BRIDGEWATER HOUSE MANCHESTER

MECHANICAL & ELECTRICAL PERFORMANCE SPECIFICATION

PREPARED BY:

PSD PROGRESSIVE SERVICES DESIGN LTD

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PSD PROGRESSIVE SERVICES DESIGN LTD

Amendment Record

Issue	Date	Amendment Details
1	December 2024	Preliminary Issue
2	February 2025	Tender Issue

Contents

Project Particulars

Electrical Specification

Mechanical Specification

Appendix 1 M&E Services Requirements
Appendix 2 M&E Engineering Services Safety File O&M Manual Required Contents
Appendix 3 Electrical Tender Summary
Appendix 4 Mechanical Tender Summary

Signed By : ……

Dated : ……

A10 PROJECT PARTICULARS

110.000 THE PROJECT

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

120.000 THE EMPLOYER: ADE4 Ltd
26 Chorley New Road
Bolton

140.000 DESIGN TEAM:

Project Manager Michael Schofield

Architect Snook Architects
89 Wood Street
Liverpool
L1 4NU

Structural Engineer ADS Structural Ltd
107 Mere Grange Business Park
Leaside
St Helens
WA9 5GG

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 35ºC dry bulb.
- Maximum conditions of 40ºC 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 (32ºC)
  - •Peak (40ºC)
- Minimum ambient temperature
  - •Average (-5ºC)
  - •Lowest (-10ºC)

  Atmospheric dust condition, as defined in BS ISO 5011 (mg/m^3)
  - 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, dry riser, ventilation, soil and waste, plumbing installations and rainwater.

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 Client main contract

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

370.000 TENDER STAGE METHOD STATEMENTS:

•Risk Assessments and Method statements must be submitted to the main contractor 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 the Main Contractor 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 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 on line sharing platform 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.
•SAP calculations and SBEM calculations are to be undertaken as part of the design, provisional ones have been completed which can be referred to for completion of final certificates.
•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 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
- •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 the Main Contractor 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 sub-contractor 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.
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 ELECTRICAL SPECIFICATION

100.000 SYSTEM DETAILS

100.010 SYSTEM DESCRIPTION

The project is the refurbishment of an existing building and the construction of a new building to create 20 apartments in the existing building and 32 apartments in the new block.
The Electrical Contractor shall be fully responsible for the complete electrical design and installation generally comprising of the following:

Main distribution and Sub mains.
General Power Installation.
Lighting Installation.
Emergency Lighting installation.
Fire Alarm Installation.
Earthing
Testing and Labelling
HVAC Electrics.
Terrestrial Television and Digital Aerial Installation.
Door Access Control.
Lightning Protection.
Telecom & Data Installation.
CCTV Installation
Electric Heating
AOV system

The installation will generally be carried out as follows: -

XLPE/SWA/LSOH cables on cable tray/cable basket shall be used to feed sub distribution boards from the main landlord switchboard. It is anticipated that sub-boards will be installed in alternative floors across both blocks of the development.

Sub distribution boards shall be of the MCB/RCBO/RCD pattern with integral isolation.

General sub circuit wiring shall be carried out in concealed plastic LSOH/LSOH insulated (T&E) cable. Residual current earth leakage protection shall be provided on all circuits serving bathrooms and socket outlets, and where any part of the circuit is buried less than 50mm below the surface finishes (unless it is in earthed metallic containment) as detailed in BS 7671.

LSOH Insulated single core cable in galvanised conduit trunking shall be installed in plant room and any external areas shall utilise XLPE/SWA/LSOH cables in ducts/buried direct.

All conduit/trunking cable trays and cables are to be concealed within the building finishes and ceiling spaces.

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 or equal and approved and shall be their galvanised pattern.

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

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

Fire rated “putty pads” to be installed to back boxes in fire compartment walls to maintain the integrity of the fire rating.

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

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

Galvanised tray and ladder rack (medium duty) shall be utilised for all infrastructure/sub-main cable containment.

Should any of the following sections refer to a specialist or other contractor, the electrical contractor will include for liaising with them to ensure any power supplies and containment etc. being provided are adequate. The Employer does not warrant the performance of the specialist or other contractor referred to.

It is the appointed electrical contractor’s responsibility under the terms of the contract to provide full design and installation drawings and calculations when requested after consultation, liaison, discussion, and perusal with all other sub-contractors under the auspices of the contract.

100.020 MAINS/SUB MAINS DISTRIBUTION

Under this section of the specification the Contractor shall allow for design and installation of the Mains/Sub Mains Distribution and liaising with the appointed supply authority to ensure proper co-ordination of the works and their requirements in accordance with normal practice and obtain approval for their proposals.

Two incoming supplies one into each building will be provided and will comprise an IDNO service to meters within service cupboards on each level in the new building and a meter room in the basement on the existing block, also a landlords supply in each building.

The IDNO supply authority will be providing and installing a main incoming supply from the IDNO switch room in each building. The current proposal is that the IDNO will take supplies to all designated Bemco/MODE’s in a riser on all levels in the new building and to the meter room in the basement on the existing building. The electrical sub-contractor shall install fuse-switches, sub-main cables to all apartments and all containment from the switch room / meter rooms up to each apartment. Detailed liaison is required with the IDNO who will be appointed by the main contractor or Client.

Sub mains shall be in XLPE/SWA/LSOH cables on cable tray.

MCCB section board complete with incoming MCCB, meter pack and outgoing MCCB’s are to serve local MCB distribution boards and items of equipment etc.

The contractor shall allow for providing all supply cables, meter tails, meter boards, and main fuse/switch and MCCB switchboard to the satisfaction of the supply authority as necessary.

The electrical contractor shall supply and install landlord's main f/sw MCCB Board, MCB boards outgoing ways comprising of MCB/RCD's to serve the landlords distribution systems, sockets, supplies etc. as necessary.

The MCCB section board shall be as manufactured by Messrs. Schneider Electric with their Power Pack 4 and meter pack or other equal and approved.

Main fuse/switch shall be as manufactured by Eaton Switch gear or other equal and approved.
All main distribution equipment shall be in the form of metal surface mounting units 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 circuit breakers of the ratings indicated and blank plates to unused way.

The Consumer Units will be either surface or recessed metal clad complete with RCD protection. Consumer units are to be minimum 10-way split load RCD protected complete with 20% spare capacity. The exact location of consumer units is to be agreed with the design team prior to any installation works of the type indicated in the Bridgewater Hall Material Specification.

The contractor shall allow for installing AFDD (arc fault detection device) and surge protection as required in BS7671 on each consumer unit and landlords board.

Also, all cables to be sized to include 20% spare capacity.

MCB distribution boards shall be in the form of surface mounting units as manufactured by Messrs Schneider Electric, or other equal and approved, MCB distribution board Isobar range Type B with meter pack 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.

The main panel board, section boards distribution boards and consumer units shall be complete with 20% spare capacity shall be manufactured by Messrs. Hager/Schneider/MEM or equal and approved.

100.030 GENERAL POWER INSTALLATION

The contractor shall allow for designing and installing the general power installation.

Flush 13 amp switched socket outlets installed on the ring main principle shall be installed throughout the areas as detailed in the drawings with exact locations to be agreed.

Sub circuit wiring shall be carried out in LSOH/LSOH T&E cables on cable tray with flush conduit drops.

All sockets and accessories shall be flush unless agreed with the client/design team/project manager or were located in areas that should be afforded additional mechanical protection. The sockets and accessories are to be the type indicated in the Bridgewater Hall Material Specification.

Dry lining back boxes being used in stud walls.

Where accessories are installed in fair faced brickwork, they shall be so arranged as to fit into the pattern of the brickwork with the sides of the accessories aligned to coincide with either perpendicular or horizontal brick joints.

This requirement shall also extend to tiled surfaces, where the positioning of the socket outlets/accessories shall be co-ordinated with the tile layout.

The electrical contractor shall produce dimensioned elevation drawings for instances where this requirement is deemed to apply.

All back boxes shall be a minimum of 25mm deep and specifically selected in line with manufacturer/specialist contractors (e.g., television systems, broadband systems, British telecom etc.) recommendations for each accessory.

Acoustic and intumescent pads are to be fitted behind all back boxes located in apartment separating walls and fire compartmentation walls.

General accessories shall be as detailed within the appendix other equal and approved.

The white goods to the apartment kitchen areas will be controlled via a multi gang grid switch assembly, each switch shall be engraved as to its use.

Plantroom accessories shall be from the MK metalclad plus range or equal and approved.

Communal area socket outlets (lockable) shall be provided at maximum spacing of 10m for cleaning purposes on access deck on each level which are to be IP66 rated and at each level in the communal areas in the existing building. Contractor shall allow for installing on equipment provided by the Client.

All accessories shall be labelled with circuit references.

Where cables pass through fire rated walls the cable openings will be sealed with intumescent sealant applied all in accordance with the Building Regulations, this will be undertaken by specialist registered company under a separate contract.

The contractor shall allow for providing power supplies as necessary to any lift as per the lift manufacturer’s requirements.

General socket outlets, light switches, and accessory heights to be installed in accordance with Building regulations and BS7671, i.e.:
General socket outlets – 450mm AFFL to underside
Kitchen socket outlets/accessories above worktop – 150mm above worktop to underside
Light switches – 1200mm AFFL to top

External accessories shall be fully weatherproof to IP66

Equipment & Outlets
Spur Units

Where required the contractor shall install flush 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 labelled for their duty in all cases with black lettering.

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

20 Amp/30 amp Double Pole Switches and Cooker Switches

Where required the contractor shall install flush double pole switches with or without flex outlets or separate low-level flex outlets as appropriate for the equipment used.

All switches shall be engraved for their duty in all cases filled in black/white depending on plate finish.

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 final connectors to all equipment**.**

All isolators to be labelled for their duty with circuit reference.

100.040 LIGHTING INSTALLATION

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

Wiring to light fitting within plasterboard ceilings shall be in the ‘loop in’ principle.

Final connections to fittings in false ceiling shall be via a plug-in ceiling rose. Where lights are the recessed pattern and are installed within a false ceiling which is fire rated the lights are to fire rated to maintain the fire integrity.

Where cables pass through fire rated walls the cables are to be sleeved and include intumescent sealant applied all in accordance with the Building Regulations.

All light fitting shall have energy efficiencies satisfying the requirements of the latest building regulations.

Motion/presence, absence and daylight sensing microwave lighting controls are to be used in the landlord's areas where appropriate and required.

The lighting is an important criterion to ensure compliance with the Building Regulations to satisfy the SAP criteria, led type lighting is to be used to ensure that the lux levels and W/m^2 values are suitable to suit the SAP calculation and provide the pass.

All lighting shall be of the LED Pattern with a 5-year guarantee for complete fitting and driver as detailed within the Bridge water Hall Material Specification.

Lighting within the new building apartments are to be wall mounted lights as indicated in the appendix, these are to include flexible cables to luminaires. It should be noted that the apartments in the new building all include exposed concrete soffits in the lounge and bedrooms as such all conduit is to be galvanised steel and installed neatly in line with walls etc.

Lighting shall be in accordance with CIBSE Codes for lighting.

Any lux levels highlighted are minimum levels.

Minimum lighting levels are indicated below.

Area	**Level**
Apartments	200lux at floor level
Kitchens/Lounge	200lux at floor level
Ensuite	150lux at floor level
Corridors	100lux at floor level
Stairwells	100lux at stair level
Stores	100lux at floor level
Entrance Area	200lux at floor level
Plantrooms	200lux at floor level

The electrical contractor shall supply and install the following.

Accessories shall be as detailed in the general power section.

All switches shall be rated at 20 amps.

Pull cord light switches shall not be used.

Bathroom light fittings shall be sealed units to a suitable IP rating.

All light switches having 3 or more gangs shall be engraved for their use.

External lighting shall be provided around the perimeter of the buildings and at all access and exits, these shall include emergency units as necessary. The external

lighting shall be sufficient to provide easy access to each designated entrance lobby etc. The design of the required lighting must be carefully considered. Care should also be taken in designing the external lighting to ensure that there is no light spillage in apartment windows.

External light fittings are to be LED type and are to be with 5 year warranty as detailed in the appendix. Lighting within the courtyard are to be bollard type to provide illuminance in the courtyard area. The access walkway are to include IP66 rated wall lights.

External lights on the building façade are to be controlled by a digital solar dial time clock / photocell/ override switch in the switch room.

100.050 EMERGENCY LIGHTING

Under this section of the specification the Contractor shall design and install two separate systems complete system of emergency lighting as required by the Fire Strategy and BS 5266.

The system shall generally comprise of 3 hour self-test self-contained or integrated packs in selected general light fittings, be self-test luminaires and shall be supplemented by self-test exit signs brass / gold effect installed as necessary to satisfy the requirements of the Fire Strategy and BS5266.

Emergency luminaires shall be fed from the local lighting circuit and be of the LED pattern.

Emergency lighting shall be provided to the common stairways, corridors, landings, risers containing electrical switchgear/equipment/meters, plantrooms, switch rooms, common mustering points, car park and outside fire exits together with illuminating all changes of direction and level, electrical switchgear, all fire appliances and fire alarm manual call points.

All luminaires shall be 3-hour emergency operation with LED status indication visible from below. Where remote battery packs are provided, they shall be located in accessible locations and the status indication LED located adjacent to the emergency luminaire served.

Upon completion the electrical contractor shall undertake a soak test to ensure the system runs for a minimum of 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, BS EN 1838 and to the satisfaction, fire strategy, of Building Control and Fire Officer.

100.060 FIRE ALARMS INSTALLATION

Under this section of the specification the electrical contractor shall allow for the design and installing a BS5839, BS9999 and BS9991, fully addressable digital fire alarm installation in landlord areas BS5839-L L1 separate system for each block including the basement of the existing building.

Within each apartment an independent fire alarm system is to be installed which is to be in accordance with BS5839 Part 6. LD1 fire detection and alarm system consisting of smoke detection in the entrance and principal living space, a heat detector is to be included in the kitchen.

Common escape routes should include fire alarm systems to Category L1 standard. Manual break glass call points shall be sited at all final exits, storey exits leading to external areas and emergency exits no call points or sounders are required within the communal corridors or staircases.

It should be noted that the apartments in the new building have exposed concrete soffits as such all conduit shall be galvanised steel and installed in neat lines parallel to walls with surface mounted back .

All as detailed in the Fire Strategy and to Fire Officers/Building Control requirements.

The FA systems to the apartments will be 230v standalone detectors/audible/beacons with battery backup interconnected with a common test switch as manufactured by AICO or other equal and approved.

Any audibles/beacons alarms shall be suitable quality to give the required audibility. Sounder bases are the preferred audible alarm type.

Wiring shall be carried out fully in accordance with the manufacturer's instruction in Delta Firetuff plus cable (red sheath).

The Contractor shall allow for installing multiple runs of cables on galvanised cable tray.

Metal capping protection shall be fitted where cables are installed flush in walls.

Single runs of cables can be P clipped using metal clips at least every 300mm fixing (minimum).

Dedicated electrical supplies shall be provided to the main and repeater panels.

Upon completion of the works the equipment manufacturer is to carry out smoke/heat 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 fire alarm system shall be commissioned by the manufacturer or an accredited installer.

The contractor shall allow for central station monitoring 'redcare' system for both systems. The cost of line rental and system for 12 months shall be included in the tender.

Overdoor magnetic door holders are to be provided to corridor doors where required by the Client.

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

The system shall interface with as necessary:-

a) Access control system

b) Lifts

c) Automatic doors/assisted doors/fob doors

d) External door security sensor system

e) Water Booster Supply

f) Apartment Mist System

The electrical sub-contractor will allow for all power supplies control wiring & final connections to fire/smoke dampers from panel in accordance with manufacturers requirements.

A quotation can be prepared by Dante, contact Andy Birkhead tel no. 07730678526 or other equal and approved.

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.

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.

All distribution boards are to 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.

All accessories shall be labelled with their circuit reference.

Completion, inspection and test certificates shall be issued.

The Contractor shall allow for testing each circuit in accordance with the IEE Regulations.

All readings obtained shall be forwarded to the Engineer and form part of the Operating and Maintenance Manuals.

100.090 HEATING & VENTILATION INSTALLATION (ELECTRICS)

Under this section of the Specification, the Contractor shall design, provide and install the electrical installation associated with the heating and ventilation equipment all as necessary and generally as detailed below.

Pumps, AHU Fans, Extract Fans etc.

From the local isolator provide and install LSOH installed single core cables in LSOH sheathed flexible metallic conduit with brass sweated glands complete with LSOH insulated earth wire (green/yellow) between the local isolator and the motor/connection box.

A dome lid with compression gland shall be fitted to the conduit box with LSOH high temperature flexible cables connecting to the equipment.

Room sensor or thermostats

LSOH/LSOH insulated cables protected by capping shall be taken via the ceiling/roof space and concealed in the wall finishes to the sensor with the hard wiring terminated directly into the sensor.

Remote extract fan

The contractor shall allow for connecting the fans as follows wiring shall be as detailed for power installation.

Fan Light Switch Control

The Contractor shall obtain a supply from the local lighting circuit. The light switch shall be a double pole unit and local flush isolator shall be provided to adjacent fan.

Fan PIR Air Quality/Humidistat Controlled

The Contractor shall obtain a radial supply and wire fan via a PIR/Air Quality/Humidistat and contractor. A suitable isolator shall be located adjacent fan AC Units.

100.100 TERRESTRIAL TELEVISION, DIGITAL AERIAL, & AUDIO WIRING INSTALLATIONS

The electrical contractor is to include for the design, supply and installation of a complete terrestrial and digital television aerial system, including aerial/down leads/outlets, amplifiers and splitters complete with trunk cables, tap offs etc.

The installation shall be suitable for receiving terrestrial, freeview, digital television signals, DAB and FM Radio.

Outlets shall be provided as detailed in the drawings and will mainly be located in the living area and bedrooms of each apartment.

A quotation for the works can be provided by Skyline, contact Mr. P. Riley Tel: 07815 183479 or equal and approved.

Allowance should be made for installing an independent /aerial on the roof to provide digital freeview service (exact position(s) to be agreed with the Architect and Engineer).

The aerial downleads shall be installed on dedicated galvanised cable tray and conduit run in the ceiling spaces and shall terminate in the flush aerial outlet plates in the locations indicated.

The contractor is advised to sub-let this portion of the works to an approved aerial system designer/installer. The designer/installer should be familiar with the area. Allowance shall be made for all necessary power supplies.

The installation is to conform to Home Office requirements in respect to BS415 regarding isolation between outlets. The signal levels at each outlet on all channels shall be not less than the minimum recommended by the Ministry of Post and Telecommunications.

The whole of the system is to be tested and adjusted and copies of the results forwarded to the Engineer.

The Contractor shall allow for testing each outlet position with a portable colour receiver in the presence of the Engineer.

Test certificates for the TV signals in each individual apartment and cluster apartments are to be provided.

100.120 TELECOM AND DATA INSTALLATION

Telecom & Data Infrastructure Installation The electrical contractor is to include for the supply and installation of a complete telecom & data system to include fibre installation to each flat etc. Fibre Installation A high-speed fibre network

system service to be provided to each flat by the contractor to be confirmed by the Client.

The contractor shall allow for liaising with specialist as required, 4th Utility are to be used to provide the new incoming fibre cable.

Consisting of a main incoming fibre cable terminated in the electric room or risers.

From these locations fibre will be run up the risers and terminated in strategic levels, with individual BT fibre cabling run out to each apartment and terminated in the store or other agreed location.

Any other outlets in apartments shall be wired in CAT 6 cable.

The contractor shall also be responsible for the supply and installation of all necessary dedicated galvanised basket cable trays etc through areas and routed up each riser etc. as necessary.

Galvanised basket tray and conduit shall be installed up the existing riser and through the corridor ceiling/floor voids to each flat etc to enable the installation of cabling as necessary.

The contractor is to wire to all apartment outlets Cat 6 cable in oval conduit drops to RJ45 outlet to match others from store room hub. Landlord Outlets

The contractor shall wire to landlords outlets and WiFi points, in Cat 6 cable on galvanised basket tray and flush conduits to back boxes and RJ45 outlets to match the accessories by the contractor to the comms racks.

The contractor shall employ an approved data certified contractor for the wiring installation to provide a full voice and data integrated infrastructure.

Comms rack to include switches, patch panels, patch leads, power pack etc to provide complete installation and 25% spare capacity.

100.140 CCTV SYSTEM

Under this section of the specification the Contractor shall allow for the design and installation of a CCTV system to the two apartment buildings. This is to be carried out by MPH Commercial Ltd (Tel 0844 504 3511)

Fully functional, cameras and monitors shall be provided in the following areas with monitors and digital recording (31 days) and control facility in the reception.

a) All entrances and exits.
b) Reception Area
c) Lift Lobbies
d) Corridors
e) All communal areas.

Cameras

External cameras

12/24v DC, Colour/monochrome Dome camera with a minimum resolution of 700TVL capable of providing up to 6 privacy zones, a 2.8-12mm vari-focal lens allows the camera to provide excellent pictures down to 0.25Lux, an I.R LED array for night time recording suitable up to a distance of 20m.

Internal Cameras

12/24v DC, Colour/monochrome Dome camera with a minimum resolution of 700TVL capable of providing up to 6 privacy zones, a 2.8-12mm vari-focal lens allows the camera to provide excellent pictures down to 0.25Lux,

P.T.Z Pan/Tilt/Zoom

12/24v DC, X 22 or X 36 Optical Zoom Colour/monochrome Dome camera with a minimum resolution of 700TVL, capable of running Vista RS485, Pelco D or Pelco P telemetry protocols, to include a minimum of 6 alarm inputs and 4 alarm outputs at the dome head, along with 240 pre-sets, 8 pre-set tours and 8 learn tours.

Control Equipment

The system must have a facility for 24 hour/7 day recording digitally and storing the recordings for a period of 31 days at a minimum resolution of 2 CIF onto the hard disk (minimum 4TB per DVR), including the downloading of the recordings onto USB/ DVD discs for archiving and evidence purposes.

Telemetry keyboard is to be included for PTZ camera control.

The system will also incorporate free issue software to allow any P.C to view real time and play back functionality off site via the internet, the system must also provide an option for Smart phone connectivity, all off site viewing must be password protected for authorised personal only and provide the following features, Playback, Search, Scheduling & back-up.

Signage to be provided in accordance with the Data Protection Act; Following Practical Completion of a training session shall be provided by the Specialist to train on site Staff in the use of the system**.**

An LED monitor is to be provided to show all cameras.

A quotation for the supply is to be by Messrs MPH Commercial Ltd

The contractor shall allow for liaising with them and providing flush wiring conduits and power supplies etc. as necessary.

The system shall be capable of expansion to include for another two cameras.
The component wiring shall be installed flush and complete in accordance with .
NACP20 and EN50132-7.

The contractor shall allow for power supplies and flush wiring facilities in the form of tray, baskets, back box trunking and conduits as necessary.

100.150 EXTERNAL LIGHTING

The electrical contractor shall allow for the design and installing external lighting within the courtyard.

Lighting shall be bollard type digital type photocell/timeclock/override switch controlled.

Separate time channels to be allowed for individual circuits and signs.

External lighting shall be photcell/time digital clock/override switch controlled with separate time channels for lights.

100.160 ELECTRIC HEATING

The contractor is to design, supply and install electrical panel heaters within the apartments, these heaters are to be panel convector type heaters.

The heaters are to be adjustable and controllable using a mobile app with a wireless thermostat WT via a mobile phone or tablet. The heaters are to comply with Erp 2018 LOT21 directive.

The heaters are to be sized to offset the heat losses from each room maintaining a room temperatures as indicated on the list below at an external temperature of -5^{0}C, the output of the heaters is to include a margin to raise the temperature from cold to the correct indoor condition. Where the heat loss cannot be offset from a single heater multiple heater points are to be designed.

Within the bathrooms electric towel rails are to be installed which are to be chrome ladder rails, these are to be submitted for approval prior to order.

Lounge/Dining 22^{0}C
Bedroom 20^{0}C
Bathroom 22^{0}C
Hallway 20^{0}C
Kitchen 21^{0}C

The contractor is to allow for supplying and installing heaters in corridors and entrance areas of the existing building if required by the SAP calculations.

A tubular heater with remote thermostat is to be installed within the switch room to maintain temperatures of 16^{0}C

100.170 LIFT INSTALLATION

Under this section of the contract the contractor shall allow for providing the lift supply for lift terminations in local switch fuse location to be agreed with the lift installer. A telephone line is to be provided to the lift control panel location all to be agreed with the lift installer.

100.180 DOOR ACCESS CONTROL SYSTEM

The contractor shall allow for the design and installation of a Audio Door Access Control System & access door fob system by MPH Commercial Ltd.

An Audio/ Visual Door Entry System complete with digital keypad and fob entry system shall be installed to the entrance door interfaced with each apartment, within each apartment a control unit is to allow to view the main entrance door camera and provide a remote release of the entrance doors on the existing block. Door access (without a fob) is only to be provided by manually opening the door from the inside.

The flush call button panels shall be complete with vandal resistant stainless steel face with LCD display for apartment names and numbers etc as detailed in Bridgewater Hall Material Specification.

The systems and installations shall be in accordance with NACP30 and BS 57671.

All access/fob control doors shall be complete with flush green mushroom exit button and green breakglass units each side, together with data connection as necessary.

A minimum of 100 fobs shall be provided.
The system shall be complete with fob programmer for staff use.

Access from all external doors into the building shall be controlled by a door fob system and keypad digital entry system. The contractor shall allow for all power supplies, fire alarm interfaces, data connections as necessary and wiring facilities for the systems.

100.190 AOV WIRING INSTALLATION

The contractor shall allow for the design, supply, installation and wiring of an AOV system for the stairs, to interface with fire alarm system in accordance with fire strategy and Building Control/Fire officer requirements.

The AOV shall be individually controlled by means of a dedicated control panel/override control switch with 3-hour battery backup and shall be complete with a break glass override switch adjacent to the opening.

The installation which is to include all cabling, commissioning and instruction is to be carried out by a recognised specialist and is to be installed strictly in accordance with the fire officer's requirements and manufacturers instruction to comply with the fire strategy, Building Control and BS 5588/BS 9991/BS8519/BS9999 to provide a complete and working installation.

Ensure wiring is suitable for high temperatures to provide a maintained supply.

Ensure manufacturers are a firm of Assessed Capability to BS EN ISO 9001 and produce equipment to relevant Quality Assessment schedule.

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.

An AOV shall be installed at the top of the staircore and also installed at each floor level with actuators fitted to opening windows as indicated on the Architects drawings and within the fire strategy document.

The installation shall be certified and tested upon completion with a complete demonstration to the fire officer and Client to prove the correct operation.

The certificate is to be included within the O&M manuals.

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 90ºC 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.
    - LSOH.
- 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.
  - LSOH 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 0ºC.
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 disconnector.
  - 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 LAMPHOLDERS:

- 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.
  - 43ºC.

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 LSOH 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 11Vented 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 (Um = 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

R19 100.010 ABOVE GROUND FOUL DRAINAGE AND RAINWATER SYSTEM DESCRIPTION

An above ground drainage system is to be installed in which is to comprise of a number of stacks based on a single stack design. The soil and waste pipework is to be designed in accordance with BS EN12056 and is to be based on the System 3 design with single vented stacks and individual branches to each appliance. The contractor is to allow for pressure testing the soil stacks with air as detailed in the British Standard.

The stacks are to be manufactured in UPVC by Polypipe Terrain or equal and approved. All internal horizontal and vertical soil pipework passing through apartments are to have insulation applied to minimise noise breakout, where the soil stacks are in ceiling voids this is to be Class O foil faced insulation suitable wrapped securely on all pipework.

Within the basement of the existing building the soil pipes from above are to collect together and connect into the external sewage mains.

Condensate drainage from the MVHR units are to include waterless traps before connecting into the drains, these are to be installed strictly in accordance with the manufacturers requirements.

The stacks are to rise within the service voids within each apartment and are to include soil pipe connections to receive waste pipes from the showers, baths, basins, WC's, sinks and washing machines, all wastes are to be installed to minimise the number of bends and are to be laid to falls in accordance with BS EN 12056 and Building Regulations.

WC connections onto horizontal drains are to be installed with rigid connections laid to the correct falls, flexible pipework can be used as a straight length with a maximum installed length of 100mm on the WC connection if required however rigid pipework should be used if at all possible.

All soil stacks are to be installed with bespoke brackets as manufactured by Polypipe and are to be fixed at intermediate levels on each floor as well as at floor levels to provide a robust and secure installations.

At every level an access cap is to be included in the soil stack to allow any maintenance to be carried out, care is to be made to ensure that these access caps are orientated so that they can be easily used following completion of the installations.

All waste pipes are to be manufactured in MUPVC by Polypipe Terrain or equal and approved and are to include intumescent fire sleeves on waste pipes above 40mm diameter where they pass through fire compartments or through the floor slabs.

Fire collars through floors are to be supplied and installed by the mechanical contractor.

The soil stacks at the head of the drain are to penetrate through the roof and vent to atmosphere with a bird guard. The Mechanical Contractor is to include for any necessary flashing to provide a weathertight seal through the roof. The remainder stacks are to rise to high level and include an air admittance valve.

At the basement floor level on the existing building the soil stacks are to set over to the external wall and connect up with the underground drainage points. The pipework is to include access points on the bends and are also to be bracketed so that they are secure, with brackets being installed directly on the base of the bend at each stack base.

The bend at the base of the stack is to be a long radius bend of at least twice the diameter of the pipe, with a minimum invert level of 750mm below the lowest connection to ensure compliance with BS.

Isolated kitchen sinks shall be connected typically to 82mm diameter waste stacks, which shall be located suitably in the corner of rooms. Drainage connections for sinks, appliances etc. shall be run wherever possible beneath the kitchen worktop arrangements and all traps shall be supplied and fixed by the mechanical subcontractor.

The Mechanical Contractor is to allow for the supply, handling and installation of all the sanitaryware items listed within the Bridgewater House Material Specification schedule including brassware. The installation is to include the supply of all fixings and sealant to provide a complete and working installation.

A system of UPVC above ground rainwater drainage as manufactured by

Friaphon or equal and approved shall be provided for all internal rainwater pipes. The mechanical contractor shall establish with the Architect the location of rainwater stacks. Rainwater pipework, stacks and high-level horizontal runs shall be supplied and installed by the mechanical contractor including all external areas, plantrooms, retail units, bike stores etc. All pipework is to be acoustically attenuated type such as Friaphon or equal and approved to prevent noise transmission. Roof, balcony and courtyard outlets are to be manufactured by Wade or equal an approved and supplied and installed by the mechanical contractor. Intumescent collars are to be installed where pipework passes through the floor slabs.

100.020 DESIGN PARAMETERS

BS 12056-2:2000
Building Regulations Part H
Local Authority Regulations.

100.030 SANITARYWARE SPECIFICATION

The contractor shall allow for the supply and installation of all sanitaryware which are to be the types indicated within the appendix. Installation shall include all traps, sealant, fixings and all components to make a complete and working installation.

200.000 DRAINAGE PIPELINES AND FITTINGS

200.010 PIPES AND FITTINGS - UNPLASTICIZED PVC TO BS 4514:

- Application Soil stacks and Waste pipework
- Manufacturer Geberit Terrain, Friaphon,
  - Or approved equivalent.
- Kitemark certified
  Material - UPVC to BS 4514,
  Finish
  - Grey
- Jointing
  - Solvent welded, Timesaver couplings

200.020 PIPEWORK ACCESSORIES:

- Pipe rings and clips
  Select type according to the application and material compatibility.

200.030 PIPE SLEEVES/FIRE COLLARS:

- Type Intumescent Fire Collars
- Application At penetrations through fire compartment structures
- Manufacturer Quelfire
  - Or approved equivalent.
- Supply intumescent sleeves where pipes pass through floors for fire separation.

300.000 DRAINAGE ACCESSORIES

300.010 PLASTICS TUBULAR TRAPS:

- Type P or S traps
- Application At sinks and showers
- Manufacturer and reference McAlpine
  - Or approved equivalent.
- Standard - BS EN 274-1, BS EN 274-2, BS EN 274-3.

- Material
  - Polypropylene.
- Pattern
  - P.
- Seal depth (mm) 75

300.020 PLASTICS BOTTLE TRAPS:
- Application At sinks
- Manufacturer and reference McAlpine
  - Or approved equivalent.
- Standard
  BS EN 274-1, BS EN 274-2, BS EN 274-3 - for sanitary appliances excluding baths.
- Material
  - Polypropylene.
- Seal depth (mm) 75

300.021 CHROME BOTTLE TRAPS:
- Application At basins
- Manufacturer and reference McAlpine
  - Or approved equivalent.
- Standard
  BS 3943
- Material
  - Chrome plated brass.
- Seal depth (mm) 75

300.030 PLASTICS WC PAN CONNECTOR:
- Manufacturer and reference Multikwik
  - Or approved equivalent.
- For horizontal outlet and shrouded pans.
- BS 5627 for pans to BS EN 33, BS EN 37, BS EN 997.
  - Figure 2 'P' traps new installations.

300.040 VENT COWL:
- Application Soil stack vents
- Manufacturer and reference Geberit Terrain
  - Or approved equivalent.
- Material
  - Plastics.

300.050 AIR ADMITTANCE VALVES:
- Application On stub stacks and main non vented stacks
- Manufacturer and reference Geberit Terrain
  - Or approved equivalent.
- Standard - BS EN 12380.
- BBA certificate.
- Material Plastic

400.000 DRAINAGE WORKMANSHIP
400.010 PERFORMANCE CRITERIA:
Install pipework fittings and accessories to ensure that

- Appliances drain quickly, quietly and completely at all times without nuisance or risk to health.
- Discharge is conveyed without crossflow, backfall, leakage or blockage.
- Air from drainage system does not enter building.
- Pressure fluctuations in pipework do not vary by more than plus or minus 38mm water gauge and traps retain a water seal of not less than 25mm.
- System can be adequately tested, cleaned and maintained.

400.020 PIPE ROUTES:
Ensure pipe routes are shortest practicable, with as few bends as possible and no bends in wet portion of soil stacks, unless indicated otherwise on drawings.

400.030 COATED PIPES:
Make good damaged coatings and cut ends, or recoat, as recommended by manufacturer.

400.040 INSTALLATION GENERALLY:
Install pipes, fittings and accessories in accordance with BS 8000-13, BS EN 12056-2 and manufacturer's recommendations. Obtain all components for each type of pipework from the same manufacturer, unless otherwise indicated.
Inspect components carefully before fixing and reject any which are defective.
Ensure cut ends of pipes to be clean and square with burrs removed.
Allow for thermal and building movement when jointing and fixing.
Form junctions using fittings intended for the purpose, ensuring that jointing material does not project into bore of pipes, fittings and appliances.
Fix pipes at centres not greater than those specified in BS 8000-13. Provide additional supports as necessary at junctions and changes in direction. Fix every length of soil vent pipe at, or close below the socket collar.
Use plated, sheradized, galvanized or nonferrous fastenings, suitable for the purpose and background, and compatible with the material being fixed or fixed to.
Avoid contact between dissimilar metals and other materials which would result in electrolytic corrosion.
In convenient locations, provide access covers and cleaning eyes as necessary and in accordance with Local Authority requirements to permit adequate testing and cleaning of pipework.
Prevent entry of foreign matter into any part of system by sealing openings during construction. Fit all access covers and cleaning eyes as work proceeds.

400.050 CONNECTIONS BETWEEN PIPES OF DIFFERENT MATERIALS:
- Plastic
  - Connect plastics pipework to pipework of other materials using approved connectors and methods in accordance with plastics pipework manufacturer's recommendations, to form a watertight joint.
  - Use AD 400 or AD 200

400.060 WASTES:
Bed in waterproof jointing compound and fix with resilient washer between appliance and backnut.

400.070 WASTE CONNECTORS:
Join to traps as manufacturer's recommendations.

400.080 WC PANS:

- Plastic
  - Connect to soil pipe spigots with plastic connectors in accordance with connector manufacturer's recommendations.

400.090 ACCESS POINTS:

Provide rodding and access points at all changes of direction to enable whole system to be maintained.
Provide square door type access points as indicated on drawings at foot of all soil and ventilation pipes.
Where practicable, locate access points and horizontal anti-syphon pipes above fitment flood level.
In general make WC connections to drain points and soil pipes via flexible connectors.

400.100 PRESSURE TESTING - SOIL, WASTE, VENTILATION, AND ANTI- SYPHON PIPEWORK:

Test section by section as the work proceeds and subsequently on completion with all sanitary fittings fixed and working. Submit systems to two separate tests, Air test and Hydraulic Performance test in accordance with BS EN 12056.

BS APPENDIX

BS 4514:2001
Unplasticized PVC soil and ventilating pipes of 82.4mm minimum mean outside diameter, and fittings and accessories of 82.4mm and of other sizes. Specification

BS 5255:1989
Specification for thermoplastics waste pipe and fittings.
Partially replaced by BS EN 1329-1:2000, BS EN 1455-1:2000, BS EN 1519-1:2000, BS EN 1565-1:2000, BS EN 1566-1:2000 but remains current

BS 5627:1984
Specification for plastics connectors for use with horizontal outlet vitreous china WC pans

BS 8000-13:1989
Workmanship on building sites. Part 13 Code of practice for above ground drainage and sanitary appliances

BS EN 12056-1:2000
Gravity drainage systems inside buildings. Part 1 General and performance requirements

BS EN 12056-2:2000
Gravity drainage systems inside buildings. Part 2 Sanitary pipework, layout and calculation

BS EN 12056-5:2000
Gravity drainage systems inside buildings. Part 5 Installation and testing, instructions for operation, maintenance and use

BS EN 12380:2002
Air admittance valves for drainage systems. Requirements, test methods and evaluation of conformity

BS EN 274-1:2002
Waste fitting for sanitary appliances. Part 1 Requirements

BS EN 274-2:2002
Waste fitting for sanitary appliances. Part 2 Test methods

BS EN 33:2003
Pedestal W.C. pans with close-coupled flushing cistern. Connecting dimensions

BS EN 681-1:1996
Electrometric seals. Material requirements for pipe joint seals used in water and drainage applications. Part 1 Vulcanized rubber

BS EN 681-2:2000
Electrometric seals. Material requirements for pipe joint seals used in water and drainage applications. Part 2 Thermoplastic elastomers

BS EN 997:2003
WC pans and WC suites with integral trap

S12 HOT AND COLD WATER

100.000 SYSTEM DETAILS:

100.010 SYSTEM DESCRIPTION:

1) Incoming Water Supply

A new water supplies will be provided into the basement of the existing building by the water supplier, the contractor is to install an isolating valve, double check valve and drain cock on each incoming supply, space is to be left in accordance with the water suppliers requirements to allow them to install a water meter at handover.

2) 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 8358, BS EN 806, TM18 & BS9251.

The water supply is to feed a water storage tank and booster set in the basement of the existing building, this is to serve both buildings with a Protectaline MDPE pipe passing from the existing building to the new building. The tank is to be a sectional pre-insulated grp break tank of sufficient capacity to provide 30 minute storage for the satisfy the requirements of the domestic services in accordance with BS EN806. A tank size of 8000 litres actual capacity has been assessed initially which is to be a maximum height of 1.5m with internally flanged base and sides.

The cold water storage tank shall be sectional, complete with central division, externally or internally flanged and bolted, base and side, suitable for erection on steels and plywood base. The mechanical contractor shall include for the supply and erection of the steel beams/base for the tank support.

The storage tank shall be complete with the following in each compartment.

- Manway access hatch
- Wash out connection
- Overflow pipe connection
- Inlet connection and float valve
- Outlet connection
- Warning pipe connection
- High & low level switches

The water storage tank shall be constructed with pre-insulated panels, tight fitting secured cover and marine grade stainless steel external access ladder and shall comply with the Water Fittings Regulations, BS3691, BS9251 & BS4549.

The tank shall be provided with all necessary nuts, bolts, washers reinforcement stays, sealant, manway cover and screwed vent. A tank more than 1m high shall have internal and external ladders and tanks greater than 1.5m high shall be complete with hand rails.

All nuts, bolts, reinforcement stay bars, internal ladders and any other items of metal exposed to eater contents shall be of stainless steel 316 marine grade.

The sectional water tank shall be erected by the manufacturer.

They shall be filled within 10 days of completion and shall remain full.

A Booster set is to be provided which is to be a packaged unit with duty/standby/assist motors invertor controlled to provide variable speed operation to maintain a constant pressure at peak draw off. The unit is to be acoustically treated and is to be ultra-quiet models to ensure there is no breakout to adjacent rooms. The unit is to be sized to cater for the peak flow and is to develop a pressure sufficient to maintain 1.5bar at the highest level at peak flow.

The connections onto the booster is to include steel braided flexible pipework which are to be WRAS approved.

The booster set shall be skid mounted and complete with:

- Anti condensation heaters to pump motors
- Full fault indicator lights on booster set control panel
- Anti-vibration mounts
- Potable quality flexible connections
- Y-Type strainer on pump set suction complete with test points
- Pressure reducing valves c/w pressure gauge
- Hand/Off/Auto controls
- Changeover of alternative lead pump set to alternate pumps every 24 hours.
- A safety relief valve set to 0.7 bar above manual working pressure
- Pressure buffer vessel
- High & low alarms
- 5 year manufacturers parts and labour warranty
- Suitable for an emergency secondary supply.

The water booster shall incorporate a system fill mode to minimise the risk of water hammer during system filling.

The domestic services pipework is to be taken from the booster set then to be routed up the riser with an isolation valve and double check valve on each floor before distributing to all the apartments on that floor.

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 pipework is to be run within risers and corridor / walkway ceiling void and into each apartment where water meter tenant valve assemblies are to be located, the contractor is to ensure that the installation is in compliance with the United Utilities Water requirements to ensure that they can install the meters at the end of the project. The tenant valve assemblies are to be prefabricated WRAS approved units as manufactured by Reliance Valves their Tenant Valve Advance unit or equal and approved and are to include isolating valve, pressure reducing valve, double check valve, pressure gauge and insulation jacket installed within the store.

No push fit fittings are to be used only crimped, soldered or compression type.

A separate Landlords system is to be provided complete with stop cock, meter adaptor with double check valve serving all Landlord outlets.

The water pipework is to include a stop cock, double check valve, pressure reducing valve and meter location on the supply within each apartment in addition an isolation valve is to be installed outside each apartment the pipework is then to feed the apartment cold water outlets and hot water cylinder.

The pipework is to run within the ceiling void of the walkway and is to include a branch to each apartment with an isolation valve prior to passing into the apartment.

The pipework is to be thermally insulated with mineral wool foil faced insulation. 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 water services pipework routed externally in the ceiling void of the walkway is to be trace heated as a frost protection utilising self limiting electrical trace heating tape, this is to be suitable for installing on the plastic pipework.

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

At the head of the boosted mains cold water riser on each riser and in each building the contractor is to install an arrestor to remove the possibility of water hammer and an automatic air vent.

Where taps do not include integral flow restrictors the contractor is to supply and install flow restrictors to inhibit the flow rate to basins at 4.5l/m, showers at 6.0l/m and sinks at 5.0l/m. The contractor is to carry out water efficiency calculations to ensure that the installation complies with building regulations and achieves a water consumption no greater than 125l/person/day, if necessary water outlets are to be changed to suit the calculations, the Client is to be made aware of any changes required before they are implemented.

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

Connections are to be made to the washing machine in each apartment which are to include a washing machine valve and hose and double check valve.

The installation is to comply with HSE Code of Practice, “The Control of Legionella Bacteria in Water Systems”.

3). Hot Water Installation

The hot water is to be provided in each apartment with a 200 litre unvented air source heat pump cylinder, as manufactured by Curv or equal and approved. The unit is to be suitable for an unvented system and include an expansion vessel, safety valves etc. The cylinder is to be a pre-insulated unit and is to be sized to provide sufficient hot water for the apartment occupancy.

The hot water cylinder is to be installed strictly in accordance with the

manufacturers requirements including insulated fresh air and exhaust ductwork to atmosphere.

The initial installation is to be inspected by a manufacturers representative prior to progressing to any other apartments, upon completion the cylinders are to be commissioned by a manufacturers engineer and certification of completion included within the O&M manuals.

The cylinder shall be complete with the following:

- Pressure testing to 15 bar
- 22mm hot water outlet
- 22mm cold water inlet
- 22mm hi flo cold water valve assembly comprising 3 bar pressure reducer ¼ turn isolating ball valve, line strainer, non-return valve and expansion valve
- Tundish 15mm inlet and 22mm outlet
- Totally insulated with 100% CFC free polyurethane insulation 60mm thick
- Drain valve
- ½ inch temperature and pressure relief valve supplied with insulation casing operating at 90°C/10bar.

The cylinders are to be installed in accordance with the pressure vessel regulations and the Building Regulations. With expansion vessels, safety relief valves etc. The safety relief valves are to be piped via a tundish to a high temperature waste pipework.

Any apartments with excessive hot water pipework runs where it is shown that hot water at 55^0C will not be at the outlet within 1 minute of opening the tap shall include trace heating to ensure that deadlegs are not excessive all in compliance with the Building Regulations and L8.

Thermostatic shower mixers are to be provided in each apartment, these are to include shower head, flexible pipework and riser rail as part of the installation. The shower head and riser rail system are to be metal, not plastic and are to be approved prior to ordering.

Thermostatic blending valves are to be installed under all baths to restrict the temperature to 41C in accordance with the building regulations.

Isolating valves are to be installed in compliance with BSEN 806 and the water regulations. The installation is to comply with HSE Code of Practice, “The Control of Legionella Bacteria in Water Systems”.

All new pipework shall be cleaned, flushed through and pressure tested before the application of thermal insulation.

Concealed pipework and pipework within the cylinder cupboards is to be thermally insulated with Class O foil faced phenolic foam insulation.

Following completion of the hot and cold water services the system is to be pressure tested and chlorinated in accordance with BS EN 806 prior to handover.

100.020 DESIGN PARAMETERS:
CIBSE TM13
BS EN 806
Water Regulation Guidelines
Hot Water Flow 60 Deg C
HSE Code of practice L8 “The Control of Legionella Bacteria in Water Systems”.

100.030 CONTROL REQUIREMENTS:
Each cylinder is to have integral control of the heating output with a time facility.

Thermostatic shower mixers are to be provided in each apartment and cluster ensuite, these are to include shower head, flexible pipework and riser rail as part of the installation. The shower head and riser rail system are to be metal, not plastic and is to be in accordance with the Clients requirements and water efficiency calculations.

Thermostatic blending valves are to be installed under all baths to restrict the temperature to 41^0C in accordance with the building regulations.

Isolating valves are to be installed in compliance with BSEN 806 and the water regulations. The installation is to comply with HSE Code of Practice, “The Control of Legionella Bacteria in Water Systems”.

All new pipework shall be cleaned, flushed through and pressure tested before the application of thermal insulation.

Concealed pipework and pipework within the plantroom is to be thermally insulated with Class O foil faced phenolic foam insulation.

Following completion of the hot and cold water services the system is to be pressure tested and chlorinated in accordance with BS EN 806 prior to handover.

100.020 DESIGN PARAMETERS:
CIBSE TM13
BS EN 806
Water Regulation Guidelines
Hot Water Flow 60 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 as provided integral with the cylinder.

200.000 <u>PLANT AND EQUIPMENT</u>:

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.

200.020 THERMOSTATIC MIXING VALVES:

- Type Blending Valves
- Hot water outlets
- Manufacturer and reference : Meynell point of use blending valves or equal and approved.

200.030 CONTROLS:

- Provide all controls necessary to meet the control requirements specified in clause 100.030.
- Controllers, immersion heater control

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 equivalent

  Bronze 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 <u>PIPELINE WORKMANSHIP</u>:

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 fitments 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 then 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 <u>THERMAL INSULATION:</u>

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

U19 VENTILATION

100.000 SYSTEM DETAILS

100.010 SYSTEM DESCRIPTION

Ventilation is to be provided to the apartments to comply with the Building Regulations following guidance detailed within the BRE digest 398 and also PPQ24

In all apartments MVHR units are to be installed which are to extract from kitchens and bathrooms, they are to provide fresh air in to the habitable rooms including bedrooms and living area in compliance with the Building Regulations.

The fans are to include any controllers necessary to make a complete and working installation. The MVHR units are to be low watt type registered under Appendix Q and are to provide trickle vent and boost facility with summer bypass as manufactured by NuAire MRXBOX Eco2 or equal and approved.

Fresh air and exhaust ductwork is to be taken from an external wall to the indoor hot water heat pump, this is to be 180 diameter and to terminate with a louvre on the external wall, louvre to be agreed with the Architect.

Natural ventilation is to provide the purge requirements via openable windows.

The units are to include an integral humidity sensor which is to increase the speed automatically in proportion to relative humidity levels, a manual boost switch is to be included in the kitchen.

The final air changes and window opening area required shall be confirmed by the mechanical contractor following completion of an overheating assessment which is to provide compliance with Part O of the Building Regulations and also Part F of the Building Regulations. These calculations are to be undertaken by the Contractor, preliminary calculations have been undertaken which can be utilised, these show no additional ventilation is required to satisfy Part O but these will require verification by the contractor.

The ventilation system is to be installed in accordance with the manufacturer's recommendations and is to include all components necessary to provide a complete and working installation.

The ventilation systems shall be designed in rooms to meet the noise levels stated within the acoustic report, namely the site suitability and noise impact assessment.

The services contractor shall provide suitable sized ductwork manufactured from flat PVC ductwork routed through the ceiling areas of the apartments to the inside face of the external wall, the duct through the wall to the louvre or air brick is to be of non-combustible material such as galvanised steel, zinc coated sheet steel or aluminium to be in accordance with the latest fire regulations and include an intumescent collar at the connection between steel and plastic ducting. Routes to be agreed with the Architect to terminations agreed. The ductwork shall pick up the grilles to each area and shall be of a size and aspect ratio suitable for integrating into the ceiling voids with a velocity between 2.5m/s and 4.5m/s.

The system shall include fire dampers or intumescent closures where ductwork passes through compartment walls.

Following completion extract and supply rates are to be measured to ensure that they comply with those listed within the Building Regulations and Partt O calculations.

The intake and extract terminations in the cladding are to be via a plenum above the door or through the external wall, the mechanical contractor is to provide a plenum at the termination which is to be a size to reflect the opening formed within the cladding, this is to be installed prior to the cladding installation carefully positioned to ensure the plenum is in the correct location where the opening is formed, the plenum is to be sealed to the back of the cladding by the cladding installer, this is to be manufactured in galvanised steel in accordance with the latest regulations and complete with intumescent closer on the plastic ductwork.

The plenums are an important and integral part of the system and also the cladding as such proposals are to be agreed with the Architect and cladding specialist before manufacturer and installation.

Attenuators shall be provided on the inlets and exhaust ducts to comply with the acoustic report to prevent ingress of noise into the apartments. Acoustic flex will be required on MVHR unit connections.

Fresh air intake and exhaust ductwork is to be thermally insulated either with a proprietary insulation system or foil faced mineral wool insulation, this is to include all plenums up to the rear of the panels and any intake and exhaust flexible ductwork.

Each MVHR unit is to include condensate waste pipework to the nearest stack complete with tundish and waterless trap.

200.000 PLANT AND EQUIPMENT

Installation

Ensure air is straightened as it leaves unit discharge.

Ensure ductwork connection is long enough to maintain the aerodynamic performance of the fan.

Seal panels around electrical cable and pipework service entry points to prevent air leakage. Provide flexible cables between fan motor and local isolator.

200.010 MVHR UNIT

- Manufacturer and reference NuAire
  - Or approved equivalent
- Operation
  - Single fan.
- Location
  - Ceiling void mounted.
- Materials
  - Manufacturer's standard.
- Electrical safety to BS EN 60335-2-80.
- Motor
  - Electrical supply to BS 7697
    - Single phase.

- Testing
  - Where fans approved under CAME scheme are used provide certified data for type.
  - Where fans are not approved under CAME scheme provide results of aerodynamic performance tests in accordance with BS 848-1; noise tests in accordance with BS 848-2 and fan vibration tests in accordance with BS ISO 14695.

200.020 GRILLES AND DIFFUSERS:
- Manufacturer and reference Gilberts/NuAire
  - Or approved equivalent
- As indicated on drawings

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

300.000 DUCTLINES AND ANCILLARIES

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

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

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

300.040 DUCTWORK AND FITTINGS:
- Design Information
  Supply ductwork in accordance with classification in DW144 Table 1.
  Ductwork Classification and Air Leakage limits
  - Low pressure - Class A - Positive.
- Plant connections.
  Make connection between air handling assembly and ductwork system in accordance with DW 144.

300.050 FLEXIBLE DUCTS:
- Supply and fasten flexible duct connections as DW144 Part 7 Section 25. Use flexible duct connections in applications listed in DW144 paragraph 25.1.
- Material
  - Aluminium
    - Aluminium double skinned flexible ductwork as supplied by Nuaire/Vent Axia.

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

appropriate.

- Internal cleanliness
  - Provide the level of cleanliness and protection as defined in HVCA document DW/TM2.
    - Basic.
- Weatherproofing
  - Fit ductwork with trimming angle and weather cravat, skirt, flashing plate and cowl where ductwork passes through or terminates in roof, to ensure a weatherproof seal to building structure
- Enclose ducts passing through building elements, (walls, floors, partitions, etc.) within purpose made sleeves. Cut sleeves of the same material as the duct and pack with mineral fibre or similar non-flammable and fire resistant material to form a fire/smoke stop of adequate rating and to prevent air movement and noise transmission between duct and sleeve.
- Provide test holes in ductwork system to allow complete testing and balancing of system in accordance with CIBSE Commissioning Code Series A.
- Site drill test holes on site in accordance with DW144 Part 7 Section 20.6.
- Provide holes in metal ductwork, in accordance with DW144 Part 7, paragraph 20.7, to accommodate thermostats, humidistats and other control sensors in positions and sizes indicated on drawings.
- Install sensors and test points in plastics ductwork to suit specialist control and sensing equipment in positions and fixing configurations shown on drawings.
- Fit sensors, damper motors and other control equipment as indicated on drawings.

400.000 COMMISSIONING

400.010 COMMISSIONING REQUIREMENTS:

Application MVHR Ventilation

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

500.000 CONTROLS

500.010 CONTROL COMPONENTS:

- Control specialist NuAire
  - Or approved equivalent
- Provide and fix control components to meet the requirements in the

specification.

BS APPENDIX

BS 2972:1989
Methods of test for inorganic thermal insulating materials. Partially replaced by BS EN 13467 to BS EN 13472:2001.

BS 3533:1981
Glossary of thermal insulation terms

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

BS 476-6:1989
Fire tests on building materials and structures. Part 6 Method of test for fire propagation for products

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

BS 5422:2001
Method for specifying thermal insulating materials for pipes, tanks, vessels, ductwork and equipment operating within the temperature range -40°C to +700°C

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

BS 848-1:1997
Fans for general purposes. Part 1 Performance testing using standardized airways

BS 848-2:1985
Fans for general purposes. Part 2 Methods of noise testing.
Partially replaced by BS EN ISO 5136:2003.

BS 848-5:1999
Fans for general purposes. Part 5 Special for mechanical safety (guarding)

BS 874-1:1986
Methods for determining thermal insulating properties. Part 1 Introduction, definitions and principles of measurement

BS 874-3.1:1987
Methods for determining thermal insulating properties. Part 3-1 Tests for thermal transmittance and conductance. Guarded hot-box method

BS 874-3.2:1990
Methods for determining thermal insulating properties. Part 3.2 Tests for thermal transmittance and conductance. Calibrated hot-box method

BS 874:1973

Methods for determining thermal insulating properties with definitions of thermal insulating terms.
Current. Partially replaced by Parts and Sections of the new edition.

BS EN 10215:1995
Continuously hot-dip aluminium-zinc (AZ) coated steel strip and sheet. Technical delivery conditions

BS EN 60529:1992
Specification for degrees of protection provided by enclosures (IP code)

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

X01 WATER MIST SYSTEM

100.010 SYSTEM DESCRIPTION

A domestic water mist system is to be installed within each apartment of the both the new and existing building.

The water mist system is to be designed, supplied, installed and commissioned by the manufacturer, these can be either iMist or IPH.

The mist systems are to include a pump set located within the utility cupboard which is to be connected direct to the incoming water supply, discreet flush mist nozzles in the ceiling activated by a heat sensitive bulb, priority valve installed on the water supply to the apartment outlets.

The mist system is to include an interface with the fire alarm and also provide an app for remotely alarming the tenant should the mists system be activated

The mist system is to be designed, installed and commissioned in accordance with BS:8458 Residential Water Mist and BS:9252 sprinkler standard.

The mist sub-contractor shall include for all necessary tools, labour materials and equipment to supply, install and commission the following:

- Install all mist pipework arrays and mist heads in accordance with BS 9252:2011 and BS:8458
- Undertake all commissioning checks, completion certificates.
- Undertake all necessary filing, venting, flushing out of the system
- Liaise and co-ordinate with other trades on site
- Preparation or working drawings, full hydraulic calculations and builders work drawings
- Preparation of all necessary Method Statements and Risk Assessments as required under CDM 2015.
- ‘As Fitted’ drawings with operation and maintenance documents/manuals

The building control and fire authority are to be given notice of demonstration so they can witness the operation of the system.

APPENDIX 1 ROOM DATA SHEETS

Index.

1) Entrance Lobby existing building
2) Switch Room
3) Basement Tankroom
4) Stairways existing building
5) Typical Apartment Hall
6) Typical Apartment Lounge / Kitchen
7) Typical Apartment Lounge / Kitchen Existing Building
8) Typical Bedroom area new build
9) Typical Bedroom Existing Building
10) Typical Bathroom
11) Typical Apartment Ensuite
12) Typical Apartment Store
13) Basement Existing Building
14) Typical Corridor Existing Building
15) Electric meter rooms
16) Lifts
17) External Areas
18) Typical Terrace / Walkway

ROOM DATA SHEET	**NO. 1 Revision**
AREA: Entrance Lobby x 3 (Existing Building)	
LIGHTING Recessed LED down lighter IP65 photocell controlled Feature light fitting in each entrance	**WATER SERVICES** N/A
SOCKET OUTLETS N/A	**HEATING** Panel Heater
GENERAL POWER Power to heater	**VENTILATION** N/A
FIRE ALARM Yes to BS 5839 Main fire Panel Fire alarm interface to automatic doors	**A/C** N/A
EMERGENCY LIGHTING Yes to BS 5266	**GAS** N/A
SECURITY Access control system	**SANITARYWARE**
DATA/TELEPHONE N/A	**SOILS & WASTES**
CCTV 1 camera to cover entrance door	**OTHER ITEMS** N/A
TELEVISION OUTLET N/A	
OTHER ITEMS External entrance door audio entry, fob access for entry Auto doors electrical supply.	

ROOM DATA SHEET	NO. 2 Revision
AREA: Switch Room	
LIGHTING Totally enclosed IP65 linear LED fitting	**WATER SERVICES** N/A
SOCKET OUTLETS 1 twin socket outlet	**HEATING** Tubular Heater
GENERAL POWER Power to tubular heater	**VENTILATION** N/A
FIRE ALARM Yes to BS 5839	**A/C** N/A
EMERGENCY LIGHTING Yes to BS 5266	**GAS** N/A
SECURITY N/A	**SANITARYWARE** N/A
DATA/TELEPHONE N/A	**SOILS & WASTES** N/A
CCTV N/A	**OTHER ITEMS**
TELEVISION OUTLET N/A	
OTHER ITEMS Tubular heater with thermostat	

ROOM DATA SHEET	**NO. 3 Revision**
AREA: Basement Tankroom	
LIGHTING Totally enclosed IP65 linear LED fitting	**WATER SERVICES** Cold water to tanks Water Booster
SOCKET OUTLETS 1 twin socket outlet (general)	**HEATING** N/A
GENERAL POWER Supply to booster	**VENTILATION** N/A
FIRE ALARM Yes BS 5839	**A/C** N/A
EMERGENCY LIGHTING Yes BS 5266	**GAS** N/A
SECURITY N/A	**SANITARYWARE** N/A
DATA/TELEPHONE N/A	**SOILS & WASTES** N/A
CCTV N/A	**OTHER ITEMS**
TELEVISION OUTLET N/A	
OTHER ITEMS	

ROOM DATA SHEET	**NO. 4 Revision**
AREA: Stairways (Existing Building)	
LIGHTING Decorative compact LED wall mounted light fitting	**WATER SERVICES** N/A
SOCKET OUTLETS 1 no. twin per floor (lockable)	**HEATING** N/A
GENERAL POWER N/A	**VENTILATION** N/A
FIRE ALARM Yes BS 5839	**A/C** N/A
EMERGENCY LIGHTING Yes BS 5266	**GAS** N/A
SECURITY N/A	**SANITARYWARE** N/A
DATA/TELEPHONE N/A	**SOILS & WASTES** N/A
CCTV Camera on each stair lobby	**OTHER ITEMS**
TELEVISION OUTLET N/A	
OTHER ITEMS	

ROOM DATA SHEET	**NO. 5 Revision**
AREA: Typical Apartment Hall	
LIGHTING Recessed down lights, two way switched (1, 2 or 3 depending on size) Main corridor LED recessed down lighter highlighting front door switched from hall.	**WATER SERVICES** N/A
SOCKET OUTLETS 1 twin socket outlet	**HEATING** Heating set at 22ºC Electric panel heater
GENERAL POWER N/A	**VENTILATION** N/A
FIRE ALARM Smoke detector and audible to BS 5839	**A/C** N/A
EMERGENCY LIGHTING N/A	**GAS** N/A
SECURITY Video Intercom	**SANITARYWARE** N/A
DATA/TELEPHONE N/A	**SOILS & WASTES** N/A
CCTV N/A	**OTHER ITEMS** Water Mist Outlet
TELEVISION OUTLET N/A	
OTHER ITEMS Audio & Video door entry handset	

ROOM DATA SHEET	**NO. 6 Revision**
AREA: Typical Apartment Lounge / Kitchen (New Build exposed soffit)	
LIGHTING Wall lights, exposed soffit	**WATER SERVICES** Hot & Cold water services to kitchen appliances,,
SOCKET OUTLETS 2 twin socket outlets (USB Outlets) 2 twin socket outlets 1 Media Outlet plate 3 twin socket outlets Kitchen 1 low level single socket outlet fridge/freezer via spur unit	**HEATING** Heating to 21^0C Electrical panel heater
GENERAL POWER 1 32A cooker outlet with integral socket and flex outlet – oven 1 32A cooker outlet with integral socket and flex outlet – hob 1 16A Water Mist Pump	**VENTILATION** Ventilation to suit Building Regulations via MVHR unit
FIRE ALARM Heat detector to BS 5839 Smoke Detector to BS5839	**A/C** N/A
EMERGENCY LIGHTING N/A	**GAS** N/A
SECURITY N/A	**SANITARYWARE** Sink
DATA/TELEPHONE 1 outlet (media outlet plate) 1 outlet home study 1 BT master outlet	**SOILS & WASTES** Waste from Sink
CCTV N/A	**OTHER ITEMS** MVHR control boost via switch Water Mist System Outlets
TELEVISION OUTLET 1 Outlet (media outlet plate)	
OTHER ITEMS MVHR control boost via switch Water Mist System	

ROOM DATA SHEET	**NO. 7 Revision**
AREA: Typical Apartment Lounge / Kitchen (Existing)	
IGHTING Recessed downlights	**WATER SERVICES** Hot & Cold water services to kitchen appliances,,
SOCKET OUTLETS 2 twin socket outlets (USB Outlets) 2 twin socket outlets 1 media outlet plate 3 twin socket outlets Kitchen 1 low level single socket outlet fridge/freezer via spur unit	**HEATING** Heating to 21^0C Electrical panel heater
GENERAL POWER 1 32A cooker outlet with integral socket and flex outlet – oven 1 32A cooker outlet with integral socket and flex outlet – hob	**VENTILATION** Ventilation to suit Building Regulations via MVHR unit
FIRE ALARM Heat detector to BS 5839 Smoke Detector to BS5839	**A/C** N/A
EMERGENCY LIGHTING N/A	**GAS** N/A
SECURITY N/A	**SANITARYWARE** Sink
DATA/TELEPHONE 1 outlet (media outlet plate) 1 outlet home study 1 BT master outlet	**SOILS & WASTES** Waste from Sink
CCTV N/A	**OTHER ITEMS** MVHR control boost via switch Water mist outlet
TELEVISION OUTLET 1 Outlet (media outlet plate)	
OTHER ITEMS MVHR control boost via switch	

ROOM DATA SHEET	**NO. 8 Revision**
AREA: Typical Apartment Bedroom (New Build)	
LIGHTING Wall lights (Exposed Soffit)	**WATER SERVICES** N/A
SOCKET OUTLETS 3 twin socket outlets (Single bedrooms)	**HEATING** Heating design temp 22ºC Electric panel heater
GENERAL POWER N/A	**VENTILATION** Supply from MVHR Unit
FIRE ALARM Smoke detector BS 5839 (Exposed soffit)	**A/C** N/A
EMERGENCY LIGHTING N/A	**GAS** N/A
SECURITY N/A	**SANITARYWARE** N/A
DATA/TELEPHONE 1 outlet	**SOILS & WASTES** N/A
CCTV N/A	**OTHER ITEMS** Water Mist System Outlet
TELEVISION OUTLET 1 outlet	
OTHER ITEMS Data, TV and Power on media plate	

ROOM DATA SHEET	**NO. 9 Revision**
AREA: Typical Apartment Bedroom (Existing Building)	
LIGHTING Recessed downlighters	**WATER SERVICES** N/A
SOCKET OUTLETS 3 twin socket outlets (Single bedrooms)	**HEATING** Heating design temp 22ºC Electric panel heater
GENERAL POWER N/A	**VENTILATION** Supply from MVHR Unit
FIRE ALARM Smoke detector BS 5839	**A/C** N/A
EMERGENCY LIGHTING N/A	**GAS** N/A
SECURITY N/A	**SANITARYWARE** N/A
DATA/TELEPHONE 1 outlet	**SOILS & WASTES** N/A
CCTV N/A	**OTHER ITEMS** Water Mist System Outlet
TELEVISION OUTLET 1 outlet	
OTHER ITEMS Data, TV and Power on media plate	

ROOM DATA SHEET	**NO. 10 Revision**
AREA: Typical Apartment Bathroom	
LIGHTING 4 x IP65 rated led recessed downlights Over mirror light	**WATER SERVICES** Hot & cold water services to sanitaryware, Hot water temp 41ºC to bath
SOCKET OUTLETS Shaver point	**HEATING** Design Temp 22ºC Towel rail
GENERAL POWER Supply to towel rail Supply to mirror	**VENTILATION** Ventilation to suit Building Regulations via MVHR unit
FIRE ALARM N/A	**A/C** N/A
EMERGENCY LIGHTING N/A	**GAS** N/A
SECURITY N/A	**SANITARYWARE** WC, Basin, Bath or Shower
DATA/TELEPHONE N/A	**SOILS & WASTES** Waste from Sanitaryware
CCTV N/A	**OTHER ITEMS** Thermostatic shower mixer, shower flexible hose and riser rail.
TELEVISION OUTLET N/A	
OTHER ITEMS Back lit mirror with shaving socket MVHR control interface via light switch	

ROOM DATA SHEET	**NO. 11 Revision**
AREA: Typical Apartment Ensuite	
LIGHTING 4 x IP65 rated led recessed downlights Over mirror light	**WATER SERVICES** Hot & cold water services to sanitaryware,
SOCKET OUTLETS Shaver Socket	**HEATING** Design Temp 22ºC Towel rail
GENERAL POWER Supply to towel rail Supply to mirror	**VENTILATION** Ventilation to suit Building Regulations via MVHR unit
FIRE ALARM N/A	**A/C** N/A
EMERGENCY LIGHTING N/A	**GAS** N/A
SECURITY N/A	**SANITARYWARE** WC, Basin, Shower
DATA/TELEPHONE N/A	**SOILS & WASTES** Waste from Sanitaryware
CCTV N/A	**OTHER ITEMS** Thermostatic shower mixer, shower flexible hose and riser rail.
TELEVISION OUTLET N/A	
OTHER ITEMS Back lit mirror with shaving socket MVHR control interface via light switch	

ROOM DATA SHEET	**NO. 12 Revision**
AREA: Typical Apartment Store	
LIGHTING Recessed downlighter	**WATER SERVICES** Hot Water Cylinder Water to Washing Machine
SOCKET OUTLETS 2 twin socket outlet	**HEATING** N/A
GENERAL POWER 1 x supply to air source hot water cylinder Supply to MVHR Unit 1 low level single socket outlet washing machine via spur unit. 1 x supply to mist system pump	**VENTILATION** MVHR Unit Extract ventilation to suit Utility requirements
FIRE ALARM Smoke detector	**A/C** N/A
EMERGENCY LIGHTING N/A	**GAS** N/A
SECURITY N/A	**SANITARYWARE** N/A
DATA/TELEPHONE Master outlet, router and hub for fibre	**SOILS & WASTES** High temperature waste from cylinder safety valve Waste from Washer
CCTV N/A	**OTHER ITEMS** Pump for fire mist system
TELEVISION OUTLET N/A	
OTHER ITEMS Consumer unit location (TBA) Washing Machine	

ROOM DATA SHEET	**NO. 13 Revision**
AREA: Basement Existing Building	
LIGHTING General linear led luminaires operated by PIR sensor IP66 rated	**WATER SERVICES** N/A
SOCKET OUTLETS 3 single sockets. IP66	**HEATING** N/A
GENERAL POWER N/A	**VENTILATION** N/A
FIRE ALARM Yes to BS5839	**A/C** N/A
EMERGENCY LIGHTING Yes to BS 5266	**GAS** N/A
SECURITY N/A	**SANITARYWARE** N/A
DATA/TELEPHONE N/A	**SOILS & WASTES** N/A
CCTV N.A	**OTHER ITEMS**
TELEVISION OUTLET N/A	
OTHER ITEMS	

ROOM DATA SHEET	**NO. 14 Revision**
AREA: Typical Corridor (Existing Build)	
LIGHTING General decorative recessed compact LED down lighter with front glass motion detector controlled. Motion detectors to be located so they instantly sense residents leaving apartments.	**WATER SERVICES** N/A
SOCKET OUTLETS 1 single socket (lockable) every 10m. 13A plug to be provided for each socket.	**HEATING** Electric Heaters to maintain 18^0C
GENERAL POWER Power for future Electric Heaters	**VENTILATION** N/A
FIRE ALARM Yes BS 5839 Repeater panels at 2 different entrances	**A/C** N/A
EMERGENCY LIGHTING Yes to BS 5266	**GAS** N/A
SECURITY N/A	**SANITARYWARE** N/A
DATA/TELEPHONE N/A	**SOILS & WASTES** N/A
CCTV Full CCTV coverage	**OTHER ITEMS**
TELEVISION OUTLET N/A	
OTHER ITEMS	

ROOM DATA SHEET	**NO. 15 Revision**
AREA: Electrical Meter Rooms	
LIGHTING Compact LED light fittings Motion detector controlled	**WATER SERVICES** N/A
SOCKET OUTLETS 5 x twin sockets	**HEATING** Electric tubular Heater 16C
GENERAL POWER N/A	**VENTILATION** N/A
FIRE ALARM Yes BS 5839	**A/C** N/A
EMERGENCY LIGHTING Yes BS 5266	**GAS** N/A
SECURITY Access control with fob access	**SANITARYWARE** N/A
DATA/TELEPHONE Data Point for BT and Fibre	**SOILS & WASTES** N/A
CCTV CCTV monitor and recorder	**OTHER ITEMS** N/A
TELEVISION OUTLET N/A	
OTHER ITEMS Location of local landlords MCB distribution boards and MCCB section boards Location of electric meters	

ROOM DATA SHEET	**NO. 16 Revision**
AREA: Lifts	
LIGHTING As required by lift manufacturer	**WATER SERVICES** N/A
SOCKET OUTLETS As required by lift manufacturer	**HEATING** N/A
GENERAL POWER Lift supply	**VENTILATION** To suit lift manufacturers requirements
FIRE ALARM Yes BS 5839	**A/C** N/A
EMERGENCY LIGHTING Yes BS 5266	**GAS** N/A
SECURITY Access control to lift	**SANITARYWARE** N/A
DATA/TELEPHONE 1 outlet	**SOILS & WASTES** N/A
CCTV Camera in lift	**OTHER ITEMS** N/A
TELEVISION OUTLET N/A	
OTHER ITEMS	

ROOM DATA SHEET	**NO. 17 Revision**
AREA: External Area	
LIGHTING Bollard type and building mounted IP65 totally enclosed LED light fittings lighting time clock/photocell with override switch controlled. External wall mounted IP65 Rated LED luminaire	**WATER SERVICES** 1 bib tap lockable cover frost protection
SOCKET OUTLETS 4 external sockets in lockable IP65 enclosure	**HEATING** N/A
GENERAL POWER N/A	**VENTILATION** N/A
FIRE ALARM N/A	**A/C** N/A
EMERGENCY LIGHTING Yes BS 5266 Adjacent external doors	**GAS** N/A
SECURITY N/A	**SANITARYWARE** N/A
DATA/TELEPHONE External data socket for parcel drop box	**SOILS & WASTES** N/A
CCTV Camera's to cover all external doors and elevations.	**OTHER ITEMS** N/A
TELEVISION OUTLET N/A	
OTHER ITEMS	

ROOM DATA SHEET	**NO. 18 Revision**
AREA: Typical Terrace /Walkway	
LIGHTING External wall mounted IP66 Rated LED luminaire Photocell and override switch operated	**WATER SERVICES** N/A
SOCKET OUTLETS 1 x Weatherproof socket per 10m	**HEATING** N/A
GENERAL POWER N/A	**VENTILATION** N/A
FIRE ALARM Fire alarm sounder	**A/C** N/A
EMERGENCY LIGHTING Along Access Walkways	**GAS** N/A
SECURITY N/A	**SANITARYWARE** N/A
DATA/TELEPHONE N/A	**SOILS & WASTES** N/A
CCTV N/A	**OTHER ITEMS**
TELEVISION OUTLET N/A	
OTHER ITEMS	

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) SAP Calculations
f) Pump sizes
g) Confirmation supply/extract air volumes
h) Ductwork sizing
i) Fan Static
j) Part O calculations and thermal model

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	

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)	Schematic Diagrams	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	}	Lighting Installation
Domestic Hot and Cold Water	}	Power Installation
Air Conditioning and Ventilation	}	Fire Alarms
Automatic Controls	}	Emergency Lighting
Gas	}	Etc
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.

Existing Building

1.	Main Distribution.	£……
2.	Sub Main Distribution.	£……
3.	Lighting Installation (excluding light fittings).	£……
4.	Light Fitting.	£……
5.	Socket Installation.	£……
6.	General Power Installation.	£……
7.	Fire Alarm Installation.	£……
8.	Emergency Lighting Installation.	£……
9.	Earthing.	£……
10.	Testing & Labelling.	£……
11.	Electric Heating Installation	£……
12.	Digital Television wiring Installation.	£……
13.	Lightning Protection.	£……
14.	Door Access control installation.	£……
15.	Telecom and Data Installation.	£……...
16.	Electric Heating	£……
17.	CCTV Installation	£……

New Building

18.	Main Distribution.	£……
19.	Sub Main Distribution.	£……
20.	Lighting Installation (excluding light fittings).	£……
21.	Light Fitting.	£……
22.	Socket Installation.	£……
23.	General Power Installation.	£……
24.	Fire Alarm Installation.	£……
25.	Emergency Lighting Installation.	£……
26.	Earthing.	£……
27.	Testing & Labelling.	£……
28.	Electric Heating Installation	£……
29.	Digital Television wiring Installation.	£……
30.	Lightning Protection.	£……
31.	Door Access control installation.	£……
32.	Telecom and Data Installation.	£……...
33.	Electric Heating	£……
34.	CCTV Installation	£……

General

35.	Design Drawings & Calculations.	£……
36.	Installation Drawings.	£……
37.	O&M Manuals.	£……
38.	As Fitted Drawings.	£……
39.	CDM Requirements.	£……
40.	12 months warranty on equipment	£……
41.	12 month maintenance	£……

Provisional Sums

Building Control Enhancements	£1,500.00
Contingency	£2,500.00

TOTAL COST **£……**

Signed By ; ……

On Behalf of: ……

Date : ……

APPENDIX 4 TENDER SUMMARY – MECHANICAL SERVICES

All elements are to be completed for analysis.

Existing Building

1)	Water Installation	£……
2)	Ventilation system	£……
3)	Above Ground Drainage installation.	£……
4)	Rainwater Pipework Installation	£……
5)	Sanitaryware Installation.	£……
6)	Chlorination of Water Services	£……
7)	Commissioning	£……

Existing Building

8)	Water Installation	£……
9)	Ventilation system	£……
10)	Above Ground Drainage installation.	£……
11)	Rainwater Pipework Installation	£……
12)	Sanitaryware Installation.	£……
13)	Water Mist installation	£……
14)	Chlorination of Water Services	£……
15)	Commissioning	£……

General

16)	Design Drawings and Calculations.	£……
17)	Installation Drawings.	£……
18)	O&M Manuals.	£……
19)	CDM Requirements.	£……
20)	As Fitted Drawings.	£……
21)	O&M Manuals	£……
22)	12 Months warranty on equipment	£……
23)	12 month Maintenance	£……

TOTAL COST **£……**

Provisional Sums

Building Control Enhancements	£1,500.00
Contingency	£2,500.00

Signed By ; ……

On Behalf of: ……

Date : ……