

The logo for BMA (British Mechanical Association) consists of the letters 'BMA' in a white, bold, sans-serif font, centered within a solid dark blue rectangular background.

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GENERAL REQUIREMENTS

FOR

MECHANICAL ENGINEERING SERVICES

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SECTION 1

GENERAL REQUIREMENTS



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(TO BE READ IN CONJUNCTION WITH RELEVANT WORK SECTIONS) AND
MAIN CONTRACT PRELIMINARIES**

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NON-NES CLAUSES

Non-NES clauses will be distinguished by the clause number beginning with a non-numeric character.

A10 PROJECT PARTICULARS

1100 THE PROJECT:

Particulars of the project as a whole are given in Main Contract Preliminaries.
Reference to these documents must be made via the Main Contractor.

1400 DESIGN TEAM:

Refer to Contract Administrator

1600 STATUTORY AUTHORITIES:

Refer to Contract Administrator

1700 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.

1800 CO-ORDINATION

The Main Contractor will co-ordinate all mechanical and electrical services with the building requirements.

The Sub-contractor will be responsible for checking the position of all equipment relative to other services

and building components prior to installation. Where potential conflicts occur these shall be reported to the

Contract Administrator prior to installation.

A11 DRAWINGS

1100 THE TENDER DRAWINGS:

Refer to the schedule at the end of this Specification.

1210 THE SUBCONTRACT DRAWINGS:

The subcontract drawings required are indicated in Section A31 of this specification and are to be prepared (by the Sub-Contractor / Contractor) prior to commencement of the works on site.

1400 INSPECTION:

Inspect all drawing and other documents relating to the Contract prior to the submission of tender.

Documents may be viewed by appointment during normal hours as follows:-
Architectural and Structural documents may be inspected at the Main Contractors Offices.

A12 THE SITE

1100 THE SITE

The site is described in the Main Contract Preliminaries.

1300 EXISTING MAINS/SERVICES:

Existing mains/engineering services are defined in the relevant work sections.

1500 SURVEY:

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

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

Examine all available drawings of the engineering services and report any discrepancies to the CA.

1700 SITE VISIT:

Site visit may be made by the Subcontractor by arrangement with the Main Contractor.

A13 DESCRIPTION OF THE WORK

1400 THE SUBCONTRACT WORK:

Supply, install, balance, test and commission the building services installations defined in the following Work Sections.

1500 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.

2100 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 500m.

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

Provide equipment for operation in the following areas with the environment as specified below

Internal

Temperature 10oC to 30oC

Max. Humidity 90%

External

Temperature (°C) -3 to 40

Humidity (% rh) 70

Protect equipment to BS EN 60529

IP 54 and IP 65

2200 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.

2300 LIFE OF SYSTEMS

The expected lifespans are based on CIBSE life factors and on good standards of plant maintenance. Where lifespans noted above are below the requirements of 25 years, the Contractor should identify the enhanced maintenance regimes to achieve the requirement.

2400 DELETERIOUS MATERIALS

In the design and construction of the Works there will be used none of the materials set out below:-

- 1) Concrete or mortar additives containing calcium chloride.
- 2) Concrete that may be susceptible to alkali/silica chloride attack.
- 3) High alumina cement.
- 4) Wood wool slabs as permanent shuttering.
- 5) Calcium silicate bricks and tiles.
- 6) Asbestos products
- 7) Urea formaldehyde will not be used in cavity wall insulation but may be used in minimum amounts in particle boards as a glue.
- 8) Lightweight or air entrained concrete blocks of less than 7N/mm²
- 9) Slipbricks which do not comply with BS5625 Part 3 and BS3291 Part 5.
- 10) Proprietary open web lattice joists or beams unless authorised by the purchaser.
- 11) Timber trussed rafters manufactured with truss plate connectors unless authorised by the Purchaser.
- 12) Montreal listed CFC gasses will not be used on site nor on equipment installed by the developer or his Contractor on site.
- 13) All tropical rain forest timber unless authorised by the Purchaser.
- 14) Aggregates for use in reinforced concrete which do not comply with BSS882: 1983 and aggregates for use in concrete which do not comply with the provisions of BSS8110: 1985.
Sea dredged aggregates save where those sea dredged aggregates have been treated in accordance with BS812: 1975 and 1976 and conform in all respects to BSS882: 1983.

- 15) Lead, or any materials containing lead, except lead flashing which may be ingested, inhaled or absorbed, except where copper alloy fittings containing lead are specifically required in drinking water pipework by any relevant statutory requirements.
- 16) Materials containing fibres of less than 3 microns diameter except for approved proprietary products such as "Gypglas cavity wall system batts" produced by Gyproc Insulation Limited and "Crown Glass fibre mat" produced by Pilkington Insulation Limited or equivalent materials commercially available. All such products must only contain a very small proportion of fibres less than this size and in any event fibres are to be sealed or otherwise stabilised to ensure that fibre migration is minimised.
- 17) Any other materials or substances not in accordance with British Standards Codes of Practice (or any recognised European Standard which has been adopted in the UK) and/or good building practice current at the time of specification or incorporation into the Works or any part Thereof.
- 18) Any other materials or substances known to be deleterious at the time of specification or incorporation into the Works or any part or parts thereof.

A30 TENDERING/SUB-SUBLETTING/SUPPLY

SUBCONTRACT TENDERING

1100 SCOPE:

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

2700 SUBCONTRACT SPECIFICATION WITHOUT QUANTITIES:

Where and to the extent that quantities are not included in the specification, tenders must include for all work shown or described in the tender documents as a whole or clearly apparent as being necessary for the complete and proper execution of the Works.

2800 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.

2900 SUBMISSION OF PRICED SUBCONTRACT SPECIFICATION:

The priced subcontract specification must be submitted with the Tender.

3120 A SCHEDULE OF RATES:

A (quantified) schedule of rates as referred to in the Form of Tender must be submitted within one week of request.

It must include all items and materials included in the tender, together with their rates, extended and totalled. Preliminaries are to be separately priced. Such totals shall agree with the Subcontract Sum and subtotals shall agree with the priced breakdown of the tender. Correction of errors in the quantification will not lead to adjustment of the Subcontract Sum.

Rates to include Contractor's cash discount.

3500 AGREED PROGRAMME:

The agreed programme for the Subcontract Works must be submitted with the tender.

Where the tenderer finds it impossible to assess the time implications of Provisional Work/Items and excludes such from his programme, this must be confirmed when submitting his tender.

3600 METHOD STATEMENTS:

Method statements must be submitted within one week of request.

before the execution of the Subcontract.

describing how and when the subcontractor proposes and undertakes to carry out the following.

Resourcing for design duties and installation of the works.

Testing and commissioning.

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

3800 ALTERNATIVE MANUFACTURERS/SUPPLIERS:

In addition to and at the same time as his tender for the Subcontract Works as defined in the tender documents, the Subcontractor may, at his discretion, submit alternative manufacturers or suppliers for consideration. Alternatives which would involve significant changes to other work will not be considered.

Such alternative(s) must include all additional costs arising from necessary changes to the details of the installation, including changes to the design and drawings, as well as any associated ancillary equipment items.

Such alternative(s) is/are deemed to be alternative tender(s) and each must include a complete and precise statement of the effects on cost and programme.

Full technical data for each such alternative must be submitted with the Tender together with details of any consequential amendments to the design and/or construction/installation of other parts of the Works.

3900 SELECTION OF MANUFACTURERS/SUPPLIERS:

Where manufacturers, suppliers or installers of products are NOT identified by name select products that comply in all respects with the specification and, as and when requested, demonstrate such compliance.

Where manufacturers, suppliers or installers of products are identified by name, or names, but no reference is made to "Or approved equivalent" use these exclusively.

Where manufacturers, suppliers or installers of products are identified by name, or names, but reference is made to "Or approved equivalent" alternatives may be selected and shall be submitted to the CA for approval.

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

4000 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.

4100 TECHNICAL INFORMATION:

Technical information relating to the Subcontractor's tender must be submitted with the Tender.

4200 QUALITY CONTROL RESOURCES:

A statement must be submitted within one week of request before the execution of the Subcontract

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.

4400 PROPOSALS FOR ANNUAL MAINTENANCE CONTRACT:

Submit with the Tender a supplementary proposal for an annual maintenance contract for the whole of the works.

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

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

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

5200 SUB-SUBCONTRACTORS:

Where the Subcontractor proposes to sublet any portion(s) of the Subcontract Works a list must be submitted with the Tender defining such portion(s) and giving, for each, the name and address of the proposed Sub-subcontractor.

A31 PROVISION, CONTENT AND USE OF DOCUMENTS

1000 DEFINITIONS AND INTERPRETATIONS

1100 MAIN CONTRACT PRELIMINARIES:

Definitions and interpretations given in Main Contract Preliminaries apply to the whole of the Works, including this Subcontract.

1200 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 shall apply

Plant

Includes boiler rooms and switch rooms.

Duct

An enclosed space specifically intended for the distribution of services, with direct access for personnel. Generally of walk-way or crawl-way type.

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.

Occupied

All occupied areas.

Service Areas

+Areas within a building with limited finishes such as loading bays, car parks etc.

Concealed Services

Installations within ducts, trenches or cavities.

Exposed Services

Installations within plant rooms, outdoors or unprotected within "service" or occupied areas.

1300 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.

Include in each system forming part of the Works all necessary offsets, bends, tapers, transformation pieces, additional lengths, etc., whether or not shown explicitly on the drawings. Ensure a satisfactory inter-relationship with other systems, the work of other trades and other building elements.

1400 SERVICES:

Services means the inclusion of one or more system.

1500 TENDER DOCUMENTS:

Tender documents means tender drawings listed in A11.1100 and specification prepared to enable competitive tenders for the Works to be obtained.

Not all items or matters referred to in the specification are indicated on the drawings nor are all items detailed on the drawings described in the specification.

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

1600 SKETCH DRAWINGS:

Sketch drawings means line diagrams and layouts indicating basic proposals, location of main items of plant, routes of main pipes, air ducts and cable runs in such detail as to illustrate the incorporation of the Engineering Services within the Project as a whole.

1700 DESIGN DRAWINGS:

Design drawings means drawings prepared, generally at a scale of not less than 1:250, to show the details of the design as they are developed from the Tender Drawings.

1800 CO-ORDINATION DRAWINGS:

Co-ordination drawings means drawings, showing the inter-relationship of two or more Engineering Services Systems, and their relation to the structural and architectural details.

Co-ordination drawings shall be prepared at a scale of not less than 1:50.

The drawings demonstrate that each service can be properly separated from each other and that the services can be satisfactorily installed and maintained.

1900 BUILDER'S WORK, BUILDER'S WORK INFORMATION AND SETTING OUT:

Builder's work is included in the Subcontract/Main Contract

Builders work information means drawings and/or schedules, prepared at a scale of 1:50, 1:100 or 1:250 as appropriate.

showing requirements for architectural and/or structural provisions necessary to facilitate the Engineering Services Works and allow their integration into the Project. Such information includes the position and sizes of all access covers, panels and doors required in the building fabric for proper access for and to plant for installation, maintenance and inspection.

Provide Builder's Work Information, appropriate to the stage of design development, and include requirements for foundations, bases, and supporting structures for plant and equipment.

Provide fully dimensioned drawings showing both size and position of builder's work.

Mark out on site, all cut holes and chases required, any pockets cast in concrete, any inserts, any built in sleeves or similar items.

Holes may not be cut in steelwork, reinforced or precast concrete without written permission from the CA. Under no circumstances will holes be cut in pre-stressed concrete. Permitted holes in steelwork must be drilled - burning by means of welding equipment is prohibited.

2000 INSTALLATION DRAWINGS:

Installation drawings means drawings based on the Tender Drawings showing details of the proposals for the execution of the Works. Ensure such drawings and details relate, where relevant, to Builder's Work information, and to all Architectural, Structural and other drawings.

2100 SHOP/FABRICATION DRAWINGS:

Shop/fabrication drawings means drawings detailing how the components of the designed work are to be fabricated and assembled.

2200 EQUIPMENT DRAWINGS:

Equipment drawings means drawings detailing principle dimensions, fixings, connections and all other relevant details of an item of equipment.

Such drawings are to be specific to the Works and all references to optional features, other equipment of a range, etc. shall be deleted or the original drawing re-drawn to comply with this requirement.

Ensure each drawing represents accurately the item concerned with correct dimensions and all connections precisely located conforms to the specific description given in the Tender Documents, quoting the relevant reference shows the item in its entirety with no extraneous or alternative parts indicated.

2300 CONTROLS LOGIC DIAGRAMS:

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

2400 WIRING/CONNECTION DIAGRAMS:

Wiring/connection diagrams means drawings, diagrams or schedules detailing all power and control wiring and control pipework connections between control panels, motors, control components, instruments and any other items requiring electrical connections.

Indicate the following

- Maximum electrical loading for each supply cable.

- Cable termination facilities.

- Cable identification and all terminal numbers.

2600 AS-INSTALLED DRAWINGS:

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

2700 RECORD DRAWINGS AND SCHEDULES:

Record drawings and schedules means drawings, diagrams and schedules, etc. prepared from as-installed drawings showing the work as finally executed.

2900 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 News up to and including that for any subsequent versions and amendments specifically referred to in the project documents.

3200 CONTRACT DOCUMENTS:

Contract documents means those documents, including drawings and specifications, on which the contract for the Works is based.

3300 INTERPRETATION OF DOCUMENTS:

Drawings provided to a scale of 1:50 or smaller and/or expressed in symbolic terms or which are in diagrammatic format, give indicative locations only and details of components are not to be inferred.

Arrangements shown on Tender Drawings are intended to indicate layout to be generally adhered to, but actual routes of services are to be such as to ensure the neatest possible arrangement.

Notify the CA of any conflict of information arising from the use of the specification or drawings.

3400 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.

Include for the determination on site, in collaboration with the CA and Contractor, of the finalised position of all such terminals.

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

Mounting heights indicated in tender documents are for tender purposes only. Confirm mounting heights with the CA before commencing work on site.

3500 EXAMINATION OF DRAWINGS/INFORMATION:

The CA will examine the drawings / information 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. The CA will require 7 working days from receipt of such information to provide comments.

Comments will be graded as follows :-

Category A drawing - deemed to be satisfactory and no further comments will be issued by the CA.

Category B drawing - deemed to be satisfactory subject to incorporation of CA's comments. No further submission required.

Category C drawing - deemed to be unsatisfactory. CA's comments must be incorporated. The drawing must be re-submitted to the CA for checking after modification.

Category D drawing - deemed to be unsatisfactory. The CA is not obliged to give any reason for rejection of the drawing. The drawing must be re-submitted after modification.

5000 DOCUMENTS TO BE PROVIDED BY SUBCONTRACTOR

5110 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 INSTALLATION / WORKING drawings and other information 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. Prior to submission the Subcontractor shall 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.

Submit sufficient copies of final information to the CA for distribution to the Contractor and all affected parties.

Provide performance characteristics of electrical equipment.

Provide Builder's Work Information, appropriate to the stage of design development.

5300 PREPARATION OF DOCUMENTS:

Prepare drawings to commonly recognised scales generally on A1 sheets and details and schedules on A4 sheets.

Agree scales, drawing sheet size and format with the CA before preparing any documents.

5400 SYMBOLS:

Ensure the notation on documents produced follows the same conventions as the tender documentation. Agree any additional notation to be used with the CA before preparing any documents.

5600 BUILDER'S WORK INFORMATION:

Confirm and amplify any builder's work information provided by the CA.

5700 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.

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 not more than 4 weeks prior to Practical Completion.

5800 RECORD DOCUMENTS:

Provide

Record Drawings and Schedules.

Plant room and switch room drawings, schedules and schematics.

Operating and Maintenance Manuals.

Blank maintenance logs.

Log book

Ensure Record Documents

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

make it possible to comprehend the extent and purpose of the Works and the method of operation thereof.

set out the extent to which maintenance and servicing is required and how, in detail, it should be executed.

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.

5900 RECORD DRAWINGS AND SCHEDULES:

Prepare Record Drawings and Schedules to a scale not less than 1:50, 1:100 or 1:250 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 provide in schedule form.

Provide reduced scale copies for inclusion in the operating and maintenance manuals as detailed in clause A31.6100.

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 plant rooms, 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.

6100 OPERATING AND MAINTENANCE MANUALS:

Provide operating and maintenance manuals.

Agree format and contents with the CA.

Operating and maintenance manuals must include, but are not limited to the following

Index of contents.

A full description of each of the systems installed, written to ensure that the Employer's staff fully understand the scope and facilities provided. Description to include data on general design parameters, normal associated operating conditions and manufacturers information concerning correct operation, etc. based on commissioning results.

A description of the mode of operation of all systems.
Diagrammatic drawings of each system indicating principal items of plant, equipment, valves etc.
A photo-reduction of all record drawings, together with an index. Size A3
Legend for all colour-coded services.

Schedules (system by system) of plant, equipment, valves, etc., stating their locations within the building, duties and performance figures. Ensure each item has a unique code 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 and order acknowledgement 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.

Copies of Insurance & Inspecting Authority Certificates and Reports.

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

Details of procedures to maintain plant in safe working conditions.

Control sequences for all systems installed.

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

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

Copies of relevant HSE/CIBSE/IEE Guidance notes etc.

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

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.

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.

Copies of all items incorporated in the Plant room and switch room schedules and schematics.

6200 PRESENTATION OF OPERATING AND MAINTENANCE MANUALS:

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.

6400 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.

6500 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 7629.

A32 MANAGEMENT OF THE WORKS

1200 CO-OPERATE:

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

1300 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. and the minimum of 14 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.

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 not less than 14 days before commencement before each (or series

- of) test, inspection, commissioning or demonstration procedures are to be carried out.

- Demonstration to the CA that test instruments and equipment are accurate.

1400 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.

1500 INSPECTION AND MEASUREMENT OF WORK:

Provide all necessary assistance to enable CA to examine or measure the Works.

1600 COVERING-UP:

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

Give not less than 5 working day(s) notice when Works which are to be covered or concealed are ready for examination and/or measurement.
Give notice to CA.

1700 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.

1800 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

1200 DELEGATION:

The CA may delegate certain powers and duties.

The CA will indicate the duties and powers of the following:

Clerk of Works

Consulting Engineers.

1300 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.

1400 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.

1500 SETTING OUT FOR THE SUBCONTRACT WORK:

Where this is done by the Main Contractor check its accuracy and obtain his approval before proceeding with the work.

1600 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.

1700 STANDARDS AND REGULATIONS:

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

Comply with all statutory instruments and regulations, and local byelaws relating to the area of the site current at

the date of tender.

Comply with the requirements of the Local Authority Building Inspector.

Comply with all relevant requirements included in the Main Contract Preliminaries Section

A20 regarding Statutory Obligations.

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.

- C.I.B.S.E Guide Books A, B and C.
- C.I.B.S.E Codes of Practice.
- Institute of Plumbing Data Handbook.
- C.I.B.S.E Code for Interior Lighting.
- C.I.B.S.E Technical Reports.

C.I.B.S.E Technical Memoranda.

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.

1710 STANDARDS AND REGULATIONS:

Provide all materials and works in accordance with the appropriate British Standard or Code of Practice and where no BS or CP is applicable the Agreement Certificate for the particular item. Comply with all statutory instruments and regulations, and local by-laws relating to the area of the site current at the date of tender.

Comply with the requirements of the Local Authority Building Inspector.

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

Statutory Obligations

- Local Authority Bye-Laws, Regulations and Notices.
- Building Regulations 1991 and current amendments.
- Building Standards (Scotland) Regulations 1990 and current amendments.
- London Government Acts.
- Offices, Shops and Railway Premises Act.
- Public Health Acts.
- Electricity Acts.
- Electricity at Work Regulations 1989.
- The Factories Act 1961.
- Clean Air (Arrestment Plant) (exemption) Regulations 1969.
- The Control of Pollution Act 1974.
- Workplace (Health, Safety and Welfare) Regulations 1992.
- The Construction (Design and Management) Regulations, 1994.
- Health and Safety (Display Screen Equipment) Regulations 1992.
- Control of Substances Hazardous to Health (COSHH) Regulations 1988.
- Asbestos Regulations.
- Provision and Use of Work Equipment Regulations 1992.
- Personal Protective Equipment at Work Regulations 1992.
- The Construction (General Provisions) Regulations 1961.
- The Construction (Lifting Operations) Regulations 1961.
- The Construction (Working Places) Regulations 1966.

Other relevant Safety Regulations.

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

Loss Prevention Council - Rules for Automatic Sprinklers.

Other Requirements

British Standards and Codes of Practice.

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

CIBSE Guides to Current Practice and Technical Memoranda.

Insurance Company Requirements.

LDSA Fire Safety Code.

IEC Standards.

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

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

1800 SAFETY:

Comply with all Safety Regulations and HSE Guidance Notes, including Construction (Design and Management) Regulations, Control of Substances Hazardous to Health (COSHH) Regulations, HSE Guidance Note GS 7 and Electricity at Work Regulations.

1900 SUITABILITY OF MATERIALS AND PRODUCTS:

Use materials and products which

are new unless specified otherwise.

are suitable for the services and conditions of use normally expected to apply after the installation is complete.

are able to withstand the testing and commissioning conditions specified.

do not initiate mould growth, support vermin, contain animal hair, contain crocidolite or support bacterial life.

do not involve the use of CFC's at any stage of manufacture, installation or subsequent operation except where specified.

are free from objectionable odours at the maximum or normal working conditions of operation.

do not suffer deterioration at the maximum or specified conditions of operation.

are capable of being applied to a base surface without causing damage or deterioration of the base.

are not a fire hazard, and do not evolve dense or toxic fumes when subjected to excessive heat, such as a fire.

when of similar type, are made by the same manufacturer.

whenever possible ensure products are manufactured and/or stocked under one of the following:

BSI Kitemark Scheme.

BSI Safety Mark Scheme.

from Firms of Assessed Capability to BS EN ISO 9000.

from Stockists of Assessed Capability to BS EN ISO 9000.

No materials generally known to be deleterious are to be used in, or incorporated into, any temporary or permanent part of the Works.

In particular use none of the following:-

Asbestos products.

Urea formaldehyde.

Check with manufacturers and/or suppliers of products and materials that products contain no such deleterious materials. If any specified product contains such material request an alternative specification of product, manufacturer or supplier.

2000 SAMPLES:

Submit samples detailed in Work Sections to the CA.

Retain on site until the completion of the contract.

2100 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.

2200 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.

2300 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".

2400 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.

2500 TESTING AND COMMISSIONING OF SERVICES:

Agree with the Contractor a programme for precommissioning checks, setting to work, commissioning and performance testing, and allow for all costs incurred.

Where required, provide formal method statements supported by risk assessments detailing all commissioning procedures.

Give not less than fourteen working days notice to the Contractor and CA and state any requirements

for the attendance and co-operation of others.

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 Work 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 5781.

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.

2600 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.

2700 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 a minimum period of 7 days.

provide a log book and record all hours run.

to allow for the full testing of the air conditioning system(s).

2800 OUTSTANDING ACCEPTANCE TESTS:

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

2900 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.

3000 OPERATION OF SYSTEMS BEFORE THE PRODUCTION OF RECORD 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.

3100 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 Subcontractor.

A34 SECURITY/SAFETY/PROTECTION

1150 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.

1200 DELIVERY:

Provide 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.

1300 HANDLING:

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

1400 STORAGE:

Store all materials and products as recommended by manufacturers.

1510 PROTECTION OF SUBCONTRACT WORKS:

Provide adequate and safe protection for all materials and products after installation.
Ensure all items are protected against ingress of water and dust, formation of condensation, extremes and rapid changes of temperature, building works and operations of others.
Protect during erection all easily damaged materials with hardboard covers or heavy duty polythene sheet. Such items include but are not limited to
control panels,
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.
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.

1600 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.

1700 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.

A37 OPERATION/MAINTENANCE OF THE FINISHED BUILDING

1100 RECOMMENDED SPARE PARTS:

At least 8 weeks before Practical Completion submit to the CA a schedule of spare parts as called for in individual Work 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.

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 Work Sections.

1400 SUPPLY OF TOOLS:

Provide all tools detailed within individual Work Sections.

Within 2 weeks of request submit to the CA a quotation, priced in detail, for the initial supply to the Employer of the additional tools identified and including for the following.

- Checking that each item is suitable for the intended application.

- Checking receipt, marking and identifying.

- Referencing, where appropriate, to the plant and equipment list in the Operation and Maintenance Manual.

- Protecting, greasing, etc. and packing to prevent deterioration.

- Providing a suitable means of storing and securing same.

1500 TRAINING OF EMPLOYER'S STAFF:

Before Practical Completion explain and demonstrate to the Employer's maintenance staff the purpose, function and operation of the installations including all items and procedures listed in the Operation and Maintenance Manual.

Provide training for the operation of the controls, monitoring or BMS installations as follows.

- Carry out initial training at the controls suppliers works.

- Include "hands on" experience of equipment and software similar to the installation.

- Include instruction on the procedures for testing and routine inspection of sensors and actuators to enable the operator to assess the nature of faults and extent of remedial action required.

- Provide all appropriate reference and training manuals.

- Complete initial instruction prior to commissioning the installed system.

- Provide site instruction on the installed system.

- Include for training operating staff (no) 3

- Include for not less than 5 operating days per staff member for this purpose.

1700 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.