



Standard Preliminaries Specification

Revision Record

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1.0 Introduction

This set of contract preliminaries shall be read in conjunction with the main contract preliminaries, and the Mechanical and Electrical services drawings and specifications.

During the course of the works the contractor shall not cause to be used, use or knowingly suffer the use on or in relation to the Project any materials which do not conform to the recommended good practice identified in the BFP/BCO Report "Good Practice in the Selection of Construction Materials" (Current Edition). In addition, the following materials shall not be utilised:

- (a) wood wool slabs in permanent formwork to concrete or in structural elements;
- (b) asbestos or asbestos-containing products, as defined in "The Asbestos (Prohibition) Regulations 1992" or any statutory modification or re-enactment thereof;
- (c) lead in paint and lead or any materials containing lead 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;
- (d) urea formaldehyde foam, cavity fill or materials containing formaldehyde in quantities which may be hazardous with reference to the limits set from time to time by the Health and Safety Executive and not in accordance with BS 5617, 5618 and 8208;
- (e) materials which are generally comprised of mineral fibres, either man-made or naturally occurring, which have a diameter of 3 microns or less and a length of 200 microns or less and which contain any fibres not sealed or otherwise stabilised to ensure that fibre migration is prevented; except for those materials which are exempt from classification as carcinogenic within the meaning of the EU Dangerous Substances Directive 67/548 (as the same is in force or replaced at the time such material is specified, authorised or used by the Consultant) provided always that such materials are used in accordance with all relevant legislation, British Standards and manufacturers' and suppliers' recommendations then in force

2.0 Definitions

Throughout this document and the associated tender drawings, the terms "Sub-contractor" and "Contractor" shall refer to the Contractor appointed to undertake Mechanical, Electrical and/or other engineering installations in any single or combined sub-contract as defined by the main contract documentation.

The term 'Employer's Agent' shall refer also to the Employer's Agent's Representative, which may, amongst others, include Crookes Walker Consulting or other members of the design team.

The term 'Engineer' shall refer to those persons appointed by the Employer to represent their interests in technical matters, which may, amongst others, include Crookes Walker Consulting or other members of the design team.

The term "Contract Administrator" shall refer to those persons appointed by the Employer to represent their interests in contractual matters.

3.0 Statutory Requirements

The works shall comply with all current and relevant Statutory Instruments and Regulations including, but not limited to the following:-

BS 7671 IEE Regulations for Electrical Installations (current edition, including all amendments and Guidance Notes).

The Electricity at Work Regulations.

The Gas Regulations.

The Construction (Design and Management) Regulations.

The Health and Safety at Work Act.

The Clean Air Acts.

The Building Regulations.

Regulations under the Factories Act.

The Control of Pollution Act.

Control of Substances Hazardous to Health Regulations

British Telecom LN139 (all buried ducts for services other than piped or LV/HV cabling).

The works shall be carried out in accordance with the requirements and regulations of all relevant local authorities, fire brigades, and water, gas and electricity authorities.

Any such portion of the works requiring the inspection and approval of such authorities shall not be built-in, covered or otherwise obscured until such approval has been obtained.

Authorities shall be notified as necessary about the connection of electricity, gas, water and telecoms.

The Contractor shall be responsible for liaison with the main Contractor to facilitate the programming and co-ordination of the various utilities to meet his installation programme.

Unless otherwise specified, the whole of the works shall comply with the requirements of all relevant British Standard Codes of Practice.

4.0 Contractor's Obligations

Where conflict occurs within or between any element clause or section of the contract tender documentation it shall be the tenderer's responsibility to give notice prior to return of the tender. In the absence of prior notice being given in advance of tender submission the Employer's Agent shall remain the final Arbiter to ensure that a positive decision can be made as to which clause or item is selected.

4.1 Contractor's Surveys

The Contractor shall be responsible for undertaking a site survey prior to submitting his tender to verify all matters that could affect his post tender costs or works. No allowance can or shall be made post tender for any omission of works or cost arising from information available at the time of tender. The arrangements to visit the site shall be made directly to the Project Manager. Application to visit should be made in the first week of receipt of the tender.

4.2 Drawings and Specification

The Contractor shall carefully and thoroughly examine the drawings and the Specification, and fully acquaint himself with the work to be done, as no allowance for claims shall be considered for any alleged deficiency of work or materials.

The tenderer must as part of his tender return identify any equipment that he intends to select that causes any change to spatial requirements or allowances made in the tender scheme.

The Contractor shall take his own dimensions for both the preparation of his Tender and for the execution of the work, and he alone shall be responsible for the accuracy of such dimensions and subsequent designs and/or drawings. All dimensions specially marked on the drawings shall be rigorously adhered to.

The Contractor shall ensure that in preparation of his tender the correct number of both drawings and relevant sections of the specification be passed to equipment manufacturers for tender prices to be obtained. Additional costs resulting from non-compliance into the above at tender stage shall be borne by the Contractor.

The tenderer shall allow for all necessary sets, bends, transformations and supports to complete the installation.

Where quotations for particular plant and equipment have been provided previously to the Engineers by a manufacturer, the tenderer shall be responsible for ensuring that these have been produced based on the requirements detailed in the attached tender documentation, and not on any previously supplied information from the Engineers.

4.3 Alternative Equipment Suppliers

The Contractor shall include in his tender for equipment supplied by the manufacturer(s) stated in the specification.

The Contractor may offer as an alternative, equipment from another manufacturer, providing the quality of the product is equivalent (and approved by the Engineer) to that specified. Any costs arising out of the use of this alternative or as a result of re-planning associated with this alternative shall be the responsibility of the contractor.

Where an alternative supplier/manufacturer is proposed at tender stage then the Employer's Agent is under no obligation to accept alternatives during the progress of the Contract.

