

ALFRED H KNIGHT JKL WASTE TREATMENT ENCLOSURES AND STORE

**MECHANICAL & ELECTRICAL
SPECIFICATION**

PREPARED BY:



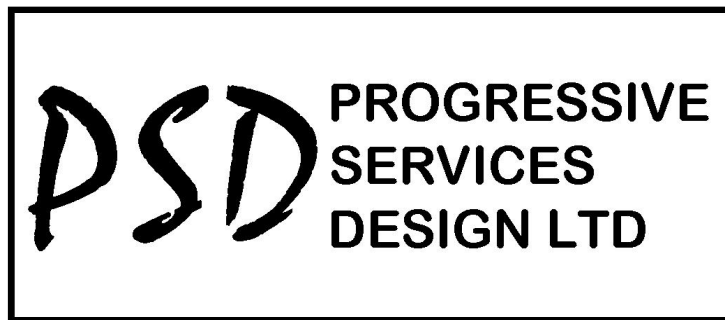
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**Reference:
CF/SPO/EF/2273_Contract Issue C2**

Date : September 2025



Amendment Record

<u>Issue</u>	<u>Date</u>	<u>Amendment Details</u>
C1	September	CONTRACT ISSUE
C2	September	CONTRACT ISSUE

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Signed By : S Oliver

Dated : September 2025

A10 PROJECT PARTICULARS

110.000 THE PROJECT

- Particulars of the project as a whole are.
- Given in Main Contract Preliminaries.

120.000 THE EMPLOYER: Alfred H Knight

140.000 DESIGN TEAM:

Architect MDG
Cleveland House
41 Shaw St
Liverpool
L7 1HL

Building Services Engineer Progressive Services Design Ltd,
21 Argyle Street
Birkenhead,
Wirral
CH41 1AD.

170.000 SUBCONTRACTOR:

The term Subcontractor is used throughout this specification and is deemed to be synonymous with the term Sub trader and the like which may be used elsewhere within the Contract Documentation.

180.000 THE SUBCONTRACT:

This document has been prepared using the Common Arrangement of Sections and this Subcontract comprises the following.

- Mechanical Services Installations.
- Public Health Service Installations.
- Rainwater Pipework Installation.
- Electrical Services Installations.

The Engineering Services Installations covered by this Subcontract comprise.

- Mechanical Services Installations.
- Electrical Services Installations.
- Rainwater Pipework Installation

A11 TENDER AND CONTRACT DOCUMENTS

110.000 THE TENDER DRAWINGS:

- The tender drawings are as detailed within this specification.

140.000 PRE-CONSTRUCTION INFORMATION

- Details of the Pre-tender health and safety plan are included in the Main Contract Preliminaries.

150.000 INSPECTION:

Any drawings and other documents relating to the Contract generally maybe inspected, by appointment.

A12 THE SITE EXISTING BUILDINGS

110.000 THE SITE

The site is described in the

- Main Contract Preliminaries.

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 ensuring 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 health and safety plan and 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.

A13 DESCRIPTION OF THE WORKS

110.000 THE MAIN CONTRACT WORK:

The main contract work is described in

- Main Contract Preliminaries.

140.000 THE SUBCONTRACT WORK:

- Undertake the detailed design.
- Design, Supply, install, balance, test, and commission the building services installations defined in the specification.
- Guarantee and maintain the complete installation for a period of 12 months from practical completion.

150.000 WORK BY OTHERS AND CO-ORDINATION OF TRADES:

Allow for co-ordinating the subcontract works with the works of other trades and installations which may be on site during the period of the subcontract.

200.000 GENERAL REQUIREMENTS

210.000 COMMON DESIGN CRITERIA:

The criteria listed in the following clauses applies to all Sections included in the Contract unless specified otherwise.

220.000 OUTSIDE CONDITIONS:

-5 Degrees

230.000 INSIDE CONDITIONS:

22 Degrees

240.000 ELECTRICAL SUPPLY:

415V 50Hz

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°C dry bulb.
 - Maximum conditions of 40°C dry bulb and 50 per cent relative humidity.
 - Supply voltage approximately sinusoidal
- Ensure all plant, motors, starters, and ancillary equipment etc. are suitable for operation at full capacity in the following conditions.
 - Height above sea level (m)
 - Maximum ambient temperature
 - Average (32°C)
 - Peak (40°C)
 - Minimum ambient temperature
 - Average (-5°C)
 - Lowest (-10°C)
 - Atmospheric dust condition, as defined in BS ISO 5011 (mg/m³)
 - Ensure the following noise values are not exceeded in:
 - Living Rooms – NR25 /NR30

- Bedrooms – NR25
- Bathrooms – NR35
- Common Circulation – NR35
- External 45dBA at 3m

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.

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 6651. Ensure all equipment meets the requirements of the appropriate electromagnetic compatibility standard.

Particular equipment as follows.

- Household electrical appliances, portable tools and similar apparatus.
 - BS EN 55014.
- Fluorescent lamps and Luminaires
 - BS EN 55015.
- Information technology equipment
 - BS EN 55022.
- Mains signalling
 - BS EN 50065.
- Broadcast receivers and associated equipment
 - BS EN 55013 and BS EN 55020.
- Other equipment to generic standards
 - Emissions
 - Domestic, commercial and light industrial
 - BS EN 61000-6-3.
 - BS EN 55014-1.
 - Immunity
 - Domestic, commercial and light industrial
 - BS EN 61000-6-1.
 - BS EN 55014-2.
- Ensure all apparatus covered by the Wireless Telegraphy Act 1998 meets regulations issued by the Radio communications Agency and the Office of Communications.
- Ensure all equipment and systems meet the requirements of BS 6328, BS 6701 and BS EN 41003.
- Ensure that all cable installations meet the minimum guidance separation in EMC of Installations and Recommended Cable Separations published by the ECA.

280.000 PERFORMANCE CHARACTERISTIC DETAILS:

Details of the equipment as selected for inclusion into the Works and shall include, in a format to be agreed, the following information.

- Plant item description, reference identification and serial number.
- Electrical input rating - kVA, Volts, Phase.
- Operating mode - duty, standby, generator etc.
- Starting characteristics - starter type, current, starts/hour and starting time.
- Performance characteristics - (full load current and power factor).

- Noise level.
- Weight.
- Any equipment passing through external cavity wall such as ducting must be A1 or better classification.

290.000 SOFTWARE:

Obtain on behalf of the end user all appropriate licences, permissions, copyright waivers, rights of use and the like from the owners of the software rights.

Ensure that the end user is properly registered with the software supplier for support and appropriate updating.

Ensure that application software is written in compliance with BS 7649.

BS APPENDIX

BS 6328-8.1:2000

Apparatus for connection to private circuits run by certain public telecommunication operators. Part 8.1 Specification for apparatus for connection to digital circuits with interfaces according to CCITT G-series Recommendations. Section 8.1: G.703 services at 2 04

BS 6651:1999

Code of practice for protection of structures against lightning

BS 6701:2004

Telecommunications equipment and telecommunications cabling. Specification for installation, operation and maintenance

BS 7649:1993

Guide to the design and preparation of documentation for users of application software

BS EN 41003:1999

Particular safety requirements for equipment to be connected to telecommunications networks.

BS EN 60529:1992

Specification for degrees of protection provided by enclosures (IP code)

A20 THE CONTRACT/SUBCONTRACT

110.000 MAIN CONTRACT PARTICULARS:

The Main Contract particulars are given in.

- Main Contract Preliminaries.

120.000 THE SUBCONTRACT CONDITIONS:

- The Subcontract conditions will be.

The subcontract conditions will be domestic subcontract standard form incorporating sub-contractors/specialist design. (Main contractor to confirm).

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.

The scope of the works shall include the design, procurement, installation, commissioning and certification of all the electrical, fire alarm, access control, CCTV, data, lighting, electric heating, M&E Infrastructure, smoke ventilation, sprinkler, wet and dry riser, ventilation, soil and waste, plumbing installations, rainwater and car park ventilation.

120.000 TENDERING PROCEDURE:

Tendering procedure is in accordance with the principles of the

- 'Code of Procedure for Single Stage Selective Tendering' 1996.

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.

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.

331.000 A SCHEDULE OF RATES:

A fully priced schedule of rates must be submitted.

- Within one week of request.
- The Schedule must include rates for all significant items of work.

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.

The sub-contractor programme shall conform to the Legacie main contract

programme included within the tender documents, Legacie programme will take precedence.

370.000 TENDER STAGE METHOD STATEMENTS:

- Risk Assessments and Method statements must be submitted to LCL two weeks before any works commence for approval and verification, 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.

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.

- With the Tender.

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.

- With the Tender.

Subcontractor must provide written and electronic QA QITP and inspection records as the works proceed and they must comply with Legacie Project Quality Plan.

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 sub-contractor's 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.

500.000 SUB-SUBLETTING

520.000 SUB-SUBCONTRACTORS:

Where the Subcontractor proposes to sublet any portion(s) of the Subcontract Works a list must be submitted

- with the Tender

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

110.000 MAIN CONTRACT PRELIMINARIES:

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

120.000 DEFINITIONS:

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

CIBSE, IOP and BSRIA Technical Publications

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
- Any subsequent versions and amendments specifically referred to in the project documents.

140.000 MANUFACTURERS' REFERENCES:

Manufacturers' references are those current at

References mean the particular product as specified in the manufacturer's technical literature current at that time.

150.000 TENDER DRAWINGS:

Tender drawings mean drawings listed in this specification.

- Architects Drawings

165.000 DETAILED DESIGN/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 manufacturing 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.

All drawings whether they be initial outline, detailed design or installation drawings must be uploaded to The Project which is an online sharing platform for the design team members. Under no circumstances are drawings to be e-mailed direct to any team member for the purpose of approval. All approvals are via The Project only.

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).

180.000 CONTROLS LOGIC DIAGRAMS:

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

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.

183.000 PLANTROOM SCHEDULES AND SCHEMATICS:

Frame the following under glass and hang in each plant room and any other appropriate location.

- Schematic drawings of circuit layouts showing identification and duties of equipment, numbers and locations, controls and circuits.
- Valve schedules in the form of printed sheets showing the number, type, location, application/service and symbol, and normal operating position of each valve.
- Location of mechanical and electrical plant and equipment items.
- First aid instructions for treatment of persons after electric shock.
- Location of isolating switch for electricity supply.
- Location of main incoming gas valve serving gas meter.
- Emergency operating procedures and telephone numbers for emergency call out service applicable to any system or item of plant and equipment.
- All other items required under Statutory or other regulations.

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.

200.000 DOCUMENTS PROVIDED ON BEHALF OF THE EMPLOYER**210.000 MAIN CONTRACT PRELIMINARIES:**

Conditions given in Main Contract Preliminaries under the heading 'Documents provided on behalf of Employer' apply to documents relating to this Subcontract.

300.000 DOCUMENTS TO BE PROVIDED BY SUBCONTRACTOR**310.000 DESIGN AND PRODUCTION INFORMATION:**

- Design and detailing of the work and provide complete production information (including, as appropriate, fabrication/installation drawings, design calculations, specifications, etc.) based on the drawings, this specification and other information provided, liaising with the CA, Planning Supervisor, Contractor and others as necessary to help ensure co-ordination of the work with related building elements and services.
- Thermal modelling is to be undertaken with CIBSE TM52 and TM59 calculations undertaken, the building is to be designed to satisfy the criteria of the calculations and a report issued to show these criteria have been met.
- Request additional information as necessary from the CA and/or Contractor and provide information as necessary in time to meet the programme.
- Submit sufficient copies of the design/production information to the Contractor (or CA if the Contractor has not been appointed). The Contractor (if he has been appointed) will check the information and submit his comments to the CA.
- The CA will record his comments and those of the Planning Supervisor and return to the Contractor (or Subcontractor if Contractor has not been appointed).
- Make any necessary amendments without delay. Unless and until it is confirmed

that resubmission is not required, resubmit for further checking and comment, and incorporate any necessary amendments all as before.

- If submitted design/production information differs from the requirements of the Subcontract documents each such difference must be the subject of a request for substitution or Variation, supported by all relevant information.
- Should any amendment required by the CA be considered to involve a Variation which has not already been acknowledged as a Variation by the CA, notify the Contractor and/or CA without delay and in any case within 7 days, and do not proceed with ordering, fabrication, or fixing until subsequently instructed. Claims for the extra cost of such work, if made after it has been carried out, may not be allowed.
- Submit sufficient copies of the final design/production information to the Contractor (or CA if the Contractor has not been appointed for distribution to all affected parties.

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.

312.000 MAIN CONTRACT DESIGN AND PRODUCTION:

313.000 CO-ORDINATION OF ENGINEERING SERVICES:

Co-ordination of the Engineering Services Installations will be carried out.

- as part of the contract

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 2 copies

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

Final copies for distribution 2 copies

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

As-installed drawings

- Site record copy
- Record drawings
- Initial copies for comment (2no)
 - 2 preliminary sets for use during commissioning.
 - CAD Format on disc
 - One reduced set incorporated into each Operating and Maintenance manual.

Plant room schedules and schematics

- Initial copies for comment (2no)
- 2 preliminary sets for use during commissioning.
 - One framed set for plantrooms.
- CAD format on disc
- One reduced set incorporated into each Operating and Maintenance manual.

Provide drawings for construction in form and number as required by the Contractor.

330.000 PREPARATION OF DOCUMENTS:

- Prepare drawings to commonly recognised scales generally on A1 sheets and details and schedules on A4 sheets.
- Prepare electrical drawings in accordance with BS EN 61082.

340.000 SYMBOLS:

- Use symbols and line conventions in accordance with BS EN ISO 3766, BS EN ISO 7518 and BS EN ISO 11091 Recommendations for symbols and other graphic conventions.

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.

- Provide Builder's Work Information, appropriate for the design 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.
- 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.
 - Current design and installation drawings.

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.

The items of plant are to have a 12-month warranty, the contractors are to include the cost from the manufacturers for this extended warranty.

BS APPENDIX

BS 7671

Requirements for electrical installations. IEE Wiring Regulations. Latest edition.

BS EN 61082-1:1993

Preparation of documents used in electrotechnology. Part 1 General requirements.

BS EN 61082-2:1994

Preparation of documents used in electrotechnology. Part 2 Function-oriented diagrams.

BS EN 61082-4:1996

Preparation of documents used in electrotechnology. Part 4 Location and installation documents.

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

110.000 MAIN CONTRACT PRELIMINARIES:

- Management of the Works
applies to the whole of the Works, including this Subcontract. Comply with the requirements specified therein in so far as they apply to the Subcontract Works and co-operate with and assist the Main Contractor in complying with them generally.

120.000 CO-OPERATE:

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

In particular, the following works carried out by others will require close and careful liaison and co-operation.

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.
- 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.
- critical path network.
- Sub-contractor to provide labour histogram along with programme.
- Sub-contractor to provide weekly progress updates to Legacie Site Management.
- 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
 - 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.

- Establish a consistent numbering system to identify work items.
- Ensure the consistent use of mnemonics to identify all BMS components and devices.
- Ensure regular database and configuration back-ups are made throughout all stages of the commissioning process.
- Ensure attendance of all appropriate and responsible parties for interface pre-commissioning tests (interface between BMS and other plant items/systems).
- Provide detailed demonstration of the installation prior to PC.

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 2 weeks.

Give notice to

- CA.

170.000 STATUTORY AUTHORITIES:

Orders for the incoming services will be placed by

- The Main Contractor.

Liaise with the Statutory Authorities and provide any test notices required to ensure final connections are made in accordance with the requirements of the testing and commissioning programme.

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

110.000 MAIN CONTRACT PRELIMINARIES:

- Quality Standards/control

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.

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.

Supervision to be full time non-working qualified in their field and hold current CSCS supervisors' card and SMSTS trained.

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.

150.000 SETTING OUT FOR THE SUBCONTRACT WORK:

Setting out is all to be carried out by the sub-contractor, this will not be undertaken by the main contractor.

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 (Latest edition) 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 and Fire Officer.

- 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

- Gas Safety (Management) Regulations 1996

- Gas Safety (Installation and Use) Regulations 1998
- Building Regulations 2000 and current amendments
- Public Health Acts
- Electricity Acts
- Electricity at Work Regulations 1989
- Factories Act 1961
- Clean Air Act 1993
- The Clean Air (Arrestment Plant) (Exemption) Regulations 1969
- The Control of Pollution Act 1974 and Amendment Acts
- The Workplace (Health, Safety and Welfare) Regulations 1992
- The Construction (Design and Management) Regulations 2015
- The Construction (Design and Management) (Amendment) Regulations 2000
- The Health and Safety (Display Screen Equipment) Regulations 1992
- The Control of Substances Hazardous to Health (COSHH) Regulations 2002
- The Control of Substances Hazardous to Health (Amendment) Regulations 2003
- Control of Asbestos at Work Regulations 2002
- 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
- Working at Height Regulations 2005
- 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).
 - Latest Amendments.
 - 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 B1 Heating
 - Guide B2 Ventilation and air conditioning
 - Guide B3 Ductwork systems in buildings
 - Guide B4 Refrigeration and heat rejection
 - Guide B5 Noise and vibration control for HVAC
 - 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.

180.000 TYPE TESTS:

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

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. The commissioning is to be carried out in full accordance with Building Regulations, BSRIA and CIBSE guidelines.

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.
- Air Ductline 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
Provide a logbook and record all hours run.
- Carry out performance testing in both summer and winter conditions.
- Provide equipment to simulate loads to allow for the full testing of the air conditioning system(s) for the following areas.

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 defect's 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.
- The Subcontractor.

BS APPENDIX**BS 7671**

Requirements for electrical installations. IEE Wiring Regulations. Latest 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 Health and Safety 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.

150.000 PROTECTION OF SUBCONTRACT WORKS:

Check regularly the protection provided after installation of equipment and inform the Main Contractor if inadequate.

- 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.
- 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.

151.000 PROTECTION OF SUBCONTRACT WORKS:

Provide adequate and safe protection for all materials and products after installation. The responsibility for the installation and its protection is by the sub-

contractor until all works are commissioned and handed over.

The sub-contractor should take all necessary precautions to protect their installation through design, sequencing, cooperation and coordination with other trades and protective equipment. No claims will be entertained by Legacie Contracts Ltd for any damage caused during the 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,
 - switchboards,
 - distribution boards,
 - heater batteries,
 - finned pipework,
 - 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

110.000 MAIN CONTRACT PRELIMINARIES:

- Specific limitations on method/sequence/timing, Section applies to the whole of the Works, including this Subcontract. Work within the limitations stated therein insofar as they relate or apply to the Subcontract Works and co-operate with and assist the Main Contractor in working within them generally.
- As soon as reasonably practicable after the subcontract is awarded, the subcontractor is to attend a sequencing meeting with the principal contractor and other contractors to agree the sequence of works.

120.000 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.

A36 FACILITIES/TEMPORARY WORK/SERVICES
110.000 MAIN CONTRACT PRELIMINARIES:

- Facilities/temporary work/services, Section.
Applies to the whole of the Works, including this Subcontract.

A37 OPERATION/MAINTENANCE OF THE FINISHED BUILDING

110.000 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

120.000 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. No later than 2 weeks before PC date.
- Prepare electrical record drawings in accordance with BS EN 61082.
- Prepare Operating and Maintenance Manuals for heating systems requiring a trained operator in accordance with BS EN 12170.
- Prepare Operating and Maintenance Manuals for heating systems not requiring a trained operator in accordance with BS EN 12171.

130.000 RECORD DOCUMENTS:

Provide

- Record Drawings and Schedules.
- Plant room and switch room drawings, schedules and schematics.
- Operating and Maintenance Manuals.
- Blank maintenance logs.
- Logbook
- 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.
- Ensure the building logbook contains the information outlined in Section 3.2 of the Building Regulations Part L2, Conservation of fuel and power in buildings other than dwellings.

140.000 RECORD DOCUMENTS:

Provide the system records and full documentation as required in the appropriate standard.

- Standard
 - BS 4737 and BS EN 50131-1 - Intruder alarm systems.
 - BS 5839 - Fire detection and alarms in buildings.
 - BS 6651 - Protection of structures against lightning.
 - BS 7671 - Requirements for electrical installations (IEE Wiring regulations).

Provide

- Record Drawings and Schedules
- Plant room and switch room drawings, schedules and schematics.
- Operating and Maintenance Manuals.
- Blank maintenance logs
- Logbook
- 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.
- Ensure the building logbook contains the information outlined in Section 3.2 of the Building Regulations Part L2, Conservation of fuel and power in buildings other than dwellings.

150.000 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.

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:

- Location, including level if buried, of Utility Service connections, including those provided by the appropriate Authority, indicating points of origin and termination, size and material of service, pressure and/or other relevant information.
 - Disposition and depth of all underground systems.
 - Schematic drawings of each system indicating principal items of plant, equipment, zoning, means of isolation, etc. in sufficient detail to make it possible to comprehend the system operation and the inter-connections between various systems.
 - Details of the principles of application of automatic controls and instrumentation.
 - Diagrammatic dimensioned plans and sections of each system or service showing sizes and locations of all ancillaries, plant, equipment controls, test points, and means of isolation etc. including any items forming an integral part of the engineering systems provided by others (such as plenum ceilings, builders' work shafts, chimneys etc.).
 - Identification of all terminals/cables etc. by size/type and duty/rating as recorded from the approved commissioning results.
 - Detailed wiring drawings/diagrams/schedules for all systems, including controls, showing origin, route, cable/conduit size, type, number of conductors, length, termination size and identification, and measured conductor and earth continuity resistance of each circuit.
 - Ensure routes indicate if cable/conduit is surface mounted, concealed in wall chase, in floor screed, cast in-situ, above false ceiling etc.
 - Details of co-ordination of wiring and connections with cable core identification, notation of fire alarm, security, control and instrumentation and similar systems provided as part of the Works.
 - Details to show inter-connections between the Works and equipment or systems provided by others to which wiring, and connections are carried out as part of the Works.
 - 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.
 - For each programmable control item, schedules indicating for each input and output point connected, full data in respect of that point including reference, type of input/output, connected equipment reference, set values of temperature or pressure etc., set values of start/stop/speed change times, alarm priority, control specification reference and any other such parameters as are applicable.
- Each spare input and output point including reference, type of input/output and space for future entry of appropriate parameters as listed above.
- Logic flow diagrams for each individual control or monitoring specification and for each building services engineering system to illustrate the logical basis of the

software design.

- Schedules setting out details of all initial values of user-defined variables, text statements for alarm messages etc.

160.000 PLANT ROOM AND SWITCH ROOM DRAWINGS, SCHEDULES AND SCHEMATICS:

Provide good quality plant and switch room drawings, schedules and schematics. Hang the following in each plant room and switch room, any other appropriate location or where directed by the CA.

- Schematic drawings of circuit layouts showing identification and duties of equipment, numbers and locations, controls and circuits.
 - Schedules in the form of printed sheets showing the number, type, location, application/service and symbol, and normal operating position of each means of isolation.
 - Control schematics.
 - Location of all plant and equipment items including plans and elevations of main switchgear showing physical disposition of switches.
 - First aid instructions for treatment of persons after electrical shock.
 - All other items required under Statutory or other regulations.
 - Location of all incoming service isolating and metering facilities.
 - Emergency operating procedures and telephone numbers for emergency call out service applicable to any system or item of plant and equipment.
 - Prepare electrical drawings in accordance with BS EN 61082.
- Protect surface of drawings by
- pressure lamination
 - framing under glass or other rigid, transparent, cleanable and protective surface.

170.000 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.
- Diagrammatic drawings of each system indicating principal items of plant, equipment, valves etc.
- Details of how-to re-commission so that complex plant services within the building can be re-commissioned by an engineer without any historic knowledge of the systems.
- A photo-reduction of all record drawings together with an index. Reduced size Legend of all colour-coded services.
- Schedules (system by system) of plant, equipment, valves, etc., stating their locations, duties and performance figures. Each item must have a unique number cross-referenced to the record and diagrammatic drawings and schedules.
- The name, address and telephone number of the manufacturer of every item of plant and equipment together with catalogue list numbers.
- Manufacturer's technical literature for all items of plant and equipment, assembled specifically for the project, excluding irrelevant matter and including detailed drawings, electrical circuit details and operating and maintenance instructions.
- A copy of all Test Certificates, Inspection and Test Records, Commissioning and Performance Test Records (including, but not limited to, electrical circuit tests, corrosion tests, type tests, start and commissioning tests) for the installations and plant, equipment, valves, etc., used in the installations.
- A copy of all manufacturers' guarantees or warranties, together with maintenance agreements offered by subcontractors and manufacturers.

- Copies of Insurance & Inspecting Authority Certificates and Reports.
- Starting up, operating and shutting down instructions for all equipment and systems installed.
- Control sequences for all systems installed.
- Schedules of all fixed and variable equipment settings established during commissioning.
- Procedures for seasonal changeovers and/or precautions necessary for the care of apparatus subject to seasonal disuse.
- Detailed recommendations for the preventative maintenance frequency and procedures which should be adopted by the Employer to ensure the most efficient operation of the systems.
- Details of lubrication systems and lubrication schedules for all lubricated items.
- Details of regular tests to be carried out (e.g., water cooling towers etc.)
- Details of procedures to maintain plant in safe working conditions.
- Details of the disposal requirements for all items in the works.
- A list of normal consumable items.
- A list of recommended spares to be kept in stock by the Employer, being those items subject to wear or deterioration and which may involve the Employer in extended deliveries when replacements are required at some future date.
- A list of any special tools needed for maintenance cross referenced to the particular item for which required.
- Procedures for fault finding.
- Emergency procedures, including telephone numbers for emergency services.
- Back-up copies of any system software.
- Documentation of the procedures for updating and/or modifying software operating systems and control programmes.
- Instructions for the creation of control procedure routines and graphic diagrams.
- Details of the software revision for all programmes provided.
- Two back-up copies of all software items, as commissioned.
- Copies of relevant HSE/CIBSE/IEE Guidance notes etc.
- Contractual and legal information including but not limited to details of local and public authority consents; details of design team, consultants, installation contractors and associated subcontractors; start date for installation, date of practical completion and expiry date for the defects liability period; details of warranties for plant and systems including expiry dates, addresses and telephone numbers.

190.000 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.
- An electronic copy of the manual is also to be provide on a disc or memory stick.

200.000 RECOMMENDED SPARE PARTS:

Before practical completion submit to the CA a schedule of spare parts as called for in individual sections and any others that the Subcontractor recommends should be obtained and kept in stock by the Employer for maintenance of the services installations included in the Subcontract. Time scale

- 2 Weeks before practical completion.

State against each item the manufacturer's current price, including packaging and

delivery to site. Identify those items which are additional to those specified for inclusion in individual Sections.

210.000 INITIAL SUPPLY OF ADDITIONAL SPARE PARTS:

Submit to the CA a quotation, priced in detail, for the initial supply to the Employer of the additional spare parts identified under clause A37.170.000, and including for:

- Checking that each spare part is suitable for the replacement of the corresponding part supplied with the item of plant or equipment.
 - Checking receipt, marking and numbering in accordance with the schedule of spare parts.
 - Referencing to the plant and equipment list in the Operation and Maintenance Manual.
 - Painting, greasing, etc. and packing to prevent deterioration during storage.
- Time scale
- Within number of weeks of request – 4.

220.000 RECOMMENDED TOOLS:

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

- Weeks before

State against each item the manufacturer's current price, including packaging and delivery to site. Identify those items which are additional to those specified for inclusion in individual Sections.

240.000 READING OF METERS:

Record readings of all water, gas, and electricity meters immediately on completion of the Works and forward, via the Main Contractor, to the CA.

250.00 ANNUAL MAINTENANCE CONTRACT:

Annual maintenance is to be included for the first 12 months.

260.000 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.

End of defects period will be 12 months from completion.

BS APPENDIX

BS EN 12170:2002

Heating systems in buildings. Procedure for the preparation of documents for operation, maintenance and use. Heating systems requiring a trained operator.

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 61082-1:1993

Preparation of documents used in electrotechnology. Part 1 General requirements

BS EN 61082-2:1994

Preparation of documents used in electrotechnology. Part 2 Function-oriented diagrams

BS EN 61082-3:1994

Preparation of documents used in electrotechnology. Part 3 Connection diagrams, tables and lists

BS EN 61082-4:1996

Preparation of documents used in electrotechnology. Part 4 Location and installation documents

A53 WORK BY STATUTORY AUTHORITIES/UNDERTAKERS**100.000 INITIAL NEGOTIATION**

- Initial negotiations have been undertaken with the IDNO/utility suppliers and quotes have been obtained for the electrical supply and water supply quotes are also part of this enquiry. It will be the responsibility of the appointed IDNO to supply and install these infrastructure works which are further described in the applicable section of this specification.

110.000 DRAINAGE WORK:

To be carried out by

Below Ground Drainage by Principal Contractor

Above Ground Drainage by Sub-Contractor

Rainwater Installation by Sub-Contractor

V90	<u>ELECTRICAL SPECIFICATION</u>
100.000	<u>SYSTEM DETAILS</u>
100.010	<u>SYSTEM DESCRIPTION</u>

The Electrical Contractor shall be fully responsible for the complete installation generally comprising of the following:

Sub Mains Distribution.
 General Power Installation.
 Lighting Installation.
 Fire Alarm Installation.
 Emergency Lighting Installation.
 HVAC Electrics.
 Earthing.
 Testing and Labelling.

The installation will generally be carried out as follows:-

XLPE SWA LSZH cables on cable tray underground or LSZH insulated single core cables in conduit/metal trunking to sub main distribution boards from the main switchboard.

Sub distribution boards shall be of the miniature circuit breaker pattern with integral isolation.

LSZH Insulated single core cable for general sub circuit wiring shall be carried out in surface galvanised conduit and galvanised trunking for car park/plant room areas.

Multiple runs of cables shall be installed on cable tray/Ladder rack.

All conduit/trunking cable trays and cables are to be surface installed.

All trunking/cable trays/basket shall be run within the ceiling spaces, fixed to the slab and routed around structural beams as necessary.

General trunking shall be as manufactured by Messrs Wiremold and shall be their galvanised pattern.

All LSZH insulated single core cables shall be stranded core not solid.

The contractor is to supply a sample of ALL accessories for approval prior to ordering/installation.

Architects and Structural Engineers drawings are to be read in conjunction with this specification.

All accessories shall be labelled with their circuit reference.

Delta Firetuff plus cables shall be employed for the fire alarm installation protected by steel capping.

Galvanised tray and ladder rack (medium duty) shall be utilised.

Should any of the following sections refer to a quotation, the accuracy of quantities and suitable specification of the item/work must be checked by the Contractor to ensure it complies in all respects with this specification.

Should any of the following sections refer to a specialist or other Sub Contractor. The Electrical Contractor will include for liaising with them to ensure facilities etc. being provided are adequate.

The contractor is to include 12 months maintenance within the tender figure, this is to include a six-monthly inspection of the plant items together with the replacement of the consumable items that will require changing during this period.

100.020 SUB MAINS DISTRIBUTION

Under this section of the specification the Contractor shall allow for installing new underground submain supplies to each of the two waste buildings and store in underground multicore XLPE/SWA/LSZH cable from the local substation LV switchboard as indicated on the drawings.

The contractor shall allow for providing new MCCB units in the existing switchboards

New sub distribution boards shall be in the form of surface mounting units as manufactured by Messrs Eaton MCB distribution board Memshield 3 range of the size/rating indicated on the drawing, complete with integral isolator, earth/neutral bars for each circuit, hinged lid, barrel lock complete with four spare keys and miniature circuit breakers of the ratings indicated and blank plates to unused way. All new switchboards, panel boards, distribution boards and consumer units shall have 20% spare capacity.

New MCB boards to be housed in IP66 hinged lockable enclosure.

All MCB units shall be RCBO pattern 30 m/a rating double pole pattern, or other equal and approved.

The contractor shall allow for "out of hours working" for connecting into the existing substation LV switchboards time/date to be agreed with the client.

100.030 GENERAL POWER INSTALLATION

The contractor shall allow for installing a surface general power installation.

Wiring shall be carried out in LSZH insulated single core cables and shall be in galvanised conduit/galvanised trunking.

General switched socket outlets shall be by Messrs MK Ltd their masterseal IP66 range.

The contractor shall allow for providing final connections to all equipment as necessary.

Equipment & Outlets

Spur Units

On the appropriate ring main the contractor shall wire and install a number of surface 13amp double pole indicating switched spur units, with or without flex outlets as appropriate for the equipment used.

Spur units shall be described under socket outlets and shall be fitted with a fuse link commensurate with the rating of equipment used. All spur units shall be engraved for their duty in all cases filled in black.

The contractor shall allow for final connections to items in all cases.

20 Amp and 30 amp Double Pole Switches

On the appropriate radial supply the Contractor shall wire and install a number of flush double pole switches with or without flex outlets or separate level flex outlet as appropriate for the equipment used.

All switches shall be engraved for their duty in all cases filled in black. The contractor shall allow for final connection to items in all cases.

Isolator

On the appropriate radial supply the contractor shall allow for installing SP+N or TP+N isolators as required. Internal isolators are to be as manufactured by MEM Ltd or IP67 for weatherproof external isolators. The contractor is to allow to find connectors to all equipment.

100.040 LIGHTING INSTALLATION

The Contractor is to provide a complete lighting installation including lamps. Wiring shall be carried out as detailed for general power.

Wiring to light fitting ceilings shall be in the 'loop in' principle.

Light fittings to be suspended on conduit drops where indicated.

All light fitting shall be of the LED energy efficiency pattern complete with diffusers. The electrical contractor shall supply and install the following;
Finish of accessories and manufacturers shall be as detailed for general power installation here before with 20 ampere rocker switches.

Lighting as indicated within the Luminaire Schedule and be as manufactured by Messrs Dextra Lighting or other equal and approved.

The contractor shall allow for providing a remote programmable controller for the above.

All light switches up to and, including 3 gang shall be engraved for their duty.

External lighting circuit shall be controlled by a photocell/digital time clock/override switch.

All luminaires shall be in accordance within the luminaire schedule.

100.050 EMERGENCY LIGHTING

Under this section of the specification the Contractor shall install a complete system of separate self-test emergency lighting system as indicated on the drawings.

The system shall generally comprise of 3-hour self-test self-contained luminaires and exit signs installed as necessary.

The contractor shall allow for a flush test key switch 'suitably engraved' to isolate and test the emergency luminaire only. (Not primary luminaires.)

Emergency luminaires shall be fed from the appropriate local lighting circuit as necessary.

Wiring to accessories/luminaires and termination of earth conductor etc. shall generally be as described here before the lighting installation.

Upon completion the Contractor shall fully test the system for 3 hours to verify the complete operation of all items of equipment and issue test and commissioning certificates to the Engineer. The system shall be fully in accordance with BS 5266 and to the satisfaction of Building Control and Fire Officer.

100.060 FIRE ALARMS WIRING FACILITIES

Under this section of the specification the contractor shall allow for extending the existing fire alarm system to cover the new waste compounds and store areas. All new components shall be compatible with existing.

Manual break glass pushes shall be sited at all exits and emergency exits and at other locations within the building so that no person has to travel more than 30m to activate a push.

Multi-detectors shall be provided in all offices, corridors, stairs, stores lift shaft, risers, plantrooms and ceiling voids etc as necessary audibles/beacons alarms shall be suitable quality to give the required audibility. Multi-sensor detectors shall be installed wherever possible to limit false alarms.

Wiring shall be carried out fully in accordance with the manufacturer's instruction in Delta Firetuff plus cable (redsheath) on Cable tray.

Underground multicore XLPE/SWA/LSZH Cable from existing substation LV rooms shall be installed to new waste buildings & store to fixed connectors in adaptable box as detailed on the drawings.

Two audible circuits shall be provided to each area.

The Contractor shall allow for installing the cables on galvanised cable tray with metal capping protection where installed flush in walls or in galvanised conduit where surface.

The fire alarm is to be interfaced with automatic smoke ventilation, access control doors, Magnetic door holder, smoke dampers and lift etc.

Upon completion of the works the equipment manufacturer is to carry out smoke/heat tests etc. to verify the complete operation of the system in the presence of the Engineer.

A framed coloured zoned drawing shall be provided adjacent panel to the Engineers approval.

All detectors/pushes etc. shall be fitted with a traffolyte label indicating the appropriate reference "Zone P1".

The system shall be relayed off site to a central station. The contractor shall allow for line rental and 12 months costs.

A quotation for the supply has been prepared by Messrs ABM Fire & Security, Contact Stan Barton Tel: 0151 523 2269.

The electrical contractor shall allow for liaising with them and providing surface conduit drops and power supplies etc. as necessary.

The system shall be fully in accordance with BS 5839 and to the satisfaction of the Building Control and Fire Officer.

The system shall interface with :-

- a) Access control system.
- b) Process control panel
- c) Any other items required by building control.

100.070 EARTHING

The entire system of conduit, trunking, distribution gear and all other non-conducting metal work of the installation including the framework and enclosures to the plant, shall be efficiently bonded together and comply in all respects with the current edition of the IEE Regulations and to the satisfaction of the Electricity Board and Engineer. Earthing/Bonding may be in accordance with requirements for a PME service.

The Contractor shall allow for a separate main copper earth bar complete with separate bolt connections and links for earth bonding cables and existing bonding cables.

100.080 TESTING, LABELLING AND CIRCUIT CHARTS

All switchgear, distribution boards etc. shall be clearly labelled externally by means of traffolyte engraved labels with black letter on white background to indicate the nature of its duty, point of supply, cable supply size, fuse rating of unit.

In addition, where medium voltage is present within a switch or distribution board, it shall be labelled to give appropriate warning i.e. 'Danger 415 Volts AC' and this shall be engraved in red letters 12mm high on a white background in traffolyte. All traffolyte labels shall be fixed with brass bolts, nuts and washers. Furthermore, all distribution boards new and existing will be fitted with a typed circuit chart to indicate the nature and number of each circuit, its connected load, outgoing cable size, fuse or breaker rating and catalogue number. This shall be fitted in plastic envelope which in turn shall be fixed using an approved epoxy or equal adhesive to the lid of the distribution boards or by spring steel clips. Completion, inspection and test certificates shall be issued. The Contractor shall allow for testing each circuit new and existing in accordance with the IEE Regulations. All readings obtained shall be forwarded to the Engineer and form part of the Operating and Maintenance Manuals.

All accessories shall be labelled with their circuit reference.

100.090 ELECTRICAL RADIANT HEATERS

The contractor is to allow for the installation of electric heaters as indicated on the drawing and detailed below;

Final connections to heaters are to be via local switched spur units/isolators as highlighted.

As part of the works the electrical contractor is to supply and fix the electric radiant heaters, these are to be Solray Apollo 2kw units all with the option of IP55 protection.

The heaters are to be mounted on the walls of the buildings at a height of 3m from floor level.

Electric Panel control kits are to be supplied by Solray for each building with a single master V22 wireless thermostat in each building, a V23 switching unit and black bulb sensor for each heater all wired in accordance with the manufacturers requirements.

Wiring shall be carried out as detailed for power here before..

100.100 ACCESS CONTROL

Under this section of the specification the contractor shall allow for installing an access control system to the new store.

The system to match and be compatible with existing.

The contractor to include for all interlinking cables to interface with existing system.

A quotation for the supply has been prepared by Messrs ABM Fire & Security, Contact Stan Barton Tel: 0151 523 2269

The contractor shall allow for wiring facilities in the form of conduits and back boxes together with 230V supplies as necessary.

100.110 SCHEDULE OF DRAWINGS

The following drawing shall be read in conjunction with this specification to form part of the contract. It should be noted that the listed drawings are tenders drawings only, it will be the appointed Sub-Contractors responsibility under the terms of the Contractor to provide the builders work and installation drawings when requested after consultation, liaison, discussion and perusal with all other Sub-Contractors under the auspices of the Contract.

Six copies of these drawings shall be issued to the Engineer for comment prior to commencement of the work, together with an additional six copies for all revised drawing throughout the contract.

MECHANICAL DRAWINGS

2273-M-53-00-01 - Proposed Building B Water Services Layout

2273-M-53-00-02 - Proposed Building C Water Services Layout

ELECTRICAL DRAWINGS

2273-E-61-00-01 - Proposed Site Plan

2273-E-63-00-01 - Proposed Building B Power, Lighting and Emergency Lighting Layout

2273-E-63-00-02 - Proposed Building C Power, Lighting and Emergency Lighting Layout

It is the appointed Sub-Contractors responsibility under the terms of the Contract to provide full installation drawings when requested after consultation, liaison, discussion and perusal with all other Sub-Contractors under the auspices of the Contract.

Six copies of these drawings shall be issued to the Engineer for comment prior to commencement of the work, together with an additional six copies for all revised drawings throughout the Contract.

Upon submission of his tender the Sub Contractor shall confirm the suitability of all plant areas and builders work/duct etc. identified on the current drawings, or if deemed unsuitable for his design, he shall clarify his requirements with his tender.

Any costs associated with such changes not identified at tender may be charged to the Sub Contractor. All design/installations shall be fully co-ordinated with all other disciplines and trades and fully detailed/dimensioned drawings shall be submitted for approval.

Details of all builders' work and attendances required shall be provided by the Sub Contractor by drawings or by marking off on site, as agreed with the Main Contractor. Such works shall include trenches, ducts, equipment bases, plinths, supports, special steelwork, holes through walls, floors, ceilings, chases in walls, floors and building-in brackets, supports, pipe sleeves etc.

Any item affecting the building structure or fabric must be submitted to the Architect for approval, before incorporation in works.

100.120 LUMINAIRE SCHEDULE

- A Dextra Lighting LED typhon IP65 linear fitting
Cat No. TYP L96 LE3PC 5S
- B Dextra Lighting LED surface IP65 with motion detector/ photocell control
Cat No. AMEX L20 OB R25E LS3 + photocell (colour TBC)
- C Dextra Lighting LED surface IP65 with motion detector control
Cat No. AMEX L20 OB R25E (colour TBC)

Emergency Luminaires

+E Suffix

The module is to contain all inverter charging, self test system and changeover circuitry, together with 12 volt lithium battery back of the 'high temp.' cell type.

Charge indication is to be LED visible

Main connection is to be via fused plug and socket.

The module is to be normally within the luminaire itself, however it may be necessary if for temperature or other consideration the module is to be mounted outside the fittings ventilated sheet steel enclosure. A warning label giving notice of high voltage being present within the fitting or sheet steel enclosure is to be fitted in a prominent position within the fitting or external on the sheet enclosure.

Lighting inverter units shall be as manufactured by Messrs. Dextra Lighting

Notes

Contact Tom Wardle at Dextra Lighting, Tel No., 07920 285664 for quotation.

100.130 DISTRIBUTION BOARDS

New TP+N 12 Way MCB Distribution Board with 125 A Integral Isolator
ref: EB

		Circuit Description	Cable	Breaker
1	L1			
	L2	LIGHTING	1.5	6
	L3			
2	L1			
	L2	RADIAL SOCKET OUTLET	4	20
	L3			
3	L1			
	L2			
	L3			
4	L1	RADIAL RADIANT HEATER	4	16
	L2	RADIAL RADIANT HEATER	4	16
	L3	RADIAL RADIANT HEATER	4	16
5	L1	RADIAL TRACE HEATING	4	16
	L2			
	L3			
6	L1	COMPRESSOR SUPPLY	4	16
	L2	COMPRESSOR SUPPLY	4	16
	L3	COMPRESSOR SUPPLY	4	16
7	L1	PROCESS PANEL SUPPLY	6	25
	L2	PROCESS PANEL SUPPLY	6	25
	L3	PROCESS PANEL SUPPLY	6	25
8	L1			
	L2			
	L3			
9	L1			
	L2			
	L3			
10	L1			
	L2			
	L3			
11	L1			
	L2			
	L3			
12	L1			
	L2			
	L3			

**NOTE - DISTRIBUTION BOARD TO BE HOUSED IN WALL MOUNTED
SOREL IP66 HINGED LOCKABLE ENCLOSURE**

New 12 Way TP+N MCB Distribution Board with 125 A Integral Isolator
ref: EC

		Circuit Description	Cable	Breaker
1	L1			
	L2			
	L3	LIGHTING	1.5	6
2	L1			
	L2			
	L3	RADIAL SOCKET OUTLET	4	20
3	L1			
	L2			
	L3			
4	L1			
	L2	RADIAL RADIANT HEATER	4	16
	L3	RADIAL TRACE HEATER	4	16
5	L1	RADIAL RADIANT HEATER	4	16
	L2	RADIAL RADIANT HEATER	4	16
	L3	RADIAL RADIANT HEATER	4	16
6	L1			
	L2			
	L3			
7	L1	COMPRESSOR SUPPLY	4	16
	L2	COMPRESSOR SUPPLY	4	16
	L3	COMPRESSOR SUPPLY	4	16
8	L1	PROCESS PANEL SUPPLY	6	30
	L2	PROCESS PANEL SUPPLY	6	30
	L3	PROCESS PANEL SUPPLY	6	30
9	L1			
	L2			
	L3			
10	L1			
	L2			
	L3			
11	L1			
	L2			
	L3			
12	L1			
	L2			
	L3			

**NOTE - DISTRIBUTION BOARD TO BE HOUSED IN WALL MOUNTED
SOREL IP66 HINGED LOCKABLE ENCLOSURE**

New 12 Way MCB Distribution Board with 125 A Integral Isolator ref: S

		Circuit Description	Cable	Breaker
1		LIGHTING	1.5	6
2		COMPOUND LIGHTING	1.5#	6
3		ACCESS CONTROL SPUR	2.5	16
4				
5				
6				
7				
8				
9				
10				

**NOTE - DISTRIBUTION BOARD TO BE HOUSED IN WALL MOUNTED
SOREL IP66 HINGED LOCKABLE ENCLOSURE**

- MULTICORE XLPE/SWA/LSZH WITH INTEGRAL EARTH

200.000 STANDARD ELECTRICAL SPECIFICATION

200.010 REGULATIONS:

Comply with:

- Requirements for electrical installations (the IEE Wiring Regulations) BS 7671.
 - Including Amendment 2.
- Requirements of the electricity supply company.

200.020 ELECTRICITY SUPPLY:

- Liaise with the electricity distribution company, as necessary, to confirm or determine:
 - The nature of the supply, its suitability for the installation and the type of earthing arrangement.
 - The location of the incoming supply.
 - Space requirements for the distribution company's switches, fuses and meters.

200.030 ARRANGEMENTS OF CIRCUITS:

Divide the installation into separately controlled circuits as described below, further subdividing where necessary to ensure compliance with BS 7671 (the IEE Regulations).

200.040 SAMPLES:

Submit samples of proposed light fittings, accessories and equipment for approval before work is started. Label each sample with name, catalogue number and services in connection with item.

200.050 INSPECTION AND TEST PROCEDURE:

Comply with BS 7671 (IEE Regulations). Provide completion certificates in accordance with BS 7671 (IEE Regulations). Provide information to fulfil BS 7671 (IEE Regulation) 711-01-02.

- Carry out site testing and inspection and provide test certificates for specialist installations. Record all results and readings. Provide copies of any test and inspection result.

Check correct operation of devices. Confirm interlocks and sequences operate correctly. Provide test equipment and consumables to complete tests and retest any failed installations following corrective measures. Check and confirm correct sequence in multiphase circuits.

200.060 TESTING FIRE ALARM SYSTEM:

Test the complete installation in accordance with BS 7671 (the IEE Wiring Regulations), BS 5839 and appropriate standards. Record all tests.

200.070 IDENTIFICATION - GENERAL:

Apply identification notices in accordance with the BS 7671 (IEE Wiring Regulations) Clause 514 to all electrical cables plant and equipment.

- Phase colour
 - Red, Yellow, Blue.

Fix using materials compatible with the notices and fixing surface.

- Obtain approval prior to manufacture of all notices.

- Provide sample for approval.

Apply identification markers in accordance with the BS 7671 (IEE Wiring Regulations), Clause 514 to all conductor termination points.

- Phase marking
 - R, Y, B.
 - L1, L2, L3.

200.080 LABELS

Label all electrical plant and equipment using safety sign 8.A.0044 of BS 5499-5, where voltages above ELV exist.

- Materials
 - Engraved thermosetting plastic laminate.
- Colour
 - Background White
 - Lettering Black or Red
- Fixing
 - Bolted through complete with washer nut and locking device, size

200.090 ENGRAVED ACCESSORY PLATES:

Engrave accessory plates and specialist items as shown in the Schedules or on the Drawings.

- Use 6mm high letters with engraving coloured red or black.

200.100 SCHEMATIC DIAGRAMS:

Provide a purpose made schematic diagram permanently fixed showing the connections of the equipment and plant.

200.110 DISTRIBUTION BOARDS IDENTIFICATION:

Identify every outgoing way with a renewable circuit chart in a transparent plastic envelope permanently fitted inside distribution board cover. Clearly indicate in typed script, circuit identification number, cable size, fuse or circuit breaker rating and a description of item supplied and area supplied by circuit.

200.120 CABLE IDENTIFICATION:

Provide all cables, other than final sub-circuit wiring with labels fixed at each end of cable, either side of wall and floor penetrations and at approximately 10m intervals. Ensure labels show reference number of cable.

200.130 UNDERGROUND CABLE IDENTIFICATION:

Identify external underground cable routes by means of approved markers along their length at distances not exceeding 50m and where a change of direction occurs.

- Provide cable markers to clearly indicate the following-
 - Size and number of conductors.
 - Type of cable and date installed.
 - Operating voltage of cable.
- Provide key to any reference system used at
 - Switchgear.
- Mark and protect direct buried cables with
 - plastic tape yellow printed black

200.140 CABLE SHEATH IDENTIFICATION - EXTERNAL:

Identify cable sheaths for various services in accordance with NJUG 7.

200.150 FIXING TO BUILDING FABRIC - PREPARATION:

Mark-out using manufacturer's drawings and templates and fix all items. Ensure structure and fixings are suitable for items to be fixed. Use largest size of fixing permitted by diameter of hole in item to be fixed. Comply with BS 3974 for fixings.

Provide all assistance to enable any item to be built in by others.

200.160 PLUGS AND SCREWS:

Use plugs of material, size and length, in accordance with the manufacturer's instructions. Use screws to BS 1210. Generally, use sherardized steel screws. In damp or exposed situations use brass screws.

200.170 FIXING - WORKMANSHIP:

Drill holes squarely. Use drills of correct size and type. Do not flame-cut holes in metalwork. Comply with manufacturer's instructions for all fixings. Avoid fixing through reinforcement. Do not fix to unsound material.

200.180 FIXING TO THE STRUCTURE:

- Obtain approval to:-
 - Cut holes in the structure.
 - Weld to structural steelwork.
 - Use fixings

200.190 OFF-SITE PAINTING AND ANTI-CORROSION TREATMENTS - GENERAL REQUIREMENTS:

Protect all equipment and ancillaries against corrosion. Protect ferrous metals with coatings at works. Provide all items for decorative finishing primed to suit base material and finish.

200.200 PAINT MATERIALS:

Apply paints in accordance with manufacturer's instructions and to BS 6150.

200.210 SPECIAL PROTECTIVE FINISHES:

Provide special protective finishes in accordance with manufacturer's instructions.

300.000 CONDUIT AND TRUNKING, LV CABLES AND WIRING - MATERIALS**300.010 STEEL CONDUIT AND FITTINGS:**

- Manufacturer Barton.
 - Or approved equivalent.
- Standard
 - BS EN 50086-2-1.
- Ends
 - Threaded.
- Size in accordance with BS 7671 (IEE regulations).
- Fittings
 - Use adaptable boxes of 100mm x 100mm x 50mm minimum size.
 - Use couplers and externally screwed brass bushes to connect conduit to loop-in circular conduit boxes.
- Protection class/finish
 - Class 4 hot dipped galvanized.
- Mounting/support

- Installation
 - Use maximum practical lengths to minimise number of joints. Form bends by machine and remove burrs from cut ends.
 - Use bends and/or junction boxes at changes of direction. Do not use elbows or tees of any sort without approval.
 - Fix securely with boxes fixed independently of conduit.
 - Tightly screw all joints to ensure electrical continuity, with no thread showing. Use expansion couplings where conduit crosses movement joints in structure.

300.020 PVC CONDUIT AND FITTINGS:

- Manufacturer Marshall Tufflex
 - Or approved equivalent.
- Standard - BS EN 50086-2-1.
- Strength
 - High impact.
- Size in accordance with BS 7671 (IEE regulations).
- Shape
 - Round.
- Colour
 - White.
- Jointing
 - Solvent welded.
- Fittings
 - Provide boxes with earthing terminal.
 - Provide weatherproof boxes.
- Mounting/support
- Installation
 - Use maximum practical straight lengths to minimise number of joints.
 - Use proprietary bends and/or junction boxes at changes of direction. Do not use elbows, tees or site formed bends without approval.
 - Fix securely with boxes fixed independently of conduit.
 - Form secure joints, using expansion couplings where recommended by manufacturer, and connectors at equipment, terminal fittings, etc.

300.030 STEEL SURFACE TRUNKING:

- Manufacturer Wiremold
 - Or approved equivalent.
- Type
 - Standard cable trunking.
 - Lighting trunking.
- Standard
 - BS 4678-1.
 - BS EN 50085
- Size in accordance with BS 7671 (IEE regulations).
- Fittings
 - PVC covers.
 - Hanger brackets.
 - Fire barriers.
 - Socket plates.
- Protection class
 - Class 1.
- Finish

- Zinc coated to BS EN 10142 or BS EN 10143 and BS EN 10147.
- Mounting/support
- Multi-compartmental trunking
 - Provide multi-compartmental trunking with separate compartments for wiring of:-
 - Extra low voltage circuits.
 - Communications.
 - Fire alarm circuits.
- Installation
 - Use proprietary units to form junctions and changes of direction wherever possible.
 - Use mechanical fastenings/fixings; do not weld.
 - Fit a copper link at each joint to ensure electrical continuity.
 - Fit grommets, bushes or liners to holes through which cables pass.

300.040 PVC SURFACE TRUNKING:

- Manufacturer Marshall Tufflex
 - Or approved equivalent.
- Standard - BS 4678-4.
- Type
 - Standard cable trunking.
 - Wall/dado trunking.
- Size in accordance with BS 7671 (IEE regulations).
- Fittings
 - Socket outlet boxes.
 - Bends.
 - Stop ends.
- Strength
 - Heavy duty.
- Colour
 - White
- Mounting/support
- Multi-compartmental trunking
 - Provide multi-compartmental trunking with separate compartments for wiring of:-
 - Extra low voltage circuits.
 - Communications.
 - Fire alarm circuits.
- Installation
 - Use proprietary units to form junctions and changes of direction wherever possible.

300.060 FIRE STOPPING OF TRUNKING/DUCTING:

Where trunking or ducting pass through fire resisting floors, ceilings, cavity barriers, etc., seal internally with

- proprietary intumescent material.

300.070 FLEXIBLE CORDS:

- BASEC certified.
- Standard
 - Sheathed 300/500V 90°C to BS 6500
 - PVC insulated cord 450/750V to BS 7919

300.080 INSULATED CABLES:

- BASEC certified.
- Type
 - Copper conductors.
 - Multi-core
 - Armoured.
 - Unarmoured.
 - Sheathed.
 - LSZH.
- Standard
 - General purpose 450/750V to BS 6004.
 - Internal wiring 300/500V to BS 6004.
 - Flat twin and earth to BS 6004.
 - 450/750V to BS 7211.
 - Flat twin and earth to BS 7211.
 - Control 300/500 to BS 7629-1.
 - LSZH 600/1000 to BS 7846.
- Cable glands
 - BS 6121-2.
 - BS EN 50262.
 - Type
 - Sealed inner and outer sheath.
 - Complete with earthing lug.
 - Electrical bond for metallic sheath.
- Fire performance to BS 5839-1
 - Standard.

300.090 POLYETHYLENE INSULATED TELECOMMUNICATIONS CABLES:

- BASEC certified.
- Standard
 - Size 0.4mm to BS 3573.
 - Size 0.5mm to BS 3573.
 - Size 0.63mm to BS 3573.
 - Size 0.9mm to BS 3573.

300.100 COAXIAL CABLES:

- BASEC certified.
- Standard - BS 2316.
 - URM Number
- Connectors
 - BS 3041-2.
 - Connect in accordance with BS 7587.
 - UHF to BS 3041-12.
 - BNC.

300.110 CABLE JOINTING SUNDRIES:

Use terminations conforming to the BS EN 61238-1. Use tapes to BS 3924 or BS EN 60454.

300.120 CABLE DUCTS - PVC:

Use underground cable duct and fittings to BS 4660, or BS EN 1401-1.

300.130 PERFORATED CABLE TRAY:

Support all cables throughout their length using cable tray, firmly fixed to building fabric.

Ensure cable tray allows for spacing in accordance with BS 7671 for the design current of the cable.

- Standard BS EN 61537

- Classification

Type Wiremold

- Return flanged.
- Basket.

Perforations and thickness

- Manufacturer's standard pattern and thickness.

Fittings

Use factory made fittings throughout of same material, type, pattern, finish and thickness as cable tray.

300.140 CABLE CLIPS AND CLEATS:

- Standard BS EN 50368

- Material
 - Impact resistance
 - Resistance to electromagnetic forces

400.000 CONDUIT AND TRUNKING, LV CABLES AND WIRING - WORKMANSHIP**400.010 INSTALLING CONDUIT IN CONCRETE:**

Fix securely to reinforcement and fix boxes to formwork to prevent displacement. Depth of concrete cover not less than indicated for reinforcement.

400.020 INSTALLING TRUNKING:

Remove burrs from cut trunking ends.

400.030 DRAINAGE OF CONDUIT:

Provide drainage outlets at lowest points in conduit installed externally and in locations where condensation may occur.

400.040 APPEARANCE:

Arrange conduit and trunking, plumb where vertical, neatly parallel with other service runs and the structure.

400.050 EXPANSION AND SETTLEMENT JOINTS:

Make provision at expansion and settlement joints for movement. Use manufactured expansion couplings.

400.060 SPACING:

Install conduit, trunking and equipment clear of other services with minimum spacings:-

- to steam - 300mm, other services - 150mm and above radiators - 1000mm.

Ensure trunking and conduit is independently supported from building fabric. Obtain approval for supports.

400.080 ACCESS:

Locate covers on top or sides of trunking to allow access to wiring.

400.090 CABLE ROUTES:

Ensure cable routes are

- Straight, vertical or horizontal and parallel to walls.
- In approved locations where exposed to view. Conceal cables wherever possible.
- Positioned at least 150 mm clear of other services. Locate cables running parallel and adjacent to heating pipes below pipes.
- Install
 - Concealed horizontal runs in walls within 150 mm of ceiling or between 150 and 300 mm of floor.
 - Concealed vertical cable runs to wall switches and outlets in line with accessory.

400.100 CABLE INSTALLATION - GENERAL:

- Do not commence internal cabling until the building is enclosed and weatherproof.
- Install cables neatly and securely, adequately protected against accidental damage, adverse environmental conditions, mechanical stress and deleterious substances.
- Install cables without joints other than at equipment and terminal fittings. Do not use junction boxes without approval.
- Sleeve cables passing through masonry walls with conduit bushed at both ends.
- Do not run cables in spaces where they will be surrounded or covered by insulation.
- Cables are not to be left in an unterminated condition before any of the installation is made live.

400.110 PROTECTIVE CONDUCTORS:

Use cable conductors throughout; do not use conduit or trunking as protective conductors.

400.120 CABLE INSTALLATION - ARMoured CABLE:

Handle and install carefully to prevent damage to sheath and armouring.

Do not install if cable and ambient temperature are, or have been for the last 24 hours, below 0°C.

Fit galvanized steel guards where cables are liable to mechanical damage.

Bond armour to equipment and main earthing system.

Make moisture proof connections to apparatus using sealed glands and PVC shrouds.

400.130 CABLE INSTALLATION - PVC SHEATHED CABLES:

Do not install cables when temperature is near or below freezing.

Do not install in cavities of external walls.

Fit insulating cable glands at entries to equipment.

Terminate cable sheaths within boxes.

400.140 CABLES LAID DIRECTLY IN THE GROUND:

Before laying cables, ensure that bottom of trench is even and free from sharp stones, roots, etc.

Lay cables on a 75 mm bed of sand.

Where two or more cables are laid in the same trench, space as BS 7671 (IEE regulations) and ERA reports.

Cover each cable with 150 mm of sand overlaid with cable marker tape to BS EN 12613.

Mark each change in direction of cables with a precast concrete slab, size 300 x 300 x 150 mm thick, impressed with 'LV CABLE' and laid level with finished ground level.

400.150 CABLES ENTERING BUILDING(S) FROM BELOW GROUND:

Seal both ends of pipe duct, to a depth of not less than 150mm, with

- an approved non-hardening, non-cracking, water resistant compound.
- a proprietary moulded duct sleeve seal.

400.160 CABLES IN PLASTER:

Cover with galvanized steel channel nailed to background.

400.170 CABLES IN VERTICAL TRUNKING/DUCTS:

Support with pin racks or cleats at each floor level or at 5m vertical centres, whichever is less.

Provide and fix heat barriers at not more than 5m centres where fire resisting barriers are not indicated.

400.180 CABLES IN ACCESSIBLE ROOF SPACES:

Cables running across ceiling joists to be fixed to timber battens nailed to joists.

400.190 TESTING BURIED CABLES:

Test continuity and insulation of buried cables immediately before and after back-filling. Test continuity and insulation of buried cables prior to handover.

500.000 LIGHTING AND POWER - PRODUCTS/MATERIALS

500.010 DISTRIBUTION BOARDS:

- Manufacturer Hagar
- Standard - BS 5486-11 or BS 5486-12 and BS EN 60439-3.
- Main control
 - Switch disconnecter.
 - Residual current circuit breaker.
- Number of ways.
 - One per circuit plus 2 spares.Permanently label each way to identify circuit and rating.
- Circuit protection
 - Miniature circuit breakers to BS EN 60898-1.
 - Type
 - Short circuit capacity kA
 - Rating (A)
 - RCCBs additional protection for circuits
 - To BS EN 61008-1 and BS IEC 1008-2-2.
 - Tripping current
 - Tripping time
 - Breaking capacity
 - Overcurrent protection
- Enclosure
 - Degree of protection to BS EN 60529
 - Manufacturer's standard.

If not as specified, sub-contractor to gain approval from CA prior to installation.

500.020 FUSES:

Supply fuses including fuse carrier, bases and associated components to BS EN 60269-1 and BS 88.

500.030 ISOLATING SWITCHES:

- Manufacturer MK
 - Or approved equivalent.
- Switch type
 - Rocker bar.
- Rating
 - 16A.
 - 20A.
 - 32A.
 - 45A.
- Pole configuration
 - SP.
 - DP.
- Ancillaries
 - Neon indicator with red lens.
 - Cord outlet with cord grip.

500.040 SWITCHGEAR ACCESSORIES:

- Provide switchgear accessories.
 - Cylinder locks on hinged doors, with 2 keys for each lock.
 - Provide each switchboard with sets of padlocks.
 - Insulating mats to BS 921
 - Along full length of switchboard.
 - Width
- Spare fuses.
 - 5% of each rating and type on switchboard.

500.050 LUMINAIRES:

- Standard
 - BS 4533
 - Part
 - BS 5225.
 - BS EN 60598.
 - Part
 - Provide exit signs to BS 5499-1 and BS 5499-3.
 - Classification
 - BS 4533 or BS EN 60598, Part
- Ensure luminaires of same types have same photometric performance.
- Accessories
 - Provide secondary support for all components so they are retained when their primary fixing is released.
 - Incorporate integral photo-cell on luminaires

500.060 LAMP HOLDERS:

- Manufacturer MK
- Standard
 - BS 7895
 - BS EN 61184, B22.

- BS EN 60400.
- BS EN 60238, E27.
- Fixing
 - Suspension.
- Finish
- Material
 - Heat resistant moulded plastic.
- Ancillaries
 - Cord grip.
 - Protective lampshade ring.
 - Use lampholder suitable for conduit box when mounted directly to conduit system backplate.

Ensure lampholders in luminaires of similar type and rating are identical.

Installation

Securely mount lampholder in luminaire.

Ensure metal lampholders incorporate an earthing terminal.

Ensure phase conductor is connected to centre contact of Edison screw lampholders.

500.070 CONTROL GEAR AND COMPONENTS:

- Manufacturer See schedule of luminaires
 - Or approved equivalent.
- Standard
 - Provide fluorescent lamp ballasts to
 - BS EN 61347-2-8 and BS EN 60921.
 - BS EN 61347-2-4, 2-5, 2-6, 2-7 and BS EN 60925 for d.c. supplied electronic ballasts.
 - BS EN 61347-2-3 and BS EN 60929.
 - Supply thermal protectors for ballasts for tubular fluorescent lamps to BS EN 60730-2-3.
 - Provide discharge lamp ballasts to BS EN 61347- 2-9 and BS EN 60923.
 - Provide starters to BS EN 61347-2-1 and BS EN 60927.
 - Provide capacitors to BS EN 61048 and BS EN 61049.
- Terminals

Use screw terminals for supply cables and circuit protective conductors, sized to terminate up to three 2.5mm diameter conductors. Provide separate terminal blocks for each incoming circuit.

Ensure control gear and components are suitable for lamp type, wattage and starting characteristics.

Comply with BS EN 55015 for interference.

- Remote control gear

Locate remote control gear in separate lockable cabinet of sheet steel with same degree of protection and finish specified for luminaire.

Comply with manufacturer's recommendations for maximum cable length between gear and lamp.

500.080 LAMPS:

- Standard
 - Fluorescent lamps, BS EN 60081.
- Ensure that lamps of each type are from the same manufacturer.
- LED lamps, BS EN 61347-2-13 :2014+A1:2017

500.090 LUMINAIRE CONNECTORS:

- Manufacturer MK
 - Or approved equivalent.
- Rating
 - 2A.
 - 5A.
- Connector type
 - Ceiling rose to BS 67.
 - 3 pin plug/socket to BS 546.
 - Captive cord grip type plug/socket (3 or 4 pin), to BS 5733.
 - Luminaire supporting coupler to BS 7001.
 - Load carrying capacity

500.100 SUPPORT SYSTEM:

- Minimum 20mm conduit as main conduit.

500.120 ENCLOSURES FOR ELECTRICAL ACCESSORIES:

- Manufacturer Rittal
 - Or approved equivalent.
- Standard, BS 4662 or BS 5733
- Pattern
 - Flush.
- Mounting
 - Direct to enclosure.
- Material and finish
 - Cast iron with finish as conduit system.
 - Pressed steel.
 - White moulded plastic.
 - Impact resistant moulded plastic.
- Cover plate finish
 - Brass with matt chrome surface.
 - Moulded plastic colour
- Engraving

500.130 LIGHTING SWITCHES:

- Manufacturer MK
 - Or approved equivalent.
- Standard - BS EN 60669-1, with earth terminal in enclosure.
- Switch type
 - Gang
 - Secret key.
 - Pull cord.
 - Dimmer.
- Rating
 - 15A.
- Ancillaries
 - Red indicator, illuminated when 'ON'.
 - Protective shrouds to rocker bars.
 - Operating keys.
 - Blank inserts.
- Switch mechanism
 - Snap action microgap.

- Two position.
- Biased in one direction.
- Pole configurations
 - Single pole.
 - Double pole.
 - 2 way.
 - Intermediate.

500.140 SWITCHED FUSE CONNECTION UNITS:

- Manufacturer MK
 - Or approved equivalent.
- Standard
 - BS 1363-4.
 - Double pole switching.
- Unit type
 - Rocker bar
- Ancillaries
 - Red indicator lamp.
 - Fuses to BS 1362, sized
 - Cord outlet and cord grip.

500.150 COOKER CONTROL UNITS:

- Manufacturer MK
 - Or approved equivalent.
- Standard - Cooker control unit to BS 4177.

500.160 SOCKET OUTLETS:

- Manufacturer MK
 - Or approved equivalent.
- Standard
 - BS 1363-2.
 - BS EN 60669.
- Type
 - Socket outlet.
 - Connection unit.
 - Switched.
 - DP switch.
 - 1 gang.
 - 2 gang.
- Ancillaries
 - RCD.
 - Fuse
 - Cord grip.
 - Cord outlet.
 - Neon indicator.

500.170 CORD OUTLETS:

- Manufacturer MK
 - Or approved equivalent.
- Standard - BS 5733.
- Rating
- Pole configuration

- DP.
- TPN.
- Ancillaries
 - Cord grip.

500.180 TELEPHONE OUTLET SOCKETS:

- Manufacturer MK
 - Or approved equivalent.
- Standard - BS 6312.
- Size
 - Standard.
- Circuit configurations
 - Master.
 - Dual master.
 - Twin master.
 - Dual secondary.
 - Twin secondary.
 - Secondary.
- Connections
 - Insulation displacement type.

500.190 AERIAL SOCKETS:

- Manufacturer MK
 - Or approved equivalent.
- Circuit configurations
 - Padded
 - Diplexed UHF/VHF.
 - Twin outlet.
 - Single outlet.

500.200 LOW VOLTAGE ISOLATING TRANSFORMER UNITS:

- Manufacturer MK
 - Or approved equivalent.
- Standard
 - BS EN 61558-1.
 - BS EN 61558-2-9.
- Rating
 - Input
 - Output
- Ancillaries
 - Plug and socket.
 - DP switch primary supply.
 - Centre tapped secondaries.
 - Secondary side fusing.

500.210 SHAVER POINTS:

- Manufacturer MK
 - Or approved equivalent.
- Provide shaver points, internally switched by plug insertion.
- Standard
 - BS 4573.
 - BS EN 61558-1.

- Rating
 - 0.2A.
 - 20VA.

500.220 INDICATOR LAMPS:

- Manufacturer MEM
 - Or approved equivalent.
- Lamp
- Moulded plastic lens cover, colour
- Lens retaining rings.
 - Chrome plated brass.
 - Moulded plastic.

500.230 ACCESSORIES MOUNTING HEIGHTS:

Provide switches and socket outlets for lighting and other equipment in habitable rooms at appropriate heights between 450mm and 1200mm from finished floor level, in accordance with Building Regulations Approved Document M and BS 8300.

600.000 LIGHTING AND POWER - WORKMANSHIP

600.010 LAMPS AND LUMINAIRES INSTALLATION:

Install luminaires in horizontal plane unless otherwise shown.

Ensure luminaires are clean.

Ensure classification of luminaires is appropriate.

- Install recessed and semi-recessed luminaires as manufacturer's details.
- Install wall mounted luminaires at height
- Support and fixing
 - Where luminaire is supported from conduit, provide a conduit box forming an integral part of conduit system at each point of suspension. Where conduit enters luminaire, use backnuts and washers to secure luminaire to conduit.
 - Where luminaire is supported from trunking, use appropriate clamps or brackets.
 - Use washers, nut and lock-nut at top and bottom of rod for rod suspensions.
 - Use hook cover for suspension of chain from circular conduit box.
 - Use manufacturer's recommended chain hook for connection to luminaires.
 - Suspend flexible cord from ceiling rose.
 - Support luminaires directly from building fabric
 - Support luminaires

Do not support luminaires directly from any flammable non-metal or heat sensitive materials.

Ensure suspensions are vertical unless otherwise shown.

600.020 CONNECTIONS TO LUMINAIRES:

Connect circuit wiring to luminaires. Use grommet where cables enter luminaire body.

Connect the earthing terminal of Class 1 luminaires to the circuit protective conductor of the supply circuit.

Clip loose wiring within luminaire, at 300mm intervals.

- Conduit, rod or chain suspension.
 - Application

- Terminate in terminal block within supporting conduit box. Use flexible cord from terminal block to luminaire, installed within tube of conduit suspension. Secure cord to rod or chain without weaving cord through chain.
- Terminate at supply terminals of luminaire.
- Direct to trunking
 - Application
 - Terminate in terminal block in an adaptable box located on side of trunking. Use flexible cord from terminal block to luminaire.
 - Terminate circuit wiring at supply terminals of luminaire.
- Suspended from trunking
 - Application
 - Fit plug and socket to BS 546, adjacent to, or on side of, trunking. Terminate circuit wiring at socket. Take flexible cord from plug to supply terminals of luminaire.
- Recessed
 - Application
 - Terminate at plug and socket to BS 546, located not more than 500mm from the access through the ceiling. Use flexible cord from plug to supply terminals of luminaire.
 - Terminate in terminal block within conduit box. Install flexible wiring to luminaire.
- MICS Cable
 - Application
 - Fix cable gland to luminaire and continue conductors to supply terminals of luminaire.
- Direct fixing
 - Luminaire supporting coupler to BS 7001.

600.030 ELECTRICAL ACCESSORY INSTALLATION:

Provide CPC between earth lug on metal box and accessory except for plastic accessories.

Ensure there is no damage to accessories during installation.

Protect surface mounted accessories from painting. Install front plates of flush mounted accessories after painting.

Align accessories to building finishes. Mount grouped accessories in line, parallel and equidistant.

700.000 MISCELLANEOUS ELECTRICAL EQUIPMENT

700.010 ELECTRIC HEATERS:

- Supply electric heaters as shown
 - On drawings
- Standard - BS 3456 or BS EN 60335.
- Heater type
 - Tubular to BS EN 60335-2-30.
 - Electric towel rail, BS EN 60335-2-43.
- Mounting
 - Wall.
- Construction
 - Manufacturer's standard
- Materials
 - Manufacturer's standard
- Finish
 - Manufacturer's standard

- Controls
 - Manufacturer's standard.
 - Thermostat
 - Thermal cut-out.
 - On/off switch.
 - Indicator lamps
 - Timer
 - Programmer
- Characteristics
 - General
 - Input rating (kW)
 - Output rating (kW)
 - Output steps
 - Dimensions
 - Supply connection

700.030 TIME SWITCHES AND PROGRAMMERS:

- Standard - BS EN 60730-2-7.
- Style
- Display
- Movement
- Input
- Accuracy
- Enclosure protected to BS EN 60529
- Adjustment
 - Automatic change-over summer time winter time.
 - Perpetual calendar
 - Manual correction and reset.
- Programme options
- Outputs

800.000 SPECIALIST SYSTEMS

800.010 EMERGENCY LIGHTING SYSTEM:

- Standards
 - BS 5266.
 - BS EN 50171.
 - BS EN 60598-2-22.
 - ICEL 1006.
 - CIBSE TM 12.
 - The requirements of the Local Authority.
 - Manufacturer's instructions.
- Mode of operation
 - Self contained luminaire.
 - Non-maintained operation.
 - Maintained.
- Type
 - Luminaire.
 - Illuminated sign
 - Conversion unit.
- Lamps
 - Fluorescent
- Illumination of signs

Illuminate exit, emergency exit and escape route signs so that they are legible at all times, with:-

- Luminaires external to sign.
- Lamps contained within sign.

800.020 TELECOMMUNICATIONS SYSTEM:

Attend to the PTO's requirements during their connection of the private system to the public network.

- Public telecommunications operator and incoming system.
 - BT.
- Cable layout

800.030 RADIO AND TELEVISION DISTRIBUTION SYSTEM:

Provide radio and television distribution system in accordance with BS 6330. Allow a planning margin of + or - 3 dB for signal levels throughout the VHF/UHF distribution system. Bond all aerials and mountings to the lightning protection system.

- Channels to be received and distributed
 - Band II, channels
 - Band IV, channels
 - Band V, channels
 - Band VI channels
 - VCR output, channels
- Aerials to BS 5640
 - Band II
 - Bands IV and V, Group
 - Characteristics
 - Mountings to BS 6330
- Components and equipment
 - Pre-amplifiers
 - Attenuators
 - Filters
 - Head-end amplifiers
 - Combiners and splitters
 - Power supply units
 - Subscriber tap offs

800.040 CCTV SYSTEM:

Provide closed circuit television system, providing adequate viewing of areas shown.

- CCTV cameras.
 - Image device
 - Resolution
 - Video output
 - Lens and mount
 - Control and telemetry
 - Mounts and supports
 - Housings
 - Pan and tilt
- Camera control equipment.
 - Control facilities
 - Video switching facilities
 - Mounting

- Monitors
 - Picture tube size
 - Input video
 - Looped through video.
 - Controls
 - Performance
 - Mounting
 - Video cassette recorders

800.050 STRUCTURED CABLING:

Plan and install a structured cabling system in accordance with BS EN 50173-1, BS EN 50174-1 and BS EN 50174-2, class.

800.060 ACCESS CONTROL SPECIALIST:

Use a specialist for design development, supply, installation and commissioning of access control installation.

800.070 DOOR ENTRY PHONE ACCESS SYSTEM:

Provide and install door entry phone access system to manufacturer's instructions.

800.100 FIRE ALARM SYSTEM:

Develop design, supply and install fire alarm system to.

- BS 5839-1.
 - BS 5839-6.
 - Fire Authority requirements.
- Provide fire alarm system to.
- Enhance safety of occupants.
 - Reduce loss of property.

800.110 CONNECTION TO LOCAL AUTHORITY FIRE BRIGADE:

Provide connection to local authority fire brigade:-

- Via commercial central fire alarm.

800.120 FIRE ALARM SYSTEM - ZONES:

- Install system with zones as drawing number.
- Indicate the location of zones by.
 - A numbered list.
 - Specially prepared plan of building.

800.130 FIRE ALARM SYSTEM - STANDBY POWER SUPPLIES:

- Standard.
 - BS 5839-1.
 - BS EN 54-4.
- Standby.
 - Secondary batteries and battery charger.
 - Mains operated with standby primary battery.

800.140 FIRE ALARM SYSTEM - MANUAL CALL POINTS:

- Standard
 - BS EN 54-11
 - Mode of operation.
 - Type A.
 - Type B.

- Mounting.
 - Flush.
 - Surface.
- Protection against accidental operation.
- Switch contact.
 - Break.

800.150 FIRE ALARM SYSTEM - HEAT DETECTORS, POINT TYPE:

- Standard.
 - BS 5446-2.
 - BS EN 54-5.
- Heat sensitive element.
 - Rate-of-rise of temperature and fixed temperature element.
- Temperature setting.
 - 43°C.

800.160 FIRE ALARM SYSTEM - SMOKE DETECTORS:

- Standard
 - BS 5446-1.
 - BS EN 54-7.
- Type
 - Point.
- Class
 - Ionisation chamber smoke detectors.
 - Optical detectors.

800.170 FIRE ALARM SYSTEM VOICE ALARM:

- Standard - BS 5839-8.
- Control power
- Power supply
- Loudspeaker

800.180 FIRE ALARM SYSTEM - SOUNDERS:

- Standard - BS EN 54-3.
- Type
 - Bell.
- Colour
 - Fire red.
- Finish
 - Weatherproof.
 - Internal.

800.190 FIRE ALARM CONTROL PANEL:

- Standard
 - BS 5839-1.
 - BS EN 54.
- Functional requirements
 - Standard functions.
- Power supply
 - Integral.
- Zone indication
 - Integral with CIE.

- General
 - Microprocessor based.
 - Modular software
 - Real time clock
 - System fault protection
 - Maximum addressable points controlled by a single processor
 - Remote inputs to CIE
- System configuration
 - Capable of operating
 - Analogue addressable detectors.
- Interfacing
- Alarm output functions
- System Management System, available at levels as required by BS EN 54.

800.200 FIRE ALARM SYSTEM - RECORD DRAWINGS AND OPERATING INSTRUCTIONS:

Provide instructions on use of installation to person responsible for use of premises. Supply the user with a logbook certificate of installation and commissioning and record drawings in accordance with BS 5839-1.

- Circuit diagrams of fire alarm system.

800.210 ELECTRICAL INSTALLATION METALWORK:

Bond together all exposed conducting parts with joints of negligible impedance. Carry out work in accordance with BS 7671 (IEE Regulations), BS 7430, Electricity Safety Quality and Continuity Supply Regulations, and Local Electricity Supply Authority Requirements.

- Comply with the requirements of BS EN 50310.

800.220 EXTERNAL SOCKETS AND EQUIPMENT:

Provide each circuit serving external socket outlets and sockets for external use of equipment with high sensitivity residual current device, earth leakage tripping current not exceeding 30mA.

800.230 PROTECTIVE CONDUCTORS:

- Application

Provide protective and equipotential bonding conductors. Size in accordance with the BS 7671 (IEE Wiring Regulations).
- Material
 - Copper PVC to BS 6004.
 - Copper LSZH to BS 7211.
 - Copper tape insulated PVC.
 - Metallic screwed conduits.
 - Metallic trunking.
 - Armouring or sheathing of cables.
 - Protective conductor of multi-core cable.

800.240 EARTH ELECTRODES:

Provide earth electrodes to BS 7430. Ensure rods meet in centres of coupling. Use high tensile steel driving studs. Protect each electrode head with purpose made concrete housing fitted with removable inspection cover. Connect tape to electrode head using heavy duty purpose made clamps.

- Rods material
 - Hard drawn copper rods

- Molecularly bonded copper clad steel
- Plates
- Rod diameter 15mm - nominal.
- Rod length
- Plate dimensions
- Electrodes interconnection
 - 25 x 3mm bare copper tape.
 - Tape

800.250 INSPECTION PITS:

Provide enclosure for each connection between earth conductor and each associated earth electrode system. Install so that top is flush with finished ground level. Ensure enclosure provides adequate access for testing purposes. Inscribe cover with legend 'Lightning Protection Earth'.

- Material
 - Concrete.
 - Galvanized steel embedded in concrete.

800.260 INSTALLATION OF EARTHING SYSTEM:

Carry out installation of earthing system in accordance with BS 7671 (IEE Regulations 16th Edition) and BS 7430. Secure bare copper tape to structure with fixing devices which avoid piercing tape and ensure 3mm (minimum) clearance of tape from structure, at 450mm maximum centres.

Locate electrodes not less than 2m distant from structure and away from all cables and metallic fences.

Drive rods vertically. Locate electrode heads just below ground level. Install interconnecting tape 750mm below finished ground level, rising vertically at each electrode.

Ensure where electrodes are installed in a group, minimum distance between electrodes is twice depth of rods.

Provide earth bar at incoming electrical service position. Mount on insulated supports. Drill holes, one for each cable plus 30% spare holes (two minimum) at 50mm minimum centres through bar for connection of cable lugs. Ensure holes are minimum size to maintain adequate contact. Connect main earth conductors and main equipotential bonding conductors to earth bar.

Terminate protective conductors on switchboard earthing bar.

Extend protective conductor from incoming main cable gland direct to earth bar.

Extend separate protective conductor from earth bar to switchpanel served by incoming main cable.

Extend when main cable is provided by Electrical Supply Authority, separate protective conductor from main cable armouring gland (or direct earth terminals or PME earth installed by supply Authority) to earth bar.

800.270 BUILDING INCOMING SERVICES:

Bond incoming services at building entry point to main earth terminal.

- Water.
- Metallic cladding.
- Cable Sheaths of TV and Radio cables.
- Sheaths of LV and ELV cables.
- Sheaths of communications cables
- Others

800.280 BUILDING SERVICES:

Bond to protective conductor system, all metallic building services in:-

- Kitchens, bathrooms and shower rooms.
- Boiler houses.
- Plantrooms.
- Wet and damp process areas.

800.290 EQUIPOTENTIAL BONDING:

Provide main and supplementary equipotential bonding conductors in accordance with BS 7671 (the IEE Wiring Regulations).

800.300 LIGHTNING PROTECTION:

Provide lightning protection system in accordance with BS 6651. Ensure that exposed metalwork of building is bonded to lightning protection. Ensure, if dissimilar metals are used for system, that bonding connections are electrolytically compatible.

800.310 LIGHTNING PROTECTION - AIR TERMINATION:

- Material
 - Copper.
 - Aluminium.
 - Galvanized steel.
- Coverings
 - PVC, colour

800.320 LIGHTNING PROTECTION - DOWN CONDUCTORS:

- Material
 - Copper.
 - Aluminium.
 - Galvanised steel.
 - Building elements
 - Mild steel bar as part of concrete reinforced column.
- Coverings
 - PVC, colour

BS APPENDIX**BS 1210:1963**

Specification for wood screws

BS 1362:1973

Specification for general purpose fuse links for domestic and similar purposes (primarily for use in plugs)

BS 1363-2:1995

13 A plugs, sockets-outlets and adaptors. Part 2 Specification for 13 A switched and unswitched socket-outlets

BS 1363-4:1995

13 A plugs, socket-outlets and adaptors. Part 4 Specification for 13A fused connection units switched and unswitched

BS 2316-3:1969

Specification for radio-frequency cables. Part 3 Cable data sheets (metric and imperial units)

BS 2950:1958

Specification. Cartridge fuse-links for telecommunication and light electrical apparatus

BS 3041-12:1981

Radio-frequency connectors. Part 12 Specification for r.f. coaxial connectors with screw coupling, unmatched (type UHF)

BS 3041-2:1977

Radio-frequency connectors. Part 2 Specification for coaxial unmatched connector

BS 3456-201:1990

Specification for safety of household and similar electrical appliances. Part 201 General requirements.

Work in hand, current, partially replaced by BS EN 60335- 1:1995

BS 3573:1990

Specification for polyolefin copper-conducted telecommunications cables

BS 3924:1978

Specification for pressure-sensitive adhesive tapes for electrical insulating purposes.

Current but partially replaced by Parts of BS EN 60454-3

BS 4177:1992

Specification for cooker control units

BS 4533-102.1:1990

Luminaires. Particular requirements. Part 102.1 Specification for fixed general purpose luminaires

BS 4573:1970

Specification for 2-pin reversible plugs and shaver socket-outlets

BS 4662:1970

Specification for boxes for the enclosure of electrical accessories

BS 4737-4.1:1987

Intruder alarm systems in buildings. Part 4.1 Codes of practice. Code of practice for planning and installation

BS 5225-1:1975

Photometric data for luminaires. Part 1 Photometric measurements

BS 5225-3:1982

Photometric data for luminaires. Part 3 Method of photometric measurement of battery-operated emergency lighting luminaires

BS 5266-3:1981

Emergency lighting. Part 3 Specification for small power relays (electromagnetic) for emergency lighting applications up to and including 32 A

BS 5446-1:2000

Fire detection and fire alarm devices for dwellings. Part 1 Specification for smoke alarms

BS 5446-2:2003

Fire detection and fire alarm devices for dwellings. Part 2 Specification for heat alarms

BS 546:1950

Specification. Two-pole and earthing-pin plugs, socket-outlets and socket-outlet adaptors. If required, see also Supplement No 1:1960 Specification for plugs made of resilient material

BS 5486-11:1989

Low-voltage switchgear and controlgear assemblies. Part 11 Specification for particular requirements of fuseboards

BS 5486-12:1989

Low-voltage switchgear and controlgear assemblies. Part 12 Specification for particular requirements of type-tested miniature circuit-breaker boards

BS 5640-1:1978

Aerials for the reception of sound and television broadcasting in the frequency range 30 MHz to 1 GHz. Part 1 Specification for electrical and mechanical characteristics

BS 5640-2:1978

Aerials for the reception of sound and television broadcasting in the frequency range 30 MHz to 1 GHz. Part 2 Methods of measurement of electrical performance parameters

BS 5649-2:1978

Lighting columns. Part 2 Dimensions and tolerances

BS 5649-5:1982

Lighting columns. Part 5 Specification for base compartments and cableways

BS 5649-7:1985

Lighting columns. Part 7 Method for verification of structural design by calculation

BS 5733:1995

Specification for general requirements for electrical accessories

BS 5839-1:2002

Fire detection and alarm systems for buildings. Part 1 Code of practice for system design, installation, commissioning and maintenance

BS 5839-3:1988

Fire detection and alarm systems for buildings. Part 3 Specification for automatic release mechanisms for certain fire protection equipment

BS 5839-5:1988

Fire detection and alarm systems for buildings. Part 5 Specification for optical beam smoke detectors

BS 5839-6:1995

Fire detection and alarm systems for buildings. Part 6 Code of practice for the design and installation of fire detection and alarm systems in dwellings

BS 5839-8:1998

Fire detection and alarm systems for buildings. Part 8 Code of practice for the design, installation and servicing of voice alarm systems

BS 5839-9:2003

Fire detection and alarm systems for buildings. Part 9 Code of practice for the design, installation, commissioning and maintenance of emergency voice communication systems.

BS 6004:2000

Electric cables. PVC insulated, non-armoured cables for voltages up to and including 450/750 V, for electric power, lighting and internal wiring

BS 6121-2:1989

Mechanical cable glands. Part 2 Specification for polymeric glands

BS 6133:1995

Code of practice for safe operation of lead-acid stationary batteries

BS 6259:1997

Code of practice for the design, planning, installation, testing and maintenance of sound systems

BS 6312-1:1994

Connectors for analogue telecommunication interfaces. Part 1 Specification for plugs

BS 6312-2.1:1994

Connectors for analogue telecommunication interfaces. Part 2.1 Sockets for use with plugs specified in BS 6312:Part 1. Specification for sockets. General requirements

BS 6312-2.2:1997

Connectors for analogue telecommunication interfaces. Part 2.2 Sockets for use with plugs specified in BS 6312:Part 1. Particular requirements for fixed socket-outlets used in permanent wiring installations

BS 6330:1983

Code of practice for reception of sound and television broadcasting

BS 6500:2000

Electric cables. Flexible cords rated up to 300/500 V, for use with appliances and equipment intended for domestic, office and similar environments

BS 6651:1999

Code of practice for protection of structures against lightning

BS 67:1987

Specification for ceiling roses

BS 6840-1:1987

Sound system equipment. Part 1 Methods for specifying and measuring general characteristics used for equipment performance

BS 7001:1988

Specification for Interchangeability and safety of a standardized luminaire supporting coupler

BS 7036-1:1996

Code of practice for safety at powered doors for pedestrian use. Part 1 General

BS 7036-3:1996

Code of practice for safety at powered doors for pedestrian use. Part 3 Swing doors and balanced doors

BS 7211:1998

Electric cables. Thermosetting insulated, non-armoured cables for voltages up to and including 450/750 V, for electric power, lighting and internal wiring, and having low emission of smoke and corrosive gases when affected by fire

BS 7430:1998

Code of practice for earthing

BS 7587:1992

Specification for interconnection of radio and TV receivers to feeder system outlets

BS 7594:1993

Code of practice for audio-frequency induction-loop systems (AFILS)

BS 7629-1:1997

Specification for 300/500 V fire resistant electric cables having low emission of smoke and corrosive gases when affected by fire. Part 1 Multicore cables

BS 7671:2001

Requirements for electrical installations. IEE Wiring Regulations. Sixteenth edition

BS 7895:1997

Specification for bayonet lampholders with enhanced safety

BS 7919:2001

Electric cables. Flexible cables rated up to 450/750V, for use with appliances and equipment intended for industrial and similar environments

BS 8300:2001

Design of buildings and their approaches to meet the needs of disabled people. Code of practice

BS 88-2.2:1988

Cartridge fuses for voltages up to and including 1000 V a.c. and 1500 V d.c. Part 2.2 Specification for fuses for use by authorized persons (mainly for industrial application). Additional requirements for fuses with fuse-links for bolted connections

BS 88-5:1988

Cartridge fuses for voltages up to and including 1000 V a.c. and 1500 V d.c. Part 5 Specification of supplementary requirements for fuse-links for use in a.c. electricity supply networks

BS 88-6:1988

Cartridge fuses for voltages up to and including 1000 V a.c. and 1500 V d.c. Part 6 Specification of supplementary requirements for fuses of compact dimensions for use in 240/415 V a.c. industrial and commercial electrical installations

BS 921:1976

Specification. Rubber mats for electrical purposes

BS EN 10143:1993

Continuously hot-dip metal coated steel sheet and strip. Tolerances on dimensions and shape

BS EN 12613:2001

Plastic warning devices for underground cables and pipelines with visual characteristics.

BS EN 50085-1:1999

Cable trunking and cable ducting systems for electrical installations. Part 1 General requirements

BS EN 50085-2-3:2001

Cable trunking and cable ducting systems for electrical installations. Part 2-3 Particular requirements for slotted cable trunking systems intended for installation in cabinets

BS EN 50086-2-1:1996

Specification for conduit systems for cable management. Part 2-1 Particular requirements. Rigid conduit systems

BS EN 50131-1:1997

Alarm systems. Intrusion systems. Part 1 General requirements

BS EN 50171:2001

Central power supply systems

BS EN 50173-1:2002

Information technology. Generic cabling systems. Part 1 General requirements and office areas

BS EN 50174-1:2001

Information technology. Cabling installation. Part 1 Specification and quality assurance

BS EN 50174-2:2001

Information technology. Cabling installation. Part 2 Installation planning and practices inside buildings

BS EN 50262:1999

Metric cable glands for electrical installations

BS EN 50310:2000

Application of equipotential bonding and earthing in buildings with information technology equipment

BS EN 50368:2003

Cable cleats for electrical installations

BS EN 54-11:2001

Fire detection and fire alarm systems. Part 11 Manual call points

BS EN 54-1:1996

Fire detection and fire alarm systems. Part 1 Introduction

BS EN 54-2:1998

Fire detection and fire alarm systems. Part 2 Control and indicating equipment

BS EN 54-3:2001

Fire detection and fire alarm systems. Part 3 Fire alarm devices. Sounders

BS EN 54-4:1998

Fire detection and fire alarm systems. Part 4 Power supply equipment

BS EN 54-5:2001

Fire detection and fire alarm systems. Part 5 Heat detectors. Point detectors

BS EN 55015:2001

Limits and methods of measurement of radio disturbance characteristics of electrical lighting and similar equipment

BS EN 60051-1:1999

Direct acting indicating analogue electrical measuring instruments and their accessories. Part 1 Definitions and general requirements common to all parts

BS EN 60238:1999

Edison screw lampholders

BS EN 60269-1:1999

Low-voltage fuses. Part 1 General requirements

BS EN 60335-1:2002

Specification for safety of household and similar electrical appliances. Part 1 General requirements

BS EN 60335-2-21:2003

Specification for safety of household and similar electrical appliances. Part 2-21 Particular requirements for storage water heaters

BS EN 60335-2-30:2003

Specification for safety of household and similar electrical appliances. Part 2-30 Particular requirements for room heaters

BS EN 60335-2-43:2003

Specification for safety of household and similar electrical appliances. Part 2-43 Particular requirements for clothes dryers and towel rails

BS EN 60335-2-80:2003

Specification for safety of household and similar electrical appliances. Part 2-80
Particular requirements for fans

BS EN 60454-1:1995

Specifications for pressure-sensitive adhesive tapes for electrical purposes. Part 1
General requirements

BS EN 60529:1992

Specification for degrees of protection provided by enclosures (IP code)

BS EN 60598-1:2000

Luminaires. Part 1 General requirements and tests

BS EN 60598-2-22:1999

Luminaires. Part 2-22. Particular requirements. Luminaires for emergency lighting

BS EN 60598-2-2:1997

Luminaires. Part 2-2. Particular requirements. Recessed luminaires

BS EN 60669-1:2000

Switches for household and similar fixed electrical installations. Part 1 General
requirements

BS EN 60730-2-7:1992

Specification for automatic electrical controls for household and similar use. Part
2-7 Particular requirements. Timers and time switches

BS EN 60896-11:2003

Stationary lead-acid batteries. General requirements and methods of test. Part
11 Vented types. General requirements and methods of tests

BS EN 60898-1:2003

Circuit-breakers for overcurrent protection for household and similar installations.
Part 1 Circuit-breakers for a.c. operation

BS EN 60921:1991

Specification for ballasts for tubular fluorescent lamps. Performance requirements

BS EN 60923:1996

Auxiliaries for lamps. Ballasts for discharge lamps (excluding tubular fluorescent
lamps). Performance requirements

BS EN 60927:1997

Specification for auxiliaries for lamps. Starting devices (other than glow starters).
Performance requirements

BS EN 60929:2004

A.C. supplied electronic ballasts for tubular fluorescent lamps. Performance
requirements

BS EN 60947-2:2003

Specification for low-voltage switchgear and controlgear. Part 2 Circuit-breakers

BS EN 60947-3:1999

Specification for low-voltage switchgear and controlgear. Part 3 Switches, disconnectors, switch-disconnectors and fuse-combination units

BS EN 60947-4-1:2001

Specification for low-voltage switchgear and controlgear. Part 4-1 Contactors and motor-starters. Electromechanical contactors and motor-starters

BS EN 61008-1:1995

Specification for residual current operated circuit-breakers without integral overcurrent protection for household and similar uses (RCCBs). Part 1 General rules

BS EN 61008-2-1:1995

Specification for residual current operated circuit-breakers without integral overcurrent protection for household and similar uses (RCCBs). Part 2-1 Applicability of the general rules to RCCBs functionally independent of line voltage

BS EN 61009-1:1995

Specification for residual current operated circuit-breakers with integral overcurrent protection for household and similar uses (RCBOs). Part 1 General rules

BS EN 61009-2-1:1995

Specification for residual current operated circuit-breakers with integral overcurrent protection for household and similar uses (RCBOs). Part 2-1 Applicability of the general rules to RCBOs functionally independent of line voltage

BS EN 61048:1993

Specification for capacitors for use in tubular fluorescent and other discharge lamp circuits. General and safety requirements

BS EN 61049:1993

Specification for capacitors for use in tubular fluorescent and other discharge lamp circuits. Performance requirements

BS EN 61184:1997

Bayonet lampholders

BS EN 61238-1:2003

Compression and mechanical connectors for power cables for rated voltages up to 36 kV ($U_m = 42$ kV). Part 1 Test methods and requirements

BS EN 61347-2-1:2001

Lamp controlgear. Part 2-1 Particular requirements for starting devices (other than glow starters)

BS EN 61347-2-3:2001

Lamp controlgear. Part 2-3 Particular requirements for a.c. supplied electronic ballasts for fluorescent lamps

BS EN 61347-2-4:2001

Lamp controlgear. Part 2-4 Particular requirements for d.c. supplied electronic ballasts for general lighting

BS EN 61347-2-7:2001

Lamp controlgear. Part 2-7 Particular requirements for d.c. supplied electronic ballasts for emergency lighting

BS EN 61347-2-8:2001

Lamp controlgear. Part 2-8 Particular requirements for ballasts for fluorescent lamps

BS EN 61347-2-9:2001

Lamp controlgear. Part 2-9 Particular requirements for ballasts for discharge lamps (excluding fluorescent lamps)

BS EN 61537:2002

Cable tray systems and cable ladder systems for cable management

BS EN 61558-1:1998

Safety of power transformers, power supply units and similar devices. Part 1 General requirements and tests

BS EN 62035:2000

Discharge lamps (excluding fluorescent lamps). Safety specifications

BS IEC 1008-2-2:1990

Specification for residual current operated circuit-breakers with integral overcurrent protection for household and similar uses (RCCBs). Part 2-2 Applicability of the general rules to RCCBs functionally dependent on line voltage

MECHANICAL SPECIFICATION

12 HOT AND COLD WATER

100.010 SYSTEM DESCRIPTION:

1) Incoming Water Supply

Building B. A new 63mm MDPE water supply is to be taken from an existing 63mm MDPE main, that is present capped at both ends. The contractor is to connect one end of the existing capped pipe into the existing incoming 90mm MDPE main, this is to be undertaken whilst the main is live as such a suitable adaptor for live mains connections is to be used. An isolation valve is to be installed in a chamber at this point of connection.

The other end of the 63mm capped main is to include a new equal tee with the branch to feed the new building, laid in a trench at a depth of 750mm below ground level. The other port after the tee is to be blanked off with flanges so it can be extended at a later date.

Building C. A new 63mm MDPE water main branch is to be taken off the existing 90mm supply to the Laundry, this is to be undertaken whilst the main is live as such a suitable adaptor for live mains connections is to be used. A new 63mm MDPE pipe is to be laid in a trench at a depth of 750mm below ground level.

It has been assumed at this stage that the ground is not contaminated and as such standard MDPE pipework can be used, an optional cost of Protectaline pipework is to be provided should it be found that the ground is contaminated.

The underground water mains are to be pressure tested and chlorinated prior to connecting to the existing mains all in accordance with BS8558 and Water Fitting Regulations, samples are to be taken and results provided showing that the water quality complies with the regulations before connection into the existing mains is undertaken.

At each incoming connection the pipework is to change to 42mm copper pipework and an isolating valve, double check valve, pressure reducing and drain cock is to be installed.

2) Hot and Cold Water Installation

The design, installation and testing of the domestic cold water services shall comply with the requirements of the water supply regulations, comply with HSC L8, BS 8558, BS EN 806, TM18 & BS9251.

Within each building the water main is to be run in 42mm copper tube at high level to the drench shower location where it will reduce to 35mm and connect into the drench shower and include an isolating valve.

A drench shower is to be supplied and installed within each building, these are to be supplied by Hughes Safety Showers Ltd and are to be their STD-18KS/25K and is to be installed strictly in accordance with the manufacturers requirements.

The cold water distribution system is to be installed in copper pipework to BS EN 1057:Part 1 Table X which is to be WRAS approved.

The cold water service in each building is to be trace heated for frost protection, this is to be manufactured by Raychem or equal and approved and is to be their self regulating cable. The installation is to include a controller, thermostat, terminations and fixings all to make a complete and working installation

The pipework is to be thermally insulated with Class O foil faced phenolic foam foil faced insulation suitably coated internally for copper pipework with all joints taped and all pipework identified with banding as per the British Standard. The pipework is not to include push fit fittings only crimped, compression or capillary type and all components are to be WRAS approved. The pipework is to be air tested rather than hydraulically tested to ensure no water is left standing in the pipework. No push fit fittings are to be used.

It should be noted that no carbon steel pipework is to be installed on the project.

The pipework on the water mains is to be vapour sealed and the stop cocks are to include vapour sealed insulation covers.

Isolation valves are to be installed at every appliance to allow isolation for maintenance all in accordance with the water regulations.

Following completion of the water services the system is to be pressure tested and chlorinated in accordance with BS 8558 prior to handover.

100.020 DESIGN PARAMETERS:

CIBSE TM13

BS EN 806

Water Regulation Guidelines

Hot Water Flow 42 Deg C

HSE Code of practice L8 "The Control of Legionella Bacteria in Water Systems".

100.030 CONTROL REQUIREMENTS:

Each cylinder is to have control for the immersion heaters with the top heater being used for boost heating.

200.000 PLANT AND EQUIPMENT:

200.010 PRESSURE EQUIPMENT DIRECTIVE/PRESSURE EQUIPMENT REGULATIONS:

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.

200.040 APPROVALS:

Ensure all water fittings and materials are listed in the Water Fittings and Materials Directory published by WRAS.

300.000 PIPELINES AND ANCILLARIES - MATERIALS:

300.010 PIPES -

- Type Copper
- Application Hot and Cold Water Services
- Manufacturer Pegler/Yorkshire
- Kitemark certified
- Material – Copper,
- Finish - Uncoated.
- Jointing
 - Capillary or crimped fittings.
 - Compression fittings for connections to equipment - as clause 600.050.

300.060 STOP VALVES TO BS 1010-2:

- Application Mains Water Service
 - Manufacturer and reference Crane, Hattersely
 - Or approved equivalent
 - Kitemark certified.
- Material -Bronze or DZR copper alloy body.
- Ends
 - Threaded to BS 21.
 - With connections for capillary fittings to BS EN 1254-1, or BS 864-2.
 -

300.080 STOP VALVES - BALL TYPE:

- Application Hot and Cold Water Service at all outlets
- Manufacturer and reference Crane, Hattersley
 - Or approved equivalentBronze or DZR copper alloy body; chrome or nickel plated sphere.
- Ends
 - Threaded to BS 21.
 - Compression to BS EN 1254-2, or BS 864-2.
- Operation
 - Screwdriver operated.

300.110 VALVE LABELS:

Supply and fit engraved plastic labels to all valves in tankroom and in riser.
Engrave with

- Valve Numbers and service

300.120 PIPEWORK IDENTIFICATION:

Colour code and label to BS 1710.

- Apply 300mm wide colour bands to each pipe at intervals not exceeding fifteen metres.

400.000 PIPELINE WORKMANSHIP:

400.010 INSTALLATION GENERALLY:

Install, test and commission systems to comply with BS 6700, Water Supply (Water fittings) Regulations 1999 and equipment manufacturers' recommendations.

- Install thermoplastics pipework in accordance with BS 5955-8.

400.020 APPEARANCE:

Arrange all exposed pipe runs to present neat appearance, parallel with other pipe or service runs and building structure, subject to gradients for draining or venting. Ensure all vertical pipes are plumb or follow building line.

400.030 SPACING:

Space pipe runs in relation to one another, other services runs and building structure, allow for thermal insulation and ensure adequate space for access to pipe joints, etc.

Minimum clearances to pipe or pipe insulation:-

FROM	MINIMUM CLEARANCE	(mm)
Wall	25	
Ceiling	50	
Floor	150	
Other pipes	25	
Electrical cables, conduit, switchgear, etc	150	

400.040 GRADIENTS:

Install pipework with gradients to allow drainage and air release.

400.050 EXPANSION AND CONTRACTION:

Arrange supports and fixings to accommodate pipe movement caused by the thermal changes. Isolate pipes from structure to prevent noise or abrasion due to thermal movement / changes in direction.

400.060 BENDS, SPRINGS AND OFFSETS:

Machine bend and ensure that machine guides and formers are smooth and clean, free from any scores, or other damage. Deformed bends will not be accepted.

400.070 PIPES THROUGH WALLS AND FLOORS:

Enclose pipes passing through building elements, (walls, floors, partitions, etc.) concentrically within purpose made sleeves.

400.080 PIPE SLEEVES:

Cut sleeves from material same as pipe one or two sizes larger than pipe. Do not use sleeves as pipe supports. Install sleeves flush with building finish.

400.090 TEMPORARY PLUGS AND CAPS:

Seal all open ends as installation proceeds by metal, plastic or wooden plugs or caps, to prevent ingress of foreign matter.

400.100 CAPILLARY JOINTS, COPPER/STAINLESS STEEL PIPES:

Preparation

Ensure that plain ends are cut square. Reamer out bore at plain ends to full bore size. Clean plain ends with fine steel wool.

Making and sealing

Use specified flux ensuring no excess material used. Make joint in accordance with manufacturer's instructions. Clean off traces of flux when joint is completed. Protect building fabric from heat when forming joints.

- Polyethylene sheathed pipe
 - Follow manufacturer's recommendations to avoid damage to plastic coating. Make good with PVC tape of matching colour.

400.110 COMPRESSION JOINTS, COPPER/STAINLESS STEEL/POLYETHYLENE PIPES:

Preparation

Ensure that plain ends are cut square. Reamer out bore at plain ends to full bore size. Clean plain ends with fine steel wool or fine sandpaper. Then if using:

Type 'A' fitting - no further preparation.

Type 'B' fitting - in accordance with fitting manufacturer's instructions.

Making and Sealing

In accordance with fitting manufacturer's instructions.

400.130 PIPE RINGS AND CLIPS:

Select type according to the application and material compatibility.

400.140 PIPE SUPPORTS:

Arrange supports and accessories for equipment, appliances or ancillary fittings in pipe runs, so that no undue strain is imposed upon pipes.

Ensure that materials used for supports are compatible with pipeline materials.

400.160 PIPE SUPPORT SPACING COPPER PIPE:

COPPER	MAXIMUM SUPPORT SPACING	
Nominal size	horizontal runs	vertical runs
(mm)	(mm)	(mm)
less than 15	300	500
15 - 22	500	800
28	800	1000
35		
42 - 67	900	1200

400.170 MAINTENANCE AND RENEWAL:

Arrange pipework, valves, drains, air vents etc., for convenient routine maintenance and renewals.

400.180 PROTECTION OF PIPES IN SCREEDS:

- Wrap pipework with two protective tapes prior to laying.
- Sheath pipework with PVC.

400.190 CLEANING:

Remove cement and clean off all pipework and brackets.

500.000 THERMAL INSULATION:

500.010 THERMAL INSULATION TO PIPELINES:

- Application All concealed hot and cold pipework and within plant areas
- Protection

Ensure that where protection is applied to insulation, the joints fall blind side and that all joints are made to shed water and sealed with waterproof tape, adhesive or joint sealant where appropriate.
- Aluminium sheeting

Apply flat or profiled aluminium cladding directly to insulating material, thickness

 - as BS 5970 table 5.

- Laminated foil/film
- All insulation is to be responsibly sourced in accordance with BREEAM Mat 04 requirements and detailed in the Green Guide as A rated insulation as a minimum. Volumes and areas of insulation will need to be presented to achieve the BREEAM credit.

500.020 THERMAL INSULATION WORKMANSHIP:

Do not apply thermal insulation until installation has been fully tested and all joints proved sound.

Ensure that all materials are kept dry.

Ensure clearance between insulated pipes.

Apply insulants, facings, coatings and protection strictly in accordance with manufacturer's instructions.

Neatly finish joints and corners, and ensure continuity over fittings and supports, with longitudinal split concealed.

Arrange insulation of feed and expansion cistern to allow removal of access covers.

500.030 DOMESTIC HOT WATER SERVICE AREAS - PHENOLIC FOAM:

Environmental insulation thickness for domestic hot water service areas to control heat loss, aged K- value.

OUTSIDE DIAMETER COPPER PIPE (mm)	THICKNESS OF PHENOLIC FOAM (mm)
15	15
22	15
28	15
35	15
42	15
54	15
67	20
76	20
82	20

600.000 COMMISSIONING AND TESTING:

600.010 PRESSURE TESTING:

Advise appropriate personnel, at least 3 days in advance, of the time that pressure tests may be witnessed.

Test concealed or buried pipework before any permanent covering is applied.

Complete pressure testing before applying thermal insulation.

Thoroughly flush out the whole system, fill system, vent all air from system and check for leaks, repair any leaks and re-check.

- Pressure test the system for a period of one hour and check for and repair any leaks. Repeat pressure test if leaks have been found.
 - Test at twice the working pressure.
- Disconnect incoming service pipe from mains, fill with potable water, pressure test for a period of one hour, and check for and repair any leaks. Repeat pressure test if leaks have been found.
 - Test at twice the working pressure.
- Test and purge gas pipelines in accordance with BS 6891 and IGE/UP/1A.

600.020 STERILIZATION - GENERAL:

After flushing process, carry out sterilization in accordance with BS 6700.

Prior to sterilization ensure each system is flushed, cleaned and drained.

Provide temporary connections to system terminal points suitable for introduction of sterilization chemicals and fluids and 22mm minimum valved drain connection on incoming main immediately downstream of mains isolating valve.

Fill system with clean, fresh water.

600.030 STERILIZATION - MAINS WATER SYSTEM:

Carry out the following operations in accordance with BS 6700.

Flush system and introduce sterilisation chemical, take samples to ensure correct chlorine concentration.

Leave system to stand for 12 Hours

Repeatedly flush system with clean water until all traces of chlorine have been removed - leave system filled.

- Submit samples to registered laboratory for microbiological analysis and report.

600.040 STERILIZATION - WATER STORAGE SYSTEMS:

Carry out the following operations in accordance with BS 6700 and Health and Safety Executive Approved Code of Practice and Guidance - Legionnaires' disease - control of legionella bacteria in water systems.

Carry out procedures as for mains water systems on potable water storage tanks and cisterns, cold and hot.

- Certificate of conformity

Immediately prior to handover, retake samples and submit for analysis and report.

Where necessary repeat sterilisation of potable water systems immediately prior to handover.

BS APPENDIX

BS 1010-2:1973

Specification for draw-off taps and stop valves for water services (screw-down pattern). Part 2 Draw-off taps and above-ground stop valves. Current, obsolescent

BS 1212-2:1990

Float operated valves. Part 2 Specification for diaphragm type float operated valves (copper alloy body) (excluding floats)

BS 1710:1984

Specification for identification of pipelines and services

BS 2456:1990

Specification for floats (plastics) for float operated valves for cold water services

BS 2879:1980

Specification for draining taps (screw-down pattern)

BS 381C:1996

Specification for colours for identification, coding and special purposes

BS 5154:1991

Specification for copper alloy globe, globe stop and check, check and gate valves

BS 5433:1976

Specification for underground stop valves for water services

BS 5970:2001

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

BS 7206:1990

Specification for unvented hot water storage units and packages

BS 7786:1995

Specification for unsintered PTFE tape. General requirements

BS 864-2:1983

Capillary and compression tube fittings of copper and copper alloy. Part 2
Specification for capillary and compression fittings for copper tubes.

Replaced by BS EN 1254-1:1998 and BS EN 1254-2:1998 but remains current.

BS 864-5:1990

Capillary and compression tube fittings of copper and copper alloy. Part 5
Specification for compression fittings for polyethylene pipes with outside diameters to BS 5556

BS EN 806:2005

Specification for design, installation, testing and maintenance of services supplying water for domestic use within buildings and their curtilages

BS EN 1111:1999

Sanitary tapware. Thermostatic mixing valves (PN 10). General technical specification

BS EN 1151:1999

Pumps. Rotodynamic pumps. Circulation pumps having an electrical effect not exceeding 200 W for heating installations and domestic hot water installations. Requirements, testing, marking

BS EN 12201-1:2003

Plastic piping systems for water supply. Polyethylene (PE). Part 1 General

BS EN 12201-2:2003

Plastic piping systems for water supply. Polyethylene (PE). Part 2 Pipes

BS EN 12201-3:2003

Plastic piping systems for water supply. Polyethylene (PE). Part 3 Fittings

BS EN 12201-5:2003

Plastic piping systems for water supply. Polyethylene (PE). Part 5 Fitness for purpose of the system

BS EN 1254-1:1998

Copper and copper alloys. Plumbing fittings. Part 1 Fittings with ends for capillary soldering or capillary brazing to copper tubes

BS EN 1254-2:1998

Copper and copper alloys. Plumbing fittings. Part 2 Fittings with compression ends for use with copper tubes

BS EN 1254-3:1998

Copper and copper alloys. Plumbing fittings. Part 3 Fittings with compression ends for use with plastics pipes

BS EN 29453:1994

Soft solder alloys. Chemical compositions and forms

APPENDIX 1**MECHANICAL AND ELECTRICAL SERVICE REQUIREMENTS****A : Pre-start****Discipline**

- | | | |
|-----|--|-----|
| 1) | Priced schedule of quantities/summary of tenders | M&E |
| 2) | Schedule of suppliers/manufactures | M&E |
| 3) | Delivery periods of plant items | M&E |
| 4) | Latest order dates | M&E |
| 5) | Builderswork details | |
| a) | Plantrooms/Major Penetrations | M |
| b) | Switchroom | E |
| c) | Main incoming services | M&E |
| d) | Bracketing details | M&E |
| e) | External Trenches | M&E |
| 6) | Schedule of contract drawings intended | M&E |
| 7) | Risk Assessments and all requirements to satisfy CDM Regulations | M&E |
| 8) | Drawing schedule programme to include approval periods | M&E |
| 9) | List of any Sub-Contractors | M&E |
| 10) | General Calculations | M&E |

Electrical

- a) Lighting Calculations
- b) Volt Drop calculations
- c) Fault level calculation (at every distribution board and accessory position)
- d) Earth loop impedance (at every distribution board and accessory position)
- e) All other calculations required by BS7671 of the IEE Regulations

Mechanical

- a) Heat losses/heat gains
- b) Hot & Cold water storage sizes
- c) Hot & Cold water service pipe sizes
- d) Heat emitter sizes schedules
- e) Heating pipe sizes
- f) Pump sizes
- g) Confirmation supply/extract air volumes
- h) Ductwork sizing
- i) Fan Static
- j) Gas pipework sizes
- k) Confirm boiler/plant sizes

- l) Thermal simulation calculations

Layout Installation Drawings :

a)	Plantroom plans and sections	M
b)	Switchroom/panel details	E
c)	Radiator setting out	M
d)	Accessory setting out	E
e)	Lighting setting out	E
f)	Meter rooms each level	
g)	PV array roof	

Installation Drawings

a)	Pipework	M
b)	Ductwork	M
c)	Tray/conduit route	E
d)	Fire/Security Alarms	E
e)	Communication wireways	E
f)	Lighting Protection	E
g)	Control Wiring Diagrams	M
h)	Car Park Lighting	E
i)	Schematic Diagrams	E
j)	Etc	M&E

4)	Commissioning Programme	M&E
5)	Witness test dates	M&E
6)	Test Certificates	M&E
7)	Commissioning Results	M&E
8)	Operating and Maintenance Manuals	M&E
9)	As Installed Drawings	M&E

General Items

- a) Layout Drawings at 1.50 scale
- b) Plantroom/switchrooms at 1.20 scale
- c) A copy of installation drawings once approved to be kept on site and marked up to reflect minor changes. Drawings to be accessible to Design Team.
- d) A sample of each light fitting and accessory to be provided for approval.

APPENDIX 2

MECHANICAL AND ELECTRICAL ENGINEERING SERVICES SAFETY FILE/O&M MANUALS REQUIRED CONTENTS

Prepared in accordance with Regulation 14(d)-(f) of The Construction (Design and Management Regulations 1994.)

Section 1	Scope of the Manual Contract Team List of Sub-Contractors Design Data Abbreviations Services Identification Health & Safety at Work Act 1974 Legionnaires Disease-Causes and Control Emergency Procedures	
Section 2	Description of Services Low Pressure Hot Water Domestic Hot and Cold Water Air Conditioning and Ventilation Automatic Controls Gas Etc	} } } } } } } } } }
		Lighting Installation Power Installation Fire Alarms Emergency Lighting Etc
Section 3	Schedule of Drawings.	
Section 4	Schedule of Equipment and Manufacturers.	
Section 5	Operation Procedures.	
Section 6	Maintenance Procedures.	
Section 7	Fault Finding and Rectification.	
Section 8	Commissioning Results and Test Certificates for Plant Systems.	
Section 9	Recommended Spares.	
Section 10	Manufacturers Literature.	
Section 11	Certificates for Conformance.	

APPENDIX 3 TENDER SUMMARY – ELECTRICAL SERVICES

All elements are to be completed for analysis.

1)	Sub Main Distribution	£.....
2)	General Power Installation	£.....
3)	Lighting Installation (Excluding Fittings)	£.....
4)	Light Fittings	£.....
5)	Fire Alarm Installation	£.....
6)	Emergency Lighting Installation	£.....
7)	Earthing	£.....
8)	Testing & Labelling	£.....
9)	Security Installation	£.....
10)	Electric Heating Installation	£.....
11)	Access Control Installation	£.....
12)	O&M Manuals	£.....
13)	As Fitted Drawings	£.....
14)	12 Months Maintenance	£.....
15)	Installation Drawings	£.....
16)	CDM Requirements	£.....
17)	Any other item the contractor wishes to include	

Provisional Sums

Contingency	£1500.00
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TOTAL COST	£.....
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Signed By ;

On Behalf of:

Date :

APPENDIX 4 TENDER SUMMARY – MECHANICAL SERVICES

All elements are to be completed for analysis.

1)	Water Installation	£.....
2)	Incoming water pipework	£.....
3)	Chlorination of Water Services	£.....
4)	O&M Manuals.	£.....
5)	CDM Requirements.	£.....
6)	As Fitted Drawings.	£.....
7)	12 Months warranty on equipment	£.....
8)	12 month Maintenance	£.....

Provisional Sum

Contingency	£1000.00
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TOTAL COST	£.....
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Optional Cost

Uplift in cost should Protectaline pipework be required	£.....
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Signed By ;

On Behalf of:

Date :