  - Function
    - Balancing damper.
- Supply and install fire dampers in accordance with DW 144 Part 7 section 22.
  - Location as shown on drawings.
  - Fusible links
    Supply spare fusible links for fire dampers. Supply links to fuse at (ºC)

300.100 DUCTWORK WORKMANSHIP:

Install ductwork in accordance with DW 144, and DW 154 as appropriate. Ensure that there are no sharp edges or corners on cut edges on ductwork, flanges and supports. Arrange ductwork to drain any entrained moisture and ensure the lapping of joints minimises moisture leakage.
Connection to builder's work. Comply with DW 144 Part 7 Section 28.
Space supports in accordance with DW 144 Part 6 or DW 154 Part 5 as appropriate.

- Internal cleanliness
  - Provide the level of cleanliness and protection as defined in HVCA document DW/TM2.
    - Basic.
- Enclose ducts passing through building elements, (walls, floors, partitions, etc.) within purpose made sleeves. Cut sleeves of the same material as the duct and pack with mineral fibre or similar non-flammable and fire resistant material to form a fire/smoke stop of adequate rating and to prevent air movement and noise transmission between duct and sleeve.
- Provide test holes in ductwork system to allow complete testing and balancing of system in accordance with CIBSE Commissioning Code A.
- Site drill test holes on site in accordance with DW 144 Part 7 Section 20.6.
- Provide holes in metal ductwork, in accordance with DW 144 Part 7, paragraph 20.7, to accommodate thermostats, humidistats and other control sensors in positions and sizes indicated on drawings.
- Install sensors and test points in plastics ductwork to suit specialist control and sensing equipment in positions and fixing configurations shown on drawings.
- Fit sensors, damper motors and other control equipment as indicated on drawings.
- Provide instrument connections where indicated on drawings.

500.000 THERMAL INSULATION

500.010 THERMAL INSULATION - MATERIALS:
- Application supply and extract office ventilation ductwork
- Thermal Insulation Sub-contractor

Standards

Comply in general with BS 5970. Description of terms as BS 3533.

Thermal conductivity

Ensure values are in accordance with BS EN 12664, BS EN 12667, BS EN 12939 or BS EN ISO 8990.

Fire rating

Employ materials that comply with BS 476-4, non-combustibility test, or obtain a Class 'O' fire rating to Building Regulations.

When finished, comply with BS 476-7.

- Class 1 spread of flame

Material
- Mineral fibre duct insulation
  - Rigid
  - Flexible
  - Lamella
  - Finish
    - Reinforced aluminium foil.
- Adhesives.

Comply with the recommendations of clause 8.2 of BS 5970, section 2 for insulation bonding adhesives, lagging adhesives, facing and film attachment adhesives.

- Protection PIB Sheeting or approved equivalent to all external thermally insulated ductwork

500.012 CALCULATION OF INSULATION THICKNESS - BUILDING REGULATIONS (ENGLAND AND WALES):
Provide insulation of thickness conforming with the values given in the tables below. These figures are derived from the requirements of the Building Regulations (England and Wales) Part L Approved Documents, and the calculation methods given in BS EN ISO 12241.

500.018 ENVIRONMENTAL THICKNESS ON DUCTWORK, BUILDING REGULATIONS:
Environmental insulation thickness for ductwork, in accordance with the requirements of the Building Regulations (England and Wales) Part L2 Approved Documents.

Application	Heated duct	Dual purpose	Cooled duct
Environmental thickness of mineral wool insulation (mm)	40	50	50
Environmental thickness of phenolic foam insulation (mm)	25	35	35
Environmental thickness of nitrile rubber insulation (mm)	40	62	62

- The above thicknesses for nitrile rubber insulation relate to Class 0 rated insulation. The thicknesses may vary for other ratings.

500.020 THERMAL INSULATION WORKMANSHIP:
Carry out thermal insulation work using one of the scheduled firms employing skilled craftsmen conversant with class of work.
Do not apply thermal insulation until installation has been fully tested and all joints proved sound.
Ensure all materials are kept dry.
Insulate each unit separately. Do not enclose adjacent units together.