4.4 Tender Returns

Tenders received after the time stated in the invitation to tender shall be rejected.

Tenders qualified in any way may be rejected.

The Employer does not bind himself to accept the lowest or any tender.

4.5 Post Tender Meeting

Upon selection of the prospective contractors, a meeting shall be convened to obtain the final agreement of the Contractors on all matters raised in tender.

Specifically all matters relating to the production of contract information and site liaison shall be agreed.

The agreed minutes of this meeting or meetings shall if required by the Employer's Agent form part of the contract document to demonstrate that the Contractor has understood his responsibilities.

4.6 Orders for Materials

The Contractor shall allow in his tender price for the purchase of all materials and equipment from stockists and other suppliers at such time and in such a manner as may be necessary to allow for the completion of the work in accordance with the Contract Programme.

Should the Contractor foresee any difficulty with the delivery periods for the selected equipment, this should be clearly stated in his tender return.

The Contractor shall provide the Employer's Agent with a schedule of latest dates for the ordering and procurement of each item of plant and equipment detailed in this specification.

Additional costs resulting from non-compliance with the above shall be borne by the Contractor.

4.7 Site Documentation

Notwithstanding the requirements of the main contract preliminaries, each Contractor shall also allow for and provide in a maintained, indexed library the following:-

- a. Relevant copies of all technical equipment schedules 'as delivered to site'.
- b. Relevant technical literature on each type of equipment or component used within the installation.
- c. Copies of all relevant information. (Technical queries, relevant instructions, current installation/working drawings, current programme).
- d. Copies of all signed daywork sheets.

All of the above is to be accessible at all times site is open by the Employer's Agent or his representative.

All of the above shall be kept up to date and in good order and must be maintained complete.

4.8 Design/Installation/Working Drawings

All drawings required to be provided shall, without exception, be produced and presented on an AutoCAD format agreed at tender.

4.9 Drawings by the Contractor

The Contractor shall, within two weeks of appointment, prepare a Drawing schedule of all his proposed Drawings required for comment. The schedule shall indicate the following:-

Drawing number and revision number.

Drawing title and service.

Scale.

Date of commencement of drawing production.

Date for submission for comments.

Date on which comments were received.

Date required for final comments.

Latest date required on site.

The Contractor shall revise and update his Drawing schedule as necessary (or on a monthly basis) taking into account any revision which may have taken place.

4.10 Drawings by the Contractor

The Contractor shall provide the following drawings:-

Design drawings (where appropriate).

Installation/Working drawings.

Builders Work drawings.

Plant and Equipment / shop drawings.

Record drawings.

Reflected ceiling drawings.

Every drawing shall bear the name of the Contract as shown on the cover of this Specification.

Drawings shall be cross referenced for ease of interpretation.

4.11 Production of Design/Installation/Working Drawings and Builders Work Drawings

The production of co-ordinated composite Design/Installation/Working and co-ordinated composite Builder's Work drawings requires that all engineering services sub-contracts produce information in concert and to a master programme.

It shall be the responsibility of the Contractor's Co-ordination Engineer to attend and chair drawing production meetings and the individual responsibility of each of the Engineering System Contractors to attend the same meetings.

The purpose of the meetings shall be to resolve the effective production of the co-ordinated multidisciplinary composite Installation/Working and Builder's Work drawings.

No allowance shall be made for abortive draughting by any of the sub-contract packages due to lack of knowledge of each specific discipline's requirements.

No draughting should proceed until each sub-contract has agreed an overall spatial relationship with the remaining sub-contracts and the architectural form and structure.

Any installation that proceeds either without a suitably produced and commented drawing or without detailed information of the other local sub-contract packages, structure or architectural form is entirely at the contractor's risk, no abortive costs shall be allowed to rectify any problems arising.

From the description of the required content of the installation drawings given elsewhere in this document, it is to be noted that all relevant details of all elements of structure, Architectural form and Engineering Systems included within the provision of the completed project, are to be indicated simultaneously upon each and every (composite) Installation/Working Drawing. All drawings shall be produced and presented in printed form. All drawings shall have independent layers of information from the following minimum schedule and the relevant aspects, in co-ordination, of the following:

- Structure and architectural form.
- Mechanical Engineering Systems.
- Electrical Engineering Systems.
- Sanitary Engineering Systems.
- Lift Engineering Systems

All shall be depicted in a readily identifiable manner.

Each of the Engineering System Contractors shall also produce independent Working and Builders Work Drawings. Each Contractor shall be responsible for the accuracy of his own information and for the physical relationship of his own works to the remainder.

4.12 Mechanical Contractor's Additional Responsibilities

Notwithstanding the overall responsibility of the Main Contractor to programme and co-ordinate the entire works, the Mechanical Contractor shall have the following particular additional responsibilities.

The Mechanical Contractor shall be responsible for the production of the co-ordinated composite installation/working drawings as described within this document i.e. IT SHALL BE THE MECHANICAL CONTRACTOR'S RESPONSIBILITY FOR THE PRODUCTION OF COMPOSITE INSTALLATION AND WORKING DRAWINGS UPON EACH OF WHICH ALL CO-ORDINATED DETAILS OF THE STRUCTURE, ARCHITECTURAL FORM, AND MECHANICAL, ELECTRICAL, SANITARY, REFRIGERATION, VOICE AND DATA SYSTEMS ARE INDICATED.

AS FOR THE INSTALLATION/WORKING DRAWINGS, THE MECHANICAL CONTRACTOR SHALL PRODUCE COMPOSITE BUILDERS WORK DRAWINGS WITH HIS OWN AND ALL OTHER CONTRACT PACKAGE REQUIREMENTS PROPERLY DEFINED.

The Mechanical Contractor shall arrange in the Main Contract a reasonable and agreed programme with the Main Contractor and the other engineering system Contractor's for the production of the fully detailed Installation/Working and Builders Work drawings.

4.13 Other Engineering System Contractor's Additional Responsibilities

The Engineering System Contractors shall ensure that the Contractor is provided with all working and builders work drawings that they produce and shall have full responsibility for the programming and accuracy of their own information.

Each services Contractor shall incorporate sufficient reasonable programme periods and monies for the execution of their responsibility for the production of the installation drawings, no programme allowance can or shall be made for non compliance.

4.14 Design/Installation/Working Drawings

The Contractor shall provide the appropriate design/installation/working drawings for the engineering services installations as described herein and in accordance with the agreed programme. The standards and definitions of such drawings shall be as contained within the BSRIA Guide BG 6/2009.

The Design/Installation/Working Drawings shall be based upon the latest contract issue of the Architectural, Structural and Interior Designer's drawings and any other drawings or information on trades or disciplines issued by the Employer's Agent during construction. Drawings shall accurately show the specified or selected plant and equipment in their true proposed location.

Copies of manufacturer's certified drawings shall be provided for major items of plant, indicating physical dimensions, schematic arrangements for components and full detailed electrical wiring diagrams.

The Design/Installation/Working Drawings shall show all plant, equipment and cable/conduit/pipe/duct runs etc. The drawings shall include full details of all plant together with cable/ conduit/pipe/duct sizes, wiring drawings, schematic and inter-connection diagrams/drawings.

Unless otherwise agreed in writing, no work may commence until the relevant installation/working drawings have been issued and commented upon.

Composite circuit and layout diagrams for the electrical wiring of plant etc., shall not only detail all circuitry within main control panels but also that within all external equipment such as starters, thermostatic control devices, together with all interconnecting wiring from the main point of supply onwards and all terminal markings. The required sizes and types of all cables shall be indicated on the layout diagrams together with the ratings of such items as fuses, switches and control.

Circuit diagrams shall, where possible, be arranged so that the main sequence of events is from left to right and from top to bottom of the diagram. Symbols for diagrams shall comply generally with industry standards. If abbreviations are employed for the designation of components, an integral schedule shall be provided on the drawings to explain the meaning of the abbreviations.

The composite circuit and layout diagrams shall subsequently form part of the set of "Record" drawings.

Individual circuit and layout drawings from the various component manufacturers shall not be accepted in lieu of composite diagrams.

Where revisions take place to the mechanical, electrical and lift works, either under the authority of a Employer's Agent's Instruction, or by written agreement with the Employer's Agent or when revised architectural or structural drawings are issued, the Contractor shall modify his drawings accordingly and shall re-issue for construction purposes any such modified drawings. The issue of revised drawings shall be in accordance with and with regard to the agreed programme for construction.

Specific installation drawings may by the prior specific and express written permission of the Employer's Agent omit minor details such as conduit provided that an agreed method statement rigorously covers the installation intent. This permission shall not be unreasonably withheld but shall not be given where either Client operation or visual appearance is affected nor where details are needed for following trades.

The installation and working drawings must include details of all local co-ordination around equipment, control panels, individual plant at access points and on architecturally finished surfaces. The intent is that all installation can be considered for spatial relationship, appearance and Client operation.

The installation and working drawings must show sufficient detail to enable the erection staff to install the works in accordance with the Specification and to show sufficient clearances for insulation, dismantling, maintenance, insertion of thermostats, thermometers, gauges and the like, painting, cleaning and commissioning. Possible causes of obstruction or restriction, either structural or by other services must also be shown to enable alternative routes to be considered. Electrical equipment and control items must be shown on the mechanical drawings.

The installation/working drawings shall be produced to the following minimum scales:

Plant rooms - plans and sections	1:20
General arrangement plans	1:50
Detail cross sections indicating co-ordination	1:20
External services general arrangements	1:100

The Contractor shall note that his installation drawings shall be of different scales to those of the tender drawings to comply with the requirements of the above clause.

4.15 Builder's Work Drawings

The Contractor shall prepare all necessary Builder's Work Drawings required for the execution of this Contract, making due reference to the Structural, Architectural and interior design final dimensioned detail drawings as applicable. All drawings must be fully dimensioned.

All Builder's Work drawings provided by the Contractor must be provided in sufficient time to comply with the agreed programme requirements and all costs arising from failure to do so shall be met by the Contractor.

4.16 Comments on Contractor's Drawings

The Contractor shall allow at least ten working days from receipt of drawings for comment by the Employer's Agent of the Contractor's drawings. The drawings shall be issued progressively, grouped according to services, to facilitate checking. Whenever possible comment by the Employer's Agent shall be issued in less than the ten working days period provided submissions by the Contractor are made on a practical basis.

Where Contractor's drawings are issued out of sequence, or without supporting information, the Employer's Agent reserves the right to reject the drawing or comment only upon those elements unaffected by missing information.

Where details are replicated throughout a series of drawings the Contractor shall present and agree such details prior to draughting of the overall scheme. Repeated or duplicated drawings need not be submitted.

The Employer's Agent's representative shall co-ordinate the response from all members of the Client Consultant team to meet with the required ten working day period.

All drawings produced by the Contractor shall be commented upon by the Employer's Agent before they can be used for constructional purposes. The Contractor shall issue his drawings for comment in a logical manner related to the construction programme and grouped according to service.

The comment procedure shall entail the Employer's Agent applying a status to each of the Contractor's drawings.

Status 'A'.

The Employer's Agent has no further comment, the drawing remains subject to the Contractor's Design Responsibility.

Status 'B'.