Apply insulants, facings, coatings and protection strictly in accordance with manufacturer's instructions.
Neatly finish joints, corners, edges and overlaps and, where possible, arrange overlaps to fall on blind side.
Ensure overlaps are neat and even and parallel to circumferential and longitudinal joints.

600.000 COMMISSIONING

600.010 COMMISSIONING REQUIREMENTS:
- Clean ductwork before plant is first run, using access openings in ductwork.
- Put system to work and demonstrate that specified duties are attained plus or minus:
  - 10%
- Carry out commissioning of installations in accordance with the procedures, checks and tolerances given in the BSRIA Application Guide for air systems to achieve the standards set in the CIBSE Commissioning Codes.
- Carry out checks and procedures as detailed in CIBSE Commissioning Code A, Section A1.
- Set to work and regulate air distribution systems in accordance with CIBSE Commissioning Code A, Section A2.
- Ensure that the control system functions in accordance with the requirements specified in clause 100.030.
- Keep a systematic record of commissioning results.

BS APPENDIX

BS 3533:1981
Glossary of thermal insulation terms

BS 476-24:1987
Fire tests on building materials and structures. Part 24 Method for determination of the fire resistance of ventilation ducts

BS 476-4:1970
Fire tests on building materials and structures. Part 4 Non-combustibility test for materials

BS 476-7:1997
Fire tests on building materials and structures. Part 7 Method of test to determine the classification of the surface spread of flame of products

BS 5970:2001
Code of practice for thermal insulation of pipework and equipment in the temperature range of -100°C to +870°C

BS 7671:2008
Requirements for electrical installations. IEE Wiring Regulations. Seventeenth edition

BS 7697:1993
Nominal voltages for low voltage public electricity supply systems

BS EN 10327:2004
Continuously hot-dip coated strip and sheet of low carbon steels for cold forming. Technical delivery conditions

BS EN 12664:2001
Thermal performance of building materials and products. Determination of thermal resistance by means of guarded hot plate and heat flow meter methods. Dry and moist products of medium and low thermal resistance

BS EN 12667:2001
Thermal performance of building materials and products. Determination of thermal resistance by

means of guarded hot plate and heat flow meter methods - Products of high and medium thermal resistance

BS EN 12939:2001
Thermal performance of building materials and products. Determination of thermal resistance by means of guarded hot plate and heat flow meter methods - Thick products of high and medium thermal resistance

BS EN 13779:2007
Ventilation for non-residential buildings. Performance requirements for ventilation and room-conditioning systems

BS EN 15423:2008
Ventilation for buildings. Fire precaution for air distribution systems in buildings

BS ISO 14695:2003
Fans for general purposes. Method of measurement of fan vibration

U60 AIR CONDITIONING UNITS

100.000 SYSTEM DETAILS

100.010 SYSTEM DESCRIPTION
For all works associated with the new comfort cooling installation, the contractor shall be responsible for providing all elements of necessary builderswork to include forming of holes, making good of holes and fire stopping and local decoration.

The contractor shall be responsible for the provision of new rotary isolators, fused connection units and sub-mains/power wiring from local distribution board to the new external condenser and internal units. The contractor shall also be responsible for all control wiring.

Provide and install a new VRF type system to provide supplementary cooling to the gym, as indicated on the tender drawing. System to include indoor and outdoor units, BC controllers, refrigerant and condensate pipework and condensate lift pump.

Provide and install ceiling mounted type units to serve the gym. The VRF system shall operate using refrigerant R410a or R32 and the associated matched outdoor unit(s) are proposed to be located at ground level on paving slabs, or wall mounted on a Unistrut frame.

The precise location of the outdoor condensing unit shall be agreed on site.

Condensate from the units shall be routed to discharge into the nearest soil pipe or rainwater pipe, via a waterless trap connection. All condensate pipework shall be carried out in plastic tube. The contractor shall allow for the supply and installation of condensate lift pumps where deemed necessary.