The Employer's Agent has comments on the drawings but subject to the incorporation of those comments the drawing may be used for construction purposes at the Contractor's risk. The drawing must be revised to incorporate any comments and re-submitted for comment.

Status 'C'.

The drawing is unacceptable and shall have to be redrawn and resubmitted for comment.

The intention of this comment procedure is that all drawings should obtain Status 'A'.

Should any drawing require amendment after comment by the Employer's Agent, unless the subject of a variation, the Employer's Agent shall not be held responsible for any delay caused.

It shall be the Contractor's responsibility to ensure that drawings are submitted for comment in sufficient time to avoid delay in the works.

The Contractor shall be responsible for any omission, errors or any discrepancies in the drawings and other particulars supplied by him or his suppliers, whether such drawings or particulars have been commented upon by the Employer's Agent or not, provided that such omission, errors or discrepancies are not due to inaccurate information of particulars furnished in writing to the Contractor by the Employer's Agent.

Comments on any drawing by the Employer's Agent shall not mean that the Employer's Agent is responsible for the correctness of the drawing or its suitability for purpose. These responsibilities shall remain with the Contractor.

One copy of every drawing issued for comment shall be submitted directly to each of the following Architect, Project Manager and Consulting Engineers (three copies in total). These drawings shall be supplied in electronic format with a corresponding A3 reduced scale paper reference copy. One copy shall be returned with the design team's comments marked as appropriate.

All manufacturers' drawings and details shall be issued to the Employer's Agent for comment prior to manufacture. The final details including all technical aspects and calculations where applicable shall be submitted in a clear, definable and easily read format with the specified technical details, notes and performance data clearly shown.

After final comment on the drawings by the Employer's Agent, the Contractor shall provide the Architect, Project Manager and Consulting Engineer each with a copy of the drawings in electronic form with an A3 paper reference copy. This is in addition to those required for construction.

4.17 Revisions and Variations

Where schemes are subject to revision or instruction, then the Installation/Working Drawings, and finally the Record Drawings, must show the full effect of such revision. Where the scheme revision involves change to the architectural or structural details immediate notice must be given to the Employer's Agent.

Where scheme revisions are required in the Main Contract works or other sub-contract works due to the contractor's variation or revision then all cost for such revision shall be the contractor's responsibility including the design team consultants' costs incurred in the incorporation or administration of such revision.

Tender drawings must not be used on site. All actual and proposed installation must be recorded accurately on a site set of drawings updated and available for inspection on site.

Where drawings are revised and updated during construction these shall be issued to the Employer's Agent for comments on the revision only.

Only if the Contractor can give proof that a significant departure from the intent of the tender drawings has been necessary shall a variation be recorded. This shall not include normal detail development relating to inclusion of, nor development of, factors within the Contractor's Design Responsibility.

The Contractor shall maintain, on site, a detailed marked-up record of the progress of the works detailing the extent of completed installation and all departures from the installation/working drawings. This site record must be incorporated in to the draft Record Drawings at no more than monthly intervals.

Key Milestones and Non-Compliance Risks

The following matters are specifically time related to key activities in the project programme. The Contractor shall identify the following matters on all programmes covering the affected period.

Non-compliance with any of the following time related activities shall be cause for bringing into effect the associated penalties.

MILESTONE	NON-COMPLIANCE RISK
Schedule of drawings 2 weeks post contract appointment	Drawing review by Contracts Administrator does not commence
Design/Working/Installation drawings to be complete prior to commencement of associated installation works	No payment for the respective installation can be authorised
Allowance of 10 working days for Employer's Agent's comment	Delay to programme at contractor risk
Notice of conflict within the documentation prior to Tender return	All risk on programme and cost remains with the Contractor
Naming and pricing of alternatives prior to tender return	The ability to change to alternatives may be withdrawn
Provision of Schedule of Rates two weeks after notification during Contractor selection period	Tender may, at the Employer's Agent's discretion, be rejected

MILESTONE	NON-COMPLIANCE RISK
Provision of method statements prior to commencing installations	Affected installations may, at the Employer's Agent's discretion be removed from any interim payment or valuation. Any consequent delays are at Contractor's risk
Draft Record Drawings to be supplied prior to testing and commissioning	Commissioning witnessing cannot proceed
Marked up Draft Record Drawings to be supplied 4 weeks prior to Completion	Review period for Employer's Agent's comments shall not commence thus Completion, if affected, shall at the Employer's Agent's discretion be deferred until compliant Drawings are available
Draft of Operation and Maintenance manual to be provided 4 weeks prior to Completion	Review period for Employer's Agent's comments shall not commence thus Completion if affected shall at the Employer's Agent's discretion be deferred until compliant manuals are available
Fourteen day running period to prove compliance	Completion if affected, shall at the Employer's Agent's discretion be deferred until compliance demonstrated

4.18 Protection of Equipment

The installations shall be properly protected at all times. Should the measures taken by the Contractor prove to be inadequate, the Employer's Agent shall decide whether repairs may be affected or whether damaged installations shall be completely replaced. The Employer's Agent shall decide whether repairs undertaken are satisfactory or whether the equipment should be replaced. At no time is the Employer's Agent obliged to accept anything other than new, totally undamaged, correctly installed and selected equipment. All costs for replacement remain with the contractor.

5.0 Quality Procedures and Workmanship

5.1 Procurement Reporting

Upon appointment, the contractor shall provide a procurement schedule for the works. The procurement schedule provided by the Contractor must declare all items of plant and equipment together with the following information:

- Delivery period from order to site;
- Last instruction date;
- Last order date;
- Actual order date.

The procurement schedule 'last instruction date' shall be used by the Employer's Agent as a record of the date up to which an instruction shall cause no delay nor incur cancellation costs to the contract.

The Contractor must furnish with his tender return a first draft of the procurement schedule.

5.2 Setting out of Works

The Contractor shall accurately set out the works and keep them correct in accordance with the Employer's Agent's Drawings and Instructions.

Setting out of all grilles, diffusers, luminaires, electrical accessories etc shall be as shown on the Interior Design drawings. The Contractor shall be responsible for obtaining copies of the latest revision of all Interior Design drawings and transferring setting out information to his own installation working drawings.

Where systems to be installed under this Contract are to be run adjacent to or near to other systems the setting out of the services shall be the responsibility of the Contractor.

The Contractor shall be responsible for and shall, at his own cost, amend any errors arising from his inaccurate setting out or lack of site co-ordination.

5.3 Site Cleanliness

It is the responsibility of all operators to maintain site cleanliness. The Contractor shall provide and enforce all site cleaning procedures to the Employer's Agent's specification.

Prior to any air system being started all of the following must be 'signed off', as being complete by the Employer's Agent:

- Temporary protection of air inlet s if site conditions require.
- Cleanliness of ductwork.
- Dust sealing of all structural and Architectural components within the air-stream. (floor voids and ceiling voids included).

5.4 Inspection before Concealment

Whenever work requiring inspection or testing is subsequently to be concealed, due notice shall be given to the Employer's Agent so that inspection may be made or tests witnessed before concealment.

Failure to give due notice, of at least 48 hours, shall necessitate the Contractor uncovering the work and reinstating it at his own expense.

The Employer's Agent reserves the right to forego his inspection; this shall in no way relieve the Contractor's responsibility to comply with the specification.

Where the Employer's Agent believes that the installation may be defective the Contractor shall at his own cost uncover a specific area selected by the Employer's Agent for inspection. This shall be restricted to 1 linear metre or 1m² depending on the nature of the work for each area of concealment. Reinstatement shall be at the Contractor's expense. Where works are proven defective by such uncovering, the entire installation shall be uncovered and brought into compliance with the specification.

5.5 Access for Plant Installation and Subsequent Removal

Before work is put in hand and orders are placed for large items of plant, the Contractor is to check on site or with the drawings to determine that plant can be adequately installed, removed and maintained. Any areas which are not deemed to have satisfactory access shall be noted to the Engineer.

Where pipes cross access routes at low level purpose made step-overs shall be installed to provide safe access.

5.6 Equipment and Plant Performance Guarantees

Where equipment and plant performance data and duties are identified in the specification, the Contractor shall thoroughly check that the equipment offered by the manufacturer complies in every respect with the detailed materials and performance specification given.

5.7 Technical Method Statements

In advance of any works being carried out on site, the Contractor shall submit for comment by the Employer's Agent a technical method statement.

Technical method statements shall be provided for the following aspects of the installation:

Installation/Working Procedures.

Commissioning Testing and Systems Proving.

Quality Control and Samples Procedure.

Water Treatment

5.8 Samples

Samples for appraisal shall be provided for all items which may be viewed in or on the building within the normally occupied space or on the exterior all samples are to be submitted prior to confirmation of orders for supply. These shall be made available at the Engineers office, or at another location agreed by the Engineer.

Samples shall also be provided for the following but shall not be limited to:

Grilles, diffusers and external louvres.

Room mounted control sensors.

Luminaires.

Floor outlet boxes

Wiring accessories

All labelling.

Radiators and valves.

Socket outlet plates.

5.9 Suitability of Materials

Materials and components shall be supplied to suit the climatic conditions and other conditions of use to which the materials and components shall be exposed during the installation process and after it is completed and must also be suitable to withstand any test specified herein or in any document referred to herein.

5.10 Materials and Workmanship

Materials and workmanship shall be the best of their respective kinds and shall be constructed from entirely new materials and equipment.

All materials considered by the Employer's Agent to be unsound, or not in accordance with the Specification, shall be immediately removed by the Contractor at his own expense, and all work carried out imperfectly or with faulty materials must be removed and properly replaced by the Contractor to the satisfaction of the Employer's Agent.

The Employer's Agent shall, in addition, require at all reasonable times to inspect any drawings or portion of the plant contracted for at the works of the manufacturer.

6.0 Handover Procedures

6.1 CAD Record Drawings

Record Drawings of the complete installation shall be provided by the Contractor on Completion or Completion of Sections as defined in the Main Contract Preliminaries.

All Record Drawings shall be produced upon common building outlines and structural details agreed by the Employer's Agent.

All Record Drawings shall be produced upon AutoCAD latest release. Drawing files (.DWG) and D.X.F. format files (.DXF) shall be provided for each drawing in addition to the required number of 'hard' copies.

The Contractor shall incorporate the required information onto an agreed number of computer disk copies for the Client's use.

Record Drawings of the final "as installed" layouts shall be issued in draft form for approval prior to the testing and commissioning period to allow checking for accuracy. Once approved the complete set of draft Record Drawings shall be revised as necessary to incorporate testing and commissioning data where applicable, and the final set(s) of Record Drawings shall be handed over in accordance with the main contract preliminaries.

The Contractor shall issue at a time in accordance with the main contract preliminaries the complete agreed package of Record Drawings made up of 1 set white prints at full size, 2 sets of A3 reduced reference sets (in A3 binder) together with a CD ROM of all drawings.

The Contractor shall maintain on site a set of Drawings for the purpose of progressive marking up of alterations and variations. These Drawings which shall form the basis for the Record Drawings shall be available for inspection by the Employer's Agent at any time.

A set of draft marked up white prints shall be issued 4 weeks prior to Completion or Completion of Section as defined in the Main Contract Preliminaries for the Employer's Agent's comments. The Employer's Agent shall provide comments within 2 weeks of receipt of the Drawings.

The Record Drawings shall indicate the completed works as installed and shall show all plant, equipment and pipe/cable/conduit routes, together with full details of plant/cable/pipe/duct sizes and schematic diagrams as appropriate.

The Record Drawings shall show any other information, particularly that shown on Working/Installation Drawings, which may be useful in the operation, maintenance of subsequent modification or extension to the installation. The Record Drawings shall show reference numbers or letters, for the controls plant items of any parts thereof, corresponding to the lettering, numbering or any identification fixed to plant or equipment.

Each Record Drawing shall show the following information:-

Employer's name.

Name of Contract and, where appropriate, the zone or floor designation.

Description of drawing, number and scale.

Name and address of originator.

The completed Record Drawings shall be signed as true Record Drawings and shall be submitted at the same time as the Operating and Maintenance Instruction Manuals for comment.

The Contractor should note that in the event of non-compliance with this Clause, the Employer's Agent reserves the right to have prepared the necessary drawings and to deduct the cost of preparing same from monies otherwise due to the Contractor. The sum deducted shall be the actual cost and may be greater than any sum declared by the Contractor.

In addition to the 'as built' drawings noted above the contractor shall provide and mount on the wall of each plantroom a laminated drawing showing the 'as built' installation together with the schematic arrangement of the plant and any valve schedules/charts together with emergency schematic diagrams for gas installations.

6.2 Operating and Maintenance Instruction Manuals

Operating and maintenance instruction manuals shall be provided by the Contractor as detailed herein.

All manuals shall be produced upon an agreed word processing package (Tender to allow for Microsoft Word).

A draft copy of the operating and maintenance instruction manuals contained in a temporary loose leaf binder shall be issued for approval of content, layout and form. A draft copy of the manual shall be issued 4 weeks prior to Completion or Completion of Section as defined in the Main Contract Preliminaries, for the Employer's Agent's comments. The Employer's Agent shall provide such comments within 2 weeks of receipt of the manuals.

Two copies of the final document shall be handed over at Completion or Completion of Section as defined in the Main Contract Preliminaries, which shall include all testing and commissioning results, and final plant duties and control settings etc., in a typed form (i.e. the commissioning data must be part of the word processed document. Handwritten entries are not acceptable).

The word processed format operating and maintenance instructions shall cover all items of plant and equipment and shall include a detailed physical and functional description of the complete installation, supplemented with manufacturer's details and maintenance instructions for all components, plants and equipment and all diagrams and data as may be required for the successful operation and maintenance of the plant and equipment.

The manual shall conform to the following minimum standards:-

The manual shall be multi-ring PVC bound stiff binder able to withstand constant usage, or where a thicker type of binder is required it shall have steel locking pins.

The cover shall be printed with the following information:-

"Operating and Maintenance Instruction Manual" (Project Name and Service).

Where more than one volume is required, the cover shall also be printed with volume number.

Each section of the manual shall be divided by a stiff full page divider. The divider shall be labelled as to the section of the manual, the labels of which shall not be obscured by the manual's content e.g. where a drawing or other information is incorporated using a filing sleeve the label/tab must be visible.

All written instructions within the manual shall be typewritten with a margin on the left hand side.

The arrangement of the manual shall be as follows (or as agreed with the Employer's Agent):-

Section One	Index
Section Two	Description of the Design Intent
Section Three	Description of the operational routines

The description must include step by step instructions on starting and stopping each plant or system and a fault diagnosis procedure in diagrammatic and tabular form to show the action necessary to correctly identify defective pieces of equipment and the steps to be taken to rectify faults.

Section Four	Planned maintenance instructions
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This section must include step by step instruction on the maintenance of all items of plant. Data shall also be provided for ordering replacements. Full sets of manufacturer's maintenance instructions including wiring diagrams, cable schedules and circuit charts shall also be provided. Protection and overload relay settings shall be recorded and calibration charts shall be incorporated. This section shall include a set of drawings of the installation upon which is recorded all plant settings, water flow-rates, pump heads and noise level readings as adjusted and measured during the testing commissioning period.

Section Five	A set of Record Drawings and Test Certificates
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If necessary, due to the number of drawings which have to be included in the manual, each drawing shall be photographically reduced in size to suit the manual.

Section Six	Emergency Measures
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Including telephone numbers of the Contractor's emergency staff, names, addresses and telephone numbers of all manufacturers.

All parts of the manual, including manufacturers instructions shall be produced electronically, in order that the entire O&M Manual and the 'as built' drawings can be burned to a DVD (or CD).

6.3 Production of CAD Record Drawings and Operation and Maintenance Manuals

Each Contractor shall be required at tender stage to incorporate within his tender separate cost for the employment of a specialist technical documentation specialists to produce the Record Drawings and Operation Maintenance manuals.

6.4 Provision of Schedule of Spares and Special Tools

The Contractor shall compile and submit to the Employer's Agent one month before completion of the works, a complete list of special tools, test equipment and spare parts to cover twelve months operation of the installations. The Contractor also submit an additional list of special tools and test equipment likely to be need during the useful life of the installation, i.e. over and above the 12 months period. If the Contractor fails to give this

information in good time and the Employer is thereby prevented from carrying out proper maintenance of the installation, the Contractor shall be responsible for carrying out the maintenance at his own cost. This requirement is in addition to the provision of the spares and tools detailed elsewhere in the contract.

Wherever spares or tools, special or otherwise, are required by other clauses within the Specification they shall be provided irrespective of the requirement of this particular section.

It shall be the Tenderer's responsibility for provision of a fully itemised schedule of spares for each and every system and item of equipment installed under the mechanical, electrical, public health and refrigeration works.

Each item of equipment upon the spares schedule shall be priced, the cost of the spares in total together with the schedule shall be provided for the Client consideration, noting that he reserves the right as to whether or not the provision of spares under this section forms part of the Contract works.

6.5 Maintenance Contract

The Contractor shall include within their tender for carrying out planned preventative maintenance of all equipment and systems within his scope of works for a full 12 months period from the date of completion or completion of section or as defined in the Main Contract Preliminaries. This shall give the client a single point of contact for the maintenance of all the systems within the development, while responsibility for ensuring that the systems are properly maintained during the 12 months defects liability period remains with the Contractor.

The maintenance to be carried out shall be strictly in accordance with the various manufacturers' recommendations and shall be sufficient to ensure that the services operate at optimum efficiency, warranties are maintained and that the life expectancy of the various items of equipment and system components are in no way compromised.

This requirement shall in no way defer the Engineering Contractors' responsibility of providing 12 months defects liability warranty for faults associated with improper workmanship or for equipment faults occurring within the warranty period of said equipment.

6.6 Instructions of Employer's Representative

The Contractor shall, at a time to be agreed prior to Completion or Completion of Section or as defined in the Main Contract Preliminaries, instruct the Employer's representative in the use and correct operation of the Contract works and shall satisfy himself that such staff are capable of taking over the installation. During this period of instruction, the Contractor shall be responsible for the correct operation and maintenance of the installation.

6.7 Commissioning and Testing

The Contractor shall notify the Employer's Agent in writing when, in his opinion the mechanical and electrical works or parts thereof are ready for testing and commissioning. The Contractor shall then carry out the tests. The Contractor shall prove to his satisfaction that all test results are in accordance with the specification and CIBSE / BSRIA Commissioning Codes and Technical Notes. The Contractor shall then operate the installation or selected parts thereof in the presence of the Employer's Agent and shall make all specified tests to the satisfaction of the Employer's Agent.

Commissioning shall be carried out by a specialist company directly employed by the Contractor.

Where portions of the work are commissioned and tested separately, the Contractor shall, upon Completion or Completion of Section as defined in the Main Contract Preliminaries, demonstrate to the Employer's Agent that all the several portions are capable of proper simultaneous operation.

In cases where the construction programme is such that the Contractor shall need to return to the portion of the building taken over and occupied by the Employer in order to undertake testing, balancing, adjustment, etc., the Contractor shall take all necessary precautions against, and shall be responsible for, any damage caused whilst working in such areas for that purpose.

For the purposes of commissioning and testing of the installation the Contractor shall provide all necessary skilled and unskilled labour and all necessary instruments and testing equipment.

Subsequent to the completion of all testing and commissioning to the satisfaction of the Employer's Agent the Contractor, when directed by the Employer's Agent, shall operate the plant and shall demonstrate that the overall systems function correctly in accordance with the requirements of the Specification. A period of at least seven days full running and operation shall be considered reasonable for this demonstration. During this period the Contractor shall be responsible for the operation and maintenance. Where a BMS is provided the operating conditions and fault alarms shall be logged by the BMS to demonstrate that the systems are operating as intended and in 'automatic' mode. A print out of the operating logs shall be inserted into the final O&M Manuals.

6.8 Practical Completion

Practical completion of the Contractor's works, or agreed phase or part of the works, shall not be effected until the Contractor has fulfilled his obligation under the Main Contractor's conditions and in particular demonstrated to the satisfaction of the Employer's Agent that the following aspects are complete.

All works to be complete other than minor snags or defects which do not compromise the use of the building for the purpose for which it was intended and could be reasonably completed within an agreed programme without causing disruption to the Employer's or his Agent's use of the Building, or parts of the building.

All tests, commissioning results and demonstrations shall have been undertaken and proven to be within tolerances allowed in the Specifications and the building is proven to be capable of running in 'Automatic Mode' as detailed above.

All final copies of the Record Drawings, Schedules, Operating and Maintenance manuals to have been supplied in a format agreed by the Contracts Administrator.

All spares, keys, tools, etc and other materials required by the specification for the running and maintenance of the Engineering Systems are to have been supplied.

All instruction of the Employer's staff to have been satisfactorily completed in accordance with the programme for handovers agreed with the Contract Administrator.

7.0 Contractor's Design Responsibility (where appropriate)

Practical completion of the Contractor's works, or agreed phase or part of the works, shall not be effected until the Contractor has fulfilled his obligation under the Main Contractor's conditions and in particular demonstrated to the satisfaction of the Employer's Agent that the following aspects are complete.

All works to be complete other than minor snags or defects which do not compromise the use of the building for the purpose for which it was intended and could be reasonably completed within an agreed programme without causing disruption to the Employer's or his Agent's use of the Building, or parts of the building.

All tests, commissioning results and demonstrations shall have been undertaken and proven to be within tolerances allowed in the Specifications and the building is proven to be capable of running in 'Automatic Mode' as detailed above.

All final copies of the Record Drawings, Schedules, Operating and Maintenance manuals to have been supplied in a format agreed by the Contracts Administrator.

All spares, keys, tools, etc and other materials required by the specification for the running and maintenance of the Engineering Systems are to have been supplied.

All instruction of the Employer's staff to have been satisfactorily completed in accordance with the programme for handovers agreed with the Contract Administrator.

Where the specific specification calls for the Contractor to take responsibility for the design of the engineering services, the following section applies.

The Contractor shall be responsible for the complete detailed design of the engineering systems within this contract, all of which shall be subject to the comment of the Employer's Agent.

The Contractor shall be responsible for ensuring that the detailed design which he undertakes is fully co-ordinated and compatible with the remainder of the project design.

The contractor shall be responsible for ensuring co-ordination with the main contractor in determining the responsibilities for interfaces such as fire stopping, flashings, kerbs and stopping up or sealing required.

Comments by the Employer's Agent shall not relieve the Contractor of his responsibility for the suitability and correctness of the Contractor's designs and his other obligations within the contract documentation.

The Contractor's design obligations shall include:

1. Complete detailed design of the engineering systems covered by this contract, including attendance at design team meetings and progress reporting as required. Design warranties and professional indemnity insurances will be required as detailed in the main contract preliminaries.
2. Preparation of detailed design calculations and production of design drawings/specifications/schedules, to be formatted and presented in a formal design file at the completion of the design phase, together with Designers Risk Assessments for the installations.

- ~~3. Fabrication drawings and the co-ordinated Installation/Working Drawings and Record Drawings.~~
- ~~4. Negotiation with all statutory undertakers for the provision of suitably sized incoming utility connections to the site.~~
- ~~5. Drain and vent point locations and pipework gradients in accordance with BSRIA documents Application Guide 1/89 Flushing and cleaning of Water Systems.~~
- ~~6. Bracket and support detailed design and locations. (All types, loads and locations must be declared to the Employer's Agent prior to installation for comment (10 working days)).~~
- ~~7. Details of Electrical wiring diagrams of all equipment supplied by the Contractor showing all interconnections between equipment to enable the necessary wiring to be undertaken.~~
- ~~8. Details of all equipment component design and selection necessary insofar as such items have been selected by the Contractor for that item of equipment to meet the engineering specification and performance indicated.~~
- ~~9. Automatic controls detailed design insofar as it is required to meet with full physical and operational requirements of the Engineering Specification. The Contractor shall be responsible for ensuring the full compatibility of the plant and equipment with the specified function. Where interfaces (relays or other devices or modifications to hardware or software) are required the design and incorporation shall be the Contractor's responsibility.~~
- ~~10. Dimensioning of, and final installation details of, the Automatic Control panels to suit the detailed requirement of the particular agreed manufacturer's of controls equipment and cable entry/exit accommodation such that:-
 - ~~• Cable entry is possible in the selected location.~~
 - ~~• Doors are not fouled by other plant, equipment, services or structural elements.~~
 - ~~• Safe operating and maintenance clearances are provided in all access positions when installed on site.~~~~
- ~~11. Fire alarm system, component and cabling requirements to meet with particular manufacturer's and the engineering specification's requirements.~~
- ~~12. Attenuator design and selection to satisfy the particular and performance requirements of the specification, including spatial allowances made within tender drawings.~~
- ~~13. Design of elements of the scheme provided by the Contractor for self weight and other applied forces/loadings in reasonable use. In particular any buried tanks or pipework shall require designed anchorage encasement or foundations.~~
- ~~14. Thermal expansion accommodation and anchorage, including provision of bellows or bends.~~
- ~~15. Acoustic design or modification of equipment to meet with the internal and external noise levels specified. All levels to be achieved with all mechanical, electrical and refrigeration plant operating.~~
- ~~16. Valve, damper and access locations.~~

- ~~17. System water capacities, selection of flushing and water treatment method and chemical additives and arranging of the facilities required to comply BSRIA Application Guide 8/91 pre-commission cleaning of water system.~~
- ~~18. Selection of all anti-vibration mountings to suit the particular application of the mounts.~~
- ~~19. Final exact locations of control sensors detectors and thermostats (to be submitted to the Contractor Administrator for comment).~~
- ~~20. Capacity, location and design of electrical conduit system, similarly trunking where used in lieu of multi-conduit installation.~~
- ~~21. Duct platforms, access covers and gratings, ladders and additional structural steelwork where required and detailed in the sub-contract documentation and where deemed necessary to allow installation operation, maintenance and removal of the systems.~~
- ~~22. Selection of regulation devices to comply with CIBSE Technical Memorandum TM8.~~
- ~~23. Sizing of cable terminations on items of equipment provided under the sub-Contract where cable sizes are specified.~~
- ~~24. Ensuring cable sizing selections as specified are not invalidated by Sub-Contractor selection of alternative routes during installation.~~
- ~~25. Detailed design of earthing and bonding requirements for electrical engineering services, mechanical engineering services, architectural and structural elements requiring earthing and bonding.~~
- ~~26. Design of cable or cable trunking terminations on to electrical equipment provided under the sub-contract and dimensioning of and final installation details of electrical switchgear to ensure that:
 - ~~• Cable entry is possible in the selected location.~~
 - ~~• Doors are not fouled by other plant, equipment, services or structural elements.~~
 - ~~• Safe operating and maintenance clearances are provided in all access positions when installed on-site.~~~~
- ~~27. Fuse sizes installed in plug tops are appropriate for the rating of connected equipment.~~
- ~~28. Detailed design of refrigeration systems, including sizing and detailed design of refrigerant pipework between items of equipment provided under contract works.~~

8.0 Utilities and Consumables

8.1 Fuel Power and Consumables for the Engineering Works

Up to the point of practical completion, the costs of all electrical, gas, and water supplies for testing, commissioning and proving of the works shall be provided by the Contractor.

Consumables, such as filters and lamps shall be replaced, by the Contractor prior to practical completion.

8.2 Secondary Steelwork

The Installer shall include in his tender for the supply and installation of all steelwork required to support the services within his works package other than that detailed on the Structural Engineering drawings.

8.3 Works by Public Bodies/Utility Suppliers undertaking their Statutory Obligations

The Installer shall be responsible for making direct contact with all parties, arranging all supplies and payment of all accounts up to and including handover, unless otherwise noted in the particular specification. This is to include for all reinforcement contribution costs and infrastructure charges etc.

The Installer shall provide all builders' work and other facilities at his own cost.