Provide and install wall mounted controllers to each room as part of this contract to control the heat pump indoor units.

Provide and install refrigerant pipework using soft copper to BS 2871 Part 2. All refrigerant pipework shall be insulated using 13mm Class ‘O’ Armaflex insulation and shall be neatly clipped to cable tray, installed specifically for refrigerant pipework distribution.

The contractor shall comply with the manufacturers recommendations in terms of maintenance space and airflow requirements when installing the outdoor units.

The contractor shall allow for the servicing of the 3 No. existing cooling installations as part of this contract.

The contractor shall allow for the repositioning of 2 No. existing indoor units to facilitate the new supply ductwork installation. Repositioning to include all refrigerant and condensate pipework and power/control wiring.

100.020 DESIGN PARAMETERS
Summer external conditions: 29.3°C db/20.7°C wb
Summer Internal temperature: 21 - 23°C ± 2°C
Winter Internal temperature: 20 - 21°C ± 2°C

100.040 SYSTEM DRAWINGS
As clause A11.110

200.000 PLANT AND EQUIPMENT - ALL AIR CONDITIONING

200.001 PRESSURE EQUIPMENT DIRECTIVE/PRESSURE EQUIPMENT REGULATIONS:
All equipment and assemblies which fall within the scope of the Pressure Equipment Directive (PED) 97/23/EC, implemented in the UK through the Pressure Equipment Regulations 1999, must be tested

by the manufacturers, and be certified as compliant with the Directive. Such compliance shall be evidenced by displaying the appropriate CE Mark on the equipment and assemblies.
Only relevant equipment and assemblies certified as compliant will be permitted under this specification, and any substitution put forward must also be compliant with the Directive.

PART 3 SPECIFICATION CLAUSES SPECIFIC TO U60

300.000 PLANT AND EQUIPMENT

300.110 PIPEWORK:
- Application DX refrigerant systems
- Seamless, round copper tube to BS EN 12449.
- Seamless, round copper capillary tube to BS EN 12450.
- Jointing
  - High temperature solder.
  - Manipulative compression (flared).
  - Manipulative compression (flared) only at connection to equipment.
- Support
  Support all pipework and controls cabling throughout their length using cable tray, firmly fixed to the building fabric.
  - Perforated cable tray
    - Flanged.
  - Fittings
    Use factory made fittings throughout of same material type, pattern, finish and thickness as tray.
- Finish

300.120 DRAINAGE PIPEWORK
- Type condensate drainage from DX equipment

Provide condensate drainage pipework from all units to drain.
- Unplasticised PVC to BS EN 1452.
- Provide tundish and air break at units.
- Provide trap - depth minimum 1.5 times negative pressure on inlet and 0.5 times negative pressure at discharge.

300.130 PIPEWORK INSULATION
- Application all new DX refreigerant pipework

Insulate entire length of pipework for thermal insulation and to avoid contact between copper and galvanising of support tray.
- Closed cell nitrile rubber preformed flexible sections
  - CFC free.
  - Fire rating (class)
  - Install un-split wherever possible.
  - Use manufacturer's standard glue for jointing.
  - Ensure vapour barrier is maintained on
    - all pipework.
    - suction pipe only.
- Protection for outdoor insulation
  - Paint
    - Manufacturer's standard colour.
    - Paint chlorinated rubber colour
  - Colour
  - Wrap fittings and valves with same insulation as pipework.

310.000 PLANT AND EQUIPMENT WORKMANSHIP

310.010 PLANT AND EQUIPMENT INSTALLATION:
Install equipment in accordance with manufacturer's recommendations.

310.020 REFRIGERANT PIPEWORK INSTALLATION:
Arrange all exposed pipe runs to present neat appearance, parallel with other pipe or service runs and building structure.
Ensure all vertical pipes are plumb or follow building line.
Space pipe runs in relation to one another, other services runs and building structure, allow for specified thickness of thermal insulation and ensure adequate space for access to pipe joints, etc.
Take precautions to prevent the discharge of refrigerant gases to atmosphere.

320.000 COMMISSIONING

320.010 COMMISSIONING REQUIREMENTS:
Application
Put the system to work.
- Demonstrate that specified air quantities are attained plus or minus:
  - 10%
- Ensure that the control system functions in accordance with the requirements specified in clause 100.030.
- Keep a systematic record of commissioning results.

BS APPENDIX

BS 7697:1993
Nominal voltages for low voltage public electricity supply systems

BS EN 1057:2006+A1:2010
Copper and copper alloys. Seamless, round copper tubes for water and gas in sanitary and heating applications

BS EN 12449:1999
Copper and copper alloys. Seamless, round tubes for general purposes
BS EN 12450:1999
Copper and copper alloys. Seamless, round copper capillary tubes

BS EN 16147:2011
Heat pumps with electrically driven compressors. Testing and requirements for marking of domestic hot water units

BS EN 60335-2-40:2003+A2:2009
Specification for safety of household and similar electrical appliances. Part 2-40 Particular requirements for electrical heat pumps, air-conditioners and dehumidifiers

BS EN 779:2002
Particulate air filters for general ventilation. Determination of the filtration performance

APPENDIX 1 TENDER SUMMARY

CLIENT: CORBY BOROUGH COUNCIL

PROJECT: SAXILBY BOXING CLUB, CORBY
MECHANICAL & ELECTRICAL ENGINEERING SERVICES INSTALLATIONS

Item:	Element:	Cost:
1.0	**Preliminaries and Site Set Up**	**£**
	SUB-TOTAL:	**£**
2.0	**Strip Out:**	
2.1	Strip out and dispose of existing warm air plant and ancillaries	£
2.2	Strip out and dispose of existing ventilation plant, ductwork etc.	£
	SUB-TOTAL:	**£**
3.0	**Gas:**	
3.1	Strip back existing gas from warm air heater	£
3.2	New gas supply/pipework to new gas heater in AHU	£
3.3	Gas solenoid valve, isolating valve etc.	£
	SUB-TOTAL:	**£**
4.0	**Heating:**	**£**
4.1	New electric radiant heaters	£
4.2	Controls for radiant heaters	£
	SUB-TOTAL:	**£**
5.0	**Mechanical Ventilation Installation:**	
5.1	External heat recovery air handling unit	£
5.2	Twinfan extract unit	£
5.3	Fabric ductwork provision/installation	£
5.4	Galvanised ductwork installation inc. toilet extract	£
5.5	Grilles, door transfer grilles & louvres	£
5.6	Attenuators (if required)	£
5.7	Thermal Insulation	£
5.8	Controls and wiring	£
	SUB-TOTAL:	**£**
6.0	**Comfort Cooling Installation:**	
6.1	VRF Heat pump Indoor and outdoor units	£
6.2	Refrigerant Pipework & Thermal Insulation	£
6.3	Controls & wiring	£
6.4	Condensate Pipework System and lift pump	£
6.5	Repositioning of 2 No. existing units inc. pipework/electrics etc/	£
6.6	Servicing of existing comfort cooling units	£
	SUB-TOTAL:	**£**
7.0	**Electrical Works:**	
7.1	Replacement lighting in Store	£
7.2	Repositioning of existing light fittings & smoke detectors	£
7.3	New power supplies, cables and control wiring	£
	SUB-TOTAL:	**£**

8.0	**Builderswork:**	**£**
8.1	New holes for refrigerant pipework, condensate, ductwork installation and louvre	£
8.2	Making good including firestopping	£
7.3	Local re-decoration	£
	SUB-TOTAL:	**£**
9.0	**Testing & Commissioning**	**£**
10.0	**Operation & Maintenance Manuals**	**£**
11.0	**As Installed Drawings**	**£**
TENDER TOTAL:		**£**

FINAL TOTAL COST IN WORDS:

SIGNATURE:

COMPANY:

DATE:

PROPOSED ALTERNATIVE SUPPLIERS/MANUFACTURERS: