gleeds

Tamworth Building New Classroom Lighting & Emergency Lighting

RIBA Stage 3 Performance Electrical Specification

College of Policing
Gleeds Building Surveying Ltd
NTBS4279-TA

Version: T01
Date: October 2024

DOCUMENT CONTROL

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Signature			
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Preamble

1 Preamble

THIS SECTION IS TO BE READ IN CONJUNCTION WITH THE MAIN CONTRACT PRELIMINARIES, DRAWINGS AND ALL OTHER SECTIONS OF THIS SPECIFICATION. WHERE ANY CONFLICT OCCURS THE MAIN CONTRACT PRELIMINARIES SHALL TAKE PRECIDENCE.

NOTE THAT THIS PROJECT HAS BEEN DESIGNED TO RIBA STAGE 3 (PERFORMANCE SPECIFICATION) AND IS CONSIDERED TO BE A COMPLETE CONTRACTOR DESIGN PROJECT. THE DRAWINGS AND SPECIFICATION HEREAFTER ARE DESIGN INTENT ONLY AND ARE TO DEFINE THE FINAL DESIRED OUTCOME ONLY. THE DRAWINGS BEING PRESENTED BY GLEEDS SHALL NOT BE USED AS A 'FINAL DESIGNED' SCHEME, THE CONTRACTOR IS WHOLLY RESPONSIBLE FOR DEVELOPING THESE DRAWINGS AND TAKING THE PROJECT FROM RIBA STAGE 3 THROUGH TO RIBA STAGE 7.

1.1 Project Particulars

For project particulars see main contract preliminaries.

1.2 Definitions

Electrical Service-Contractor – Where this term is used within the specification it shall be taken as the contractor completing the electrical installation works as detailed in this specification and associated drawings etc. Depending upon the type of contract the term Sub-Service Contractor shall equally refer to the Service Contractor or Building Services sub-contractor.

Mechanical Service - Contractor – Where this term is used within the specification it shall be taken as the contractor completing the mechanical installation works as detailed in this specification and associated drawing etc. Depending upon the type of contract the term Sub - Service Contractor shall equally refer to the Service Contractor or Building Services sub-contractor.

Specialist – Refers to a Specialist contractor employed by the Building Services Contractor, Service Contractor or the Service Contractor to complete a part of the works on their behalf, the Building Services Contractor, Service Contractor or the Service Contractor shall be fully responsible for all works undertaken by the Specialist.

Services Contractor – Where this term is used it shall refer equally to the Service Contractor and Service Contractor completing the mechanical and/or electrical installation works as detailed in this specification and associated drawings etc. Depending upon the type of contract the term Services Contractor shall equally refer to the Building Services Sub-contractor, Main Contractor or Service Contractor.

Main Contractor – Where this term is used within the specification it shall be taken as the contractor completing the overall contract for the client as detailed in the main contract specification and associated drawings etc. Depending upon the type of contract this shall equally refer to the Builder, Principal contractor or the Mechanical, Electrical or Service Contractor if they are the Main Contractor for the project.

Engineer – Refers to a representative of Gleeds.

Contract Administrator – Refers to representative of the company administering the project as defined in the Main Contract preliminaries.

The term "Supervising Officer" has been used throughout these documents and shall mean the person or persons whom the employer has appointed to act as his representative for the execution of the project.

The Supervising Officer shall be the Project Manager, unless stated otherwise.

1.3 Tender

Tender Documents

Electrical documents/drawings shall be as follows:

Document Title	Reference	Revision
Electrical Services		
NTBS4279-GLE-TA-GF-DR-E-3000	Tamworth Ground Floor Lighting & Emergency Lighting Layout	T01
NTBS4279-TA-E01	RIBA Stage 3 Performance Electrical Specification	T01

1.3.1 Tender Returns

Tenders for the Contract Works shall be submitted on the Tender Forms accompanying this Specification, in compliance with the main contract preliminaries.

Tenders received after the time stated may be rejected. Tenders qualified in any way may be rejected. No payment will be made for Tenders. The employer does not bind himself to accept the lowest or any Tender.

1.3.2 Tender for the Complete Installation

The works covered by this tender shall include (but not be limited to):

1) Design Development and Detailing
2) Production of working drawings
3) Works testing
4) Supplying and delivering to site
5) Support Equipment (steelwork etc)
6) Erecting equipment
7) All minor items (screws, fixings etc)
8) Testing
9) Commissioning and Performance testing
10) Demonstration
11) Handing over in working order the complete engineering services installations described in the Tender Documents.

The Tender shall be for complete installations and not only the major items of plant and equipment contained within the Tender Documentation but also all incidental sundry components necessary for the complete execution of the work.

The Tender shall include the proper commissioning, performance testing and operation of the Services Contract Installation and notwithstanding the obligation of the Services Contractor to produce co-ordination and installation drawings and the like based on the Services Contract Drawings, no additional cost will be allowed for want of knowledge in this respect.

The Services Contractor shall, when submitting his Tender clearly describe any excluded work which of necessity he requires to be executed and paid for by others. Any such work not specially stated and described shall be deemed to have been included in the Tender.

1.3.3 Preliminary Items

A full breakdown of costs for the requirements of preliminary items is to be provided with the submission of the Tender return and shall be detailed within the section Summary of Tender.

1.3.4 Schedule of Rates

The Tenderer shall include with their tender, a fully priced out Schedule of Rates with each item priced and totalled to agree with the sub-totals and final total of the Tender. These prices shall be the basis for the valuation of any variance of the Services contract Works.

The priced Schedule of Rates shall be deemed to include for all items, whether mentioned in the Schedule or not, for this services contract. Detailed rates are also required for all Sub Traders' work included in the Services contract.

Ancillary items not shown separately in the schedule will be assumed to be included in the general rates stated.

1.3.5 Warranty to be given by the Services Contractor Employed by the Contractor

Prior to appointment the Tenderer shall provide the employer with the warranties as detailed in the Main Contract preliminaries. Failure to comply with this clause will invalidate this tender.

1.3.6 Site Management

The Tenderer must include with his Tender his management proposals together with details of his supervisory staff intended to be employed on the works. Where the Services Contractor has a design or design development responsibility his management proposals must include details of his design staff. The management proposals shall include the following information in respect of all supervisory/design staff:

a) Organisation chart - both off and on site
b) Name
c) Title and function
d) Relevant experience and references
e) Duration and percentage of employment on the Works
f) Cost per week
g) Total staff costs.

The above proposals shall include the Services Contractor's proposed Field Staff Organisation Chart showing lines of responsibility within the field staff and reporting lines of authority with key Head Office Managers/Directors, with particular regard to Safety, Quality, Project Controls and Project Management.
The above information does not in any way relieve the Services Contractor of the obligations to provide suitable and adequate management to complete the works.

1.3.7 Meetings

The Supervising Officer may require a meeting during the tender period and/or post tender. These meetings will be to ensure that Tenderers are aware of all of the requirements of the Works, clarify any ambiguities which may exist, to provide any additional information which may be required and to review progress. The Tenderer's proposed management team will be required to attend these meetings. It is envisaged that the management team may include people associated with both off and on-site operations.

1.3.8 Visit to Site

It is a pre-requisite to submitting a Tender that the Services Contractor shall visit the site before tendering to have satisfied himself as to the local conditions and accessibility of the site, the full extent, scope, nature of the works, the supply of and conditions affecting labour, carriage, cartage, unloading, tools, scaffolding, ladders and everything else necessary for the execution of the works. No claims on the ground of lack of knowledge in such respect will be admitted.

The Services Contractor is to allow in his prices for complying with all traffic and other regulations of the Main Contractor, the Local Authority and Police with regard to access to and egress from the site as advised from time to time.

The site address is:

College of Policing (Tamworth Building)
Leamington Road
Ryton-on-Dunsmore
Coventry
CV8 3EN

1.3.9 Discrepancies in Tender Documents

Any queries relating to the Specification, or the drawings must be sent in writing to the Supervising Officer, who will circulate the questions and answers to all firms tendering.

In the event of the discrepancies appearing in the drawings, or between the drawings and Specification, or drawings and schedules, Tenderers shall refer the matter in writing to the Supervising Officer for interpretation.

1.4 Provisions Required by the Services Contractor in Constructing the Contract works

1.4.1 Meetings

The contractor shall be required to attend such meetings as detailed within the specification, and as a minimum:

- Pre-Contract meeting
- Pre-Start meeting
- Design Review Meetings
- Fortnightly/Monthly Progress Meetings
- Pre-completion snagging
- Practical Completion/Handover meeting

Dependent on programme and availability it is possible that some meetings may combined. This shall be entirely at the discretion of the supervising officer.

1.4.2 Supervision

The Services contract shall allow for keeping on the site, throughout the duration of the Services contract period and until the work is completed to the satisfaction of the Supervising Officer, a competent Engineer whose name shall have been communicated in writing to the Supervising Officer. This representative shall supervise and superintend the carrying out of the works on the site, prepare progress schedules and programme's and ensure full exchange of information with other trades and shall be permanently available during the working hours on the site and shall attend all meetings on the site when requested. The site representative shall be fully authorised and qualified to accept written instructions from the Supervising Officer via the Main Contractor, and issue instructions on behalf of the Services Contractor, and shall keep a diary recording the day-to-day progress of the work and the details of all the instructions received. This diary shall be at the disposal of the Supervising Officer.

If, in the opinion of the Supervising Officer, the degree of site supervision is inadequate, he shall instruct the Main Contractor and Services Contractor, who shall immediately rectify this matter to the satisfaction of the Supervising Officer.

The Supervising Officer and/or Main Contractor shall be at liberty (by notice in writing to the Services Contractor), to object to any representative or persons employed by the Services Contractor, in the execution of or otherwise about the works, who shall, in the opinion of the Supervising Officer misconduct himself or be incompetent or negligent, and the Services Contractor shall remove such persons from the works forthwith.

1.4.3 Staff

The Services Contractor shall supply all the necessary labour, both skilled and unskilled, required to carry out the Contract and during the execution of the Contract, shall observe those conditions of employment which have been agreed between the Employer's Federation and the Trade Unions concerned to apply to the place and circumstances in which these works are to be carried out.

Additional nett overtime costs shall only be permitted as extra when specifically authorised by the Supervising Officer in writing for special or emergency purposes. Overtime working for any purpose necessary for normal building organisation, such as that necessary to keep to programme, encouragement or working to provide continuity of working in certain trades, or to facilitate trade waiting on trade, etc., shall not be regarded as special or emergency purposes.

1.4.4 Work Area

The Services Contractor shall take all precautions necessary to restrict the area of his works to the immediate vicinity of the work involved under his Services contract and shall prevent his workmen from straying beyond the boundaries of such works. The work areas shall be on a floor by floor basis.

1.4.5 Planning

Co-operate with the Main Contractor in planning the construction of the Services contract works before the work commences.

Prepare a schedule detailing all items of plant and equipment with their true delivery period which he considers should be brought to the attention of the Main Contractor in the preparation of this main programme.

Liaise with the Supervising Officer and Main Contractor, providing them with a detailed program confirming when Client supply items if any are required for installation.

Advise the Main Contractor in sufficient time to allow access to be provided for the installation of large items of plant and equipment or long lengths of cable, containment, etc.

1.4.6 Statutory Undertakings

The Services Contractor will be responsible for programming, co-ordinating and progressing the involvement of the statutory undertakings and other Authorities in the works.

The Services Contractor shall provide all necessary information so required by the Main Contractor in respect of the statutory undertakings and other authorities related to the construction works.

The Services Contractor shall, allow for full attendance on the statutory undertaking and other Authorities and shall assist their Engineers on site to the full.

1.4.7 Roads

All necessary temporary roads, tracks, crossings and hard standings will be provided free of charge by the Main Contractor.

1.4.8 Buildings and Security Measures

Provide, as necessary, temporary sheds, offices, other temporary buildings and security measures for your own exclusive use and clear away everything on completion.

The Services Contractor shall allow for moving the site accommodation from time to time as may be requested by the Main Contractor, subject to the confines of the site. Storage area for the Services Contractor's materials, plant, etc., shall be provided free by the Main Contractor. Suitable mess rooms and sanitary accommodation will be provided, free of charge, by the Main Contractor for all persons employed on the works all in compliance with the current Statutory Regulations and the Code of Welfare conditions.

1.4.9 Telephones/Facsimile/Computer

Provide, as necessary, temporary telephone, facsimile and computer facilities for your own exclusive use. Pay all charges.

1.4.10 Water, Lighting, Electrical Power and Fuel

The Main Contractor will supply water, lighting, electric power and fuel in accordance with the Contract Preliminaries.

The Services Contractor is to assure himself that all the necessary electric supplies are available for the Services contract works.

1.4.11 Plant

i) The Services Contractor shall include in his contract price for the provision of all tools, implements, instruments, cutting and bending machinery, etc.

ii) The Services Contractor shall provide all special machinery and all tackle, tools and other equipment required for the execution of his work and will be held responsible for such equipment when on site.

iii) Unless otherwise advised, all tools, etc., shall be suitable for operation on 110V 50Hz supply.

1.4.12 Local Authorities Requirements

The Services Contractor shall comply with and give all notices required by any Act of Parliament, regulations or by-laws of any local authority, public services, company or authority who may have any jurisdiction with regard to the work or whose systems, the same, are or will be connected, and he shall pay and indemnify the Employer against any fees or charges legally demandable under such an Act of Parliament, regulations or by-laws in respect of the works. No extra charge will be allowed due to failure to allow for this requirement.

Where the requirements of any water or electricity authority call for the submission to them of any component part of the works for approval, testing, stamping or certifying, the Services Contractor shall, at his own expense, submit and deliver any such component part to the place required by such Authority.

After such component part has been satisfactorily approved, tested, stamped or certified, the Services Contractor shall return it to the site for incorporation into the works. Any expense incurred shall be paid by the Services Contractor.

1.4.13 Inspection and Testing at Works

The Services Contractor shall provide all assistance, labour, materials, power, fuel, stores, apparatus and properly calibrated and certified instruments for carrying out the necessary works and shall allow in his Tender Sum for all costs in this regard.

The Supervising Officer shall be entitled at all times during the manufacture to inspect, examine and test on the Services Contractor's premises the material and workmanship of all plant to be supplied under the Services contract and, if part of the said plant is being manufactured on other premises, the Services Contractor shall obtain for the Supervising Officer permission to inspect, examine and test as if the said plant were being manufactured on the Services Contractor's premises. Such inspection, examination or testing, if made, shall not release the Services Contractor from any obligation under the Services contract.

The Services Contractor shall give the Supervising Officer two weeks written notice of the date on and the place at which any plant will be ready for testing as provided in the Services contract and unless the Supervising Officer shall attend at the place so named within ten days of the date which the Services Contractor has stated in his notice, the Services Contractor may proceed with the tests which shall be deemed to have been made in the Supervising Officer's presence and shall forthwith forward to the Supervising Officer, duly certified, copies of the test reading.

In the event of the plant not so passing the tests, the Employer shall be at liberty to deduct from the Services contract price all reasonable expenses incurred by him or the Main Contractor in repeating the tests.

1.4.14 Connecting to Existing Services

Give seven days' notice to the Supervising Officer of your intention to connect into or isolate any of the existing services and await his approval for so doing.

Include for all overtime and other additional payments necessary to ensure that the interruptions to existing services are carried out within the minimum possible inconvenience. Work without pause until the services are back to normal.

1.4.15 Operation of Plant, etc.

Prior to practical completion ensure that working plant is doing so correctly. Provide your own skilled personnel to attend the plant etc., while working, together with such Specialist personnel as are necessary for each circumstance.

1.4.16 Damage Due to Inclement Weather

The Services Contractor shall take all such measures and precautions deemed necessary for the protection of the works forming the Services contract and shall make good free of charge to the Employer or his assigns such damage, defects or faults which shall appear during the progress of the works due to inclement weather, frost, etc.

1.4.17 Practical Completion

Before the Services contract works are included in a Certificate of Practical Completion, the Services contract works, or such part as is referred to in the Certificate, shall be complete. The completion shall include setting to work, testing and commissioning, including proving the performance is in accordance with the Specification, of all items included in the Certificate, and full adjustment and balancing, in as far as is possible without the building

being occupied or the system being subject to a full climatic cycle, subject to the approval of the Supervising Officer.

Unless otherwise agreed the whole or any part of the subcontract works will only be included in a Certificate of Practical Completion when you have issued to the Supervising Officer required number of sets of Operating Manuals and Record Drawings as detailed later in this document.

After the installation has been shown to meet the commissioning requirements, the Supervising Officer may call for further operation of the plant in evaluating the performance of the installation. Be prepared to operate the plant, the cost of which will be reimbursed.

Include in your Tender for all additional works and expenditure necessary as a consequence of phased completion and handover.

1.4.18 Training of Employer's Personnel

The Services Contractor shall provide experienced personnel to instruct the Employer's personnel in the operation, maintenance and servicing of all the installation. Give instructions for a period of one week before the issue of the Certificate of Practical Completion.

The Services Contractor shall, at a time to be agreed prior to Completion or Completion of Section 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 Services Contractor shall be responsible for the correct operation and maintenance of the installation.

The training shall take place prior to completion and during the system reliability trial with all systems fully operational. The Services Contractor shall allow for a minimum of five days training for two representatives. All two representatives will attend each day of training. The Services Contractor shall provide training handout notes and background information to the employer's representative prior to the training period.

Training shall be structured to suit all the relevant building elements (building and its services) and shall include theory, demonstration and hands-on experience in the operation and maintenance of the building. Each training day shall allow for relevant instruction on an elemental basis.

A register shall be kept of attendance at each of the training sessions.

1.4.19 Obligations after Practical Completion

Between the issue of a Certificate of Practical Completion and the Certificate of Making Good Defects relating to the whole or part of the Services Contract works, provide the following:

1) A prompt call-back service, available at all times, to attend to any faults.

2) Prepare and submit a record of any failure or malfunction of any part of the services contract, the remedial action taken, subsequent re-testing and the results thereof.

3) Notify the Main Contractor of any malfunction in, or damage to, the subcontract which the Services Contractor can demonstrate had been caused by incorrect operation of the system, vandalism or action of a third party.

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

5) Carry out a final test at the end of the Defects Liability Period to demonstrate to the Supervising Officer that the Services contract works are operating efficiently and that all components are functioning correctly.

6) Carry out all work using competent, trained personnel and except where made necessary by abuse, misuse or negligence by other than the Services Contractor, make no change to the Employer.

Notwithstanding the foregoing paragraph, charge to the Employer the nett cost of replacement for life expired disposable parts.

1.5 Information required from the Services Contractor

1.5.1 Generally

Select materials and products capable of attaining the performances specified in the Schedules and ensure that the various components of the systems can be coupled together in a proper manner to provide a workmanlike installation.

Develop the design intent proposals and provide installation/working drawings, as detailed later, to demonstrate your solutions to the Supervising Officer.

Provide Builder's Work Drawings, as detailed later, to illustrate your requirements in this respect to the Main Contractor and Supervising Officer.

Respond, in such good time that the Completion of Works will not be delayed, to the directions of the Supervising Officer and assist in integrating the Services contract works into the design of the works as a whole.

The Services Contractor must ensure that he is provided, through the Main Contractor, with up-to-date copies of Architectural and Structural detail drawings and with working drawings of other trades where they may affect the Services Contractor's own drawings. Site dimensions should be used wherever possible in preference to drawings.

The Supervising Officer will be advised of the cost of the Services contract works by the Quantity Surveyor. Carry out the services entrusted to you with strict regard to the Employer's budget for the project.

Perform your duties in accordance with a programme to be agreed with the Main Contractor and/or Supervising Officer.

1.5.2 Quality Assurance

The Services Contractor shall provide for agreement by the Supervising Officer fully documented Quality Assurance Procedure (QAP) to International or British Standards, prior to commencement of draughting, procurement or installation.

The Services Contractors QAP must be provided in concert and agreement with the main contract procedures. The QAP must detail specific procedures related to the tendered project and not be generalised.

The QAP shall be provided by the Services Contractor at tender, its content subject only to the Supervising Office and Main Contractors comment.

1.5.3 Services Contractor to State Objections

In the event of anything described in the Specification or other relevant documents, or shown in the drawings being in the opinion of the Services Contractor, unsuitable or undesirable, or inconsistent with his guarantee and responsibilities under the Services contract, he shall draw the Supervising Officer's attention to such matters

at the time of tendering or, in the case of matters arising out of documents, or in the case of instructions issued after the time of tendering, immediately on receipt of such documents or instructions and prior to the commencement of any part of works affected thereby.

1.5.4 Integration

Co-operate with the Main Contractor in planning the installation before the work commences. Take particular care to ensure that there is no obstruction of electrical services positions, cable routes, switch positions, mechanical services, pipework, access points and plumbing, etc. Arrange services in ducts so that the services are readily accessible for maintenance.

The routes of services and the approximate position of the equipment and the apparatus are shown on the Tender Drawings. Attend such meetings as are necessary to enable you to provide the Installation Drawings which the Supervising Officer requires to process.

The meetings will be called and be under the direction of the Supervising Officer. The object of the meetings will be:

i) To establish the inter-relationship of services in such confined spaces as ceiling voids, ducts and plantrooms;

ii) To allow adequate space for maintenance and access purposes;

iii) To assist in the proper provision of Builder's Work Drawings.

1.5.5 Installation Drawings

Prepare, agree with the Supervising Officer and supply for issue all detailed Installation Drawings (including wiring diagrams and builders work drawings) required to enable the Services contract works to be integrated into the design of the works as a whole before installation is commenced.

Drawings provided by the Services Contractor shall be drawn to commonly recognised scales on A0 or A1 sheets. In addition to the project title, the Architect's and Consulting Engineer's name and address, a unique drawing number, drawing title, scale and date shall be entered in the title block, together with full cross-reference details to the related drawings.

All drawings shall be produced and presented in print form and on computer disk with files in DXF format (unless agreed otherwise)

All drawings shall have independent layers of information in accordance with International or British Standards. All layers shall be displayed 'on screen' in different colours.

The Services Contractor shall verify the accuracy of all dimensions abstracted from the drawings, including verifying the accuracy by taking dimensions on site, in the preparation of any construction drawings by the Services Contractor and before the relevant works proceeds.

All drawings, schedules and other information provided by manufacturers, suppliers or approved Specialist Services Contractors shall be checked by the Services Contractor who shall ensure that all requirements of the design installation and working drawings/documents have been incorporated prior to submission.

Inform the Supervising Officer before changing any component or detail of installation shown on the Tender Drawings or described elsewhere in these documents. At the time notify the Supervising Officer of the total effect of these changes, including the design parameters of the system and their effect on power requirements, cable sizes, performance or rotating machines, etc.

The installation drawings must also clearly show withdrawal space required for dismantling of plant and access space which must be kept clear of obstruction.

Builder's work drawings shall form part of the installation drawings and shall show the sizes and locations of all foundations, bases, plinths, sumps, chases, holes, etc, required and shall be based on certified manufacturers drawings.

The drawings shall be clear and concise in detail to enable building works to be carried out without misunderstanding.

The scale of these drawings shall be 1:50 or, where necessary 1:20.

In addition, the location and size of all equipment, access panels, penetrations etc., shall be shown.

Switchgear, starter control and instrument panel drawings shall show the construction, the external and internal layout of panels, and wiring diagrams comprising internal wiring diagrams, for the complete systems in the panels.

Manufacturer's equipment drawings shall show the precise details of each and every item they will be providing and shall highlight all dimensions and particular requirements necessary for the correct installation and maintenance of their equipment.

Specific installation drawings may with the prior specific and express written permission of the Supervising Officer omit minor details such as conduit provided that a method statement rigorously covers the installation intent. This permission will not be unreasonably withheld but will not be given where either Client operation or visual appearance is affected nor where details are needed for following trades.

The Services Contractor shall submit such drawings as the Supervising Officer may reasonably require at any stage of the Services contract.

Supply four copies of each drawing for inspection by the Supervising Officer and, if required, four copies of each subsequent amendment. When agreement has been reached, issue further copies of the drawings as follows:

i)	For the Supervising Officer	-	4 copies *
ii)	For the Main Contractor which includes one copy by the means of which one copy by the means of which the Main Contractor will instruct the Services Contractor	-	6 copies *

* unless agreed otherwise

Issue copies of drawings to those of your suppliers and Services Contractor's affected by the drawings.

The Tender Drawings shall not be used to meet the requirements of this clause. Clearly mark the drawings as Installation Drawings and accept full responsibility for them as such.

Allow in your programme for the preparation and obtaining approval of drawings, plus time to make any necessary amendments.

1.5.6 Definition of Approval

Understand that whenever you submit information to the Supervising Officer for approval, such approval will be approval in principle only and will not, in any way invalidate your responsibility for ensuring the accuracy and suitability of the information in accordance with requirements specified elsewhere.

The Supervising Officer will approve the overall layout of plant and equipment, cabling, trunking, conduit, etc., shown on the Installation Drawings, and their general location, as well as the type and size of these items, in so far as they conform to the Tender Drawings.

The exact position in the works of the above items relative to grid lines, floors, beams, ceilings, walls and other structural/finishes items, and any other services is your responsibility and the Supervising Officer's approval does

not absolve you from the necessity of checking these items with the Main Contractor and other Services Contractor's.

Note also that approval of drawings will not relieve you of your responsibility for complying with the Specification.

When submitting any drawings, the Services Contractor shall advise the Supervising Officer if, in order to avoid delay in the completion of the works, early approval is necessary. All detailed drawings submitted for approval shall be to a reasonable scale and the Supervising Officer's decision as to what constitutes a reasonable scale shall be final.

1.5.7 Drawing Approval Categories

A co-ordinating consultant will be identified by the Supervising Officer for each Specialist sub-contractor.

In addition to the co-ordinating consultant, fabrication drawings will be commented on by other consultants as considered appropriate by the Supervising Officer.

Two sets of drawings shall be issued to each commenting consultant.

The co-ordinating consultant will arrange receipt of other consultant's comments and transfer these to a single set of Services Contractor's drawings to be returned to the Main Contractor within 15 working days (or less by special arrangement).

Drawings may be returned direct to the Specialist sub-contractors by agreement in writing with the Services Contractor and Main Contractor. Copies of correspondence covering return of drawings will be copied to the Main Contractor or Services Contractor in either case.

Installation/working drawings will be returned under one of three following categories.

Document Commenting

Status	Description
A	Contractor to proceed with the works in accordance with the design documents.
B	Contractor to proceed with the works in accordance with the comments, the document shall be amended to take on board such comments.
C	Contractor to resubmit documents incorporating comments made. NO works to be carried out.

The co-ordinated, returned drawings will incorporate the most onerous classification awarded by any consultant making comment.

Services Contractor only entitled to be paid in respect of such work where it has been executed in accordance with designs marked A or B.

Engineer’s comments shall not relieve the Services Contractor of any of their design or co-ordination responsibility for the services installations.

1.5.8 "As Installed" Record Prints

Throughout the execution of the Services contract works, keep on the site a complete set of up-to-date prints and schedules marked with "As Installed" details. Make these prints available at any time to the Supervising Officer or his representative.

If, in the event, upon completion of the works, of it being discovered that, the Services Contractor shall have failed to comply with this requirement and it becomes necessary for the Supervising Officer to examine or trace through

installed services in order to update the "As Installed" drawings, the cost of this work will be time charged and debited to the retention monies being held on the Contract.

1.5.9 "As Installed" Drawings and Diagrams

Unless otherwise agreed, the Services contract works, or any part thereof, will only be included in a Certificate of Practical Completion when you have issued to the Supervising Officer the final "As Installed" Drawings and Diagrams. These shall consist of two paper copies and a USB memory stick.

You may purchase copy negatives or dwg electronic drawings where appropriate of the Tender Drawings from the Consultant. Amend these to bring them into line with the works as fixed and then submit them to the Supervising Officer.

Before the above-mentioned final issue, send two prints of the "As Installed" drawings and diagrams to the Supervising Officer for approval of format and general content. Allow 14 days for approving.

Include on the "As Installed" Drawings and Diagrams the following in as far as they are the subject of the Services Contractor works. The general content and layout of the drawing shall be as that required for the "Installation Drawings".

i) Single line and schematic wiring diagrams for the whole of the Services contract works showing all terminal references and cable sizes.

ii) The layout, location and extent of all electrical plant, cable, cable tray, cable trunking, conduit, distribution boards, switches, outlets and lighting fittings which form part of the Services contract works, including dimensioned layouts of all concealed work. Where components are grouped or housed in a cubicle or on a common panel, an exploded arrangement must be incorporated.

iii) The layout, location and extent of all electrical plant, cable, cable tray, cable trunking, conduit, switches, outlets, terminals and indicators and alarms of all ancillary communication, detection, alarm and control installations which form part of the Services contract works, including dimensioned layouts of all concealed work.

iv) The location and identity of each room of space housing plant, machinery, distribution boards, draw-in boxes or apparatus.

v) The detailed general arrangements, to one-twentieth scale (minimum), of all boiler rooms, machinery spaces, air handling plant, refrigeration plant, tank rooms, switchrooms, meter rooms and other plant spaces, including the location, identity, size, colour coding and details of each piece of plant and equipment.

vi) The detailed general arrangements, to one-twentieth scale of service subways, ducts, meter rooms or other special sections of the work where, in the opinion of the Supervising Officer, the small scale drawings cannot provide an adequate record.

vii) Manufacturer's drawings showing the general arrangement and assembly of component parts of all machines and any pieces of equipment which may require servicing.

viii) Flow diagrams indicating the principles of the arrangements and operation of each of the various services as related to central plant, other principal components and zoning of distribution, etc.

ix) Diagrams illustrating the principles of automatic controls and of instruments, presented in combination

with the foregoing or separately, as agreed with the Supervising Officer.

x) Location of all earth tapes, earth electrodes and test points.

xi) In conjunction with schedules of location and detail and reference, voltage and wattage of all lighting fittings.

xii) Comprehensive electrical diagrams or sets of diagrams which shall show size, type and length (to within one meter) of each main and services main cable, together with the measured conductor and earth continuity resistance of each.

xiii) Manufacturer's internal wiring diagrams for each piece of electrical equipment supplied under the Services contract, together with physical arrangement drawings to locate and identify the component parts.

xiv) Comprehensive diagrams showing in detail all power wiring and all control wiring and/or pneumatic of other control piping executed within the Services contract by others in accordance with detail provided by the Services Contractor, including size and type of conductor or piping used and identifying the terminal points of each.

1.5.10 Operating Manuals

Unless otherwise agreed, issue to the Supervising Officer, four copies of all manuals and operating and maintenance instructions in stiff-backed ring binders together with an electronic copy on a USB memory stick.

Before the commencement of the commissioning program, send initial Draft Copy to the Supervising Officer for approval of format and general content. Minimum 28 days prior to contract completion.

Include the following information in the operating manuals:

i) Index

ii) General description of the installation, equipment used and method of operation of the installation

iii) Handbooks, maintenance instructions, drawings and spare parts list for all components, plant and equipment used in the Services contract works.

i) Line diagrams indicating the main features of the plant, drawing attention to the method of setting the controls, switchgear, safety precautions etc.

ii) Schedule of routing maintenance, complete with list of normal consumables, routine oil and grease points and recommended lubricants.

iii) Schedule of periodic and preventative maintenance for specialised equipment.

iv) Schedules of methods of adjustments, typical fault-finding routines.

v) Schedule of operation and maintenance risk assessment sheets in accordance with the latest Construction (Design and Management) Regulations.

vi) Wiring diagrams of plant etc.

vii) Service manual for all specialised plant, giving all details as listed above.

viii) Schedule for obtaining and ordering replacement parts.

ix) Schedules of equipment valves and motors related to the "As Installed" drawings and giving names, addresses, telephone and facsimile numbers of manufacturer, serial number of plant, kilowatt-power electrical supply, performance duties and location within the building.

x) Description of emergency action which should be taken in the event of a breakdown of equipment. Telephone numbers of essential contacts shall be included.

xi) Outline design data of plant.

xvi) Test and performance data.

xvii) Test Certificates.

xviii) Schedule of "As Installed" Drawings.

xix) Legend for colour - coded services.

xx) Copies of all manufacturers guarantees.

In addition, and separate from the Operating Manuals, supply four sets of manufacturer's catalogues relating to specialised plant and equipment.

The requirements and obligations of manufacturers to provide literature as part of the installation record shall form part of plant and equipment orders and such orders shall be considered unfulfilled until literature requirements have been met.

1.5.11 Preparation of Manuals

The manuals shall be encased in A4 size, plastic-covered, loose leaf, four ring binders, with hard covers, each indexed, divided and appropriately cover titled. Drawings larger than A4 shall be folded and accommodated in the binder so that they may be unfolded without being in any way detached from the rings.

Prepare the Operation and Maintenance Manuals in draft as soon as the Installation Drawings are in hand.

Make two temporary manuals with provisional record drawings and preliminary performance data available at commencement of commissioning to enable Employers staff to familiarise themselves with the installation. These should be of the same format as the final manuals with temporary insertions for items which cannot be finalised until the Services Contract is commissioned and performance tested.

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 divider of the same size as the holder. The divider shall be labelled as to the section of the manual.

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:

A. Index

B. Description of the Design

C. Description of the operational routes. 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.

D. Planned maintenance instruction. 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 manufacturers maintenance instructions including wiring diagrams, cable schedules, circuit chart. 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.

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

F. Emergency measures including telephone numbers of the Services Contractor's emergency staff, names, addresses and telephone numbers of all manufacturers.

1.5.12 Submission of Operation and Maintenance Manuals

The final draft of the Operation and Maintenance Manuals shall be submitted in due time, and in any case not less than four weeks prior to Practical Completion, so that at least one copy of the complete final version is in the possession of the Employer at Practical Completion in order to comply with the Health & Safety at Work Act.

If partial possession is required by the Employer, then the documentation shall also be phased accordingly and so arranged to finally form one comprehensive document.

It shall be the Services Contractor's responsibility, whenever a successive phase of services contract is handed over, to amend and update the previously issued version of the Operation and Maintenance Manuals, bring it to the appropriate stage of completion and submit same to the Main Contractor in due time to comply with the Health & Safety at Work Act.

1.5.13 Maintenance Contract

The Services Contractor shall provide a separate quotation for the maintenance of all equipment and systems distribution equipment, cabling, etc.) within his scope of works for a full 12 months' period from the date of completion or completion of section as defined in the Main Contract Preliminaries.

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 and that the life expectancy of the various items of equipment and system components are in no way compromised.

Contractor to include full service of equipment in accordance with manufacturers recommendations at the end of the 12-month defect period. This is to include documentation of any result changes from commissioning.

1.5.14 Spare Parts and Tools

The Services Contractor shall submit a Schedule of additional spare parts and tools (including lighting programmers) that he recommends should be supplied over and above those consumable spares required up to Practical Completion and for routine Maintenance.

1.5.15 Notice Prior to Covering Works

Any section of the work located below the ground, within trenches, ducts, ceiling voids or other concealed area, must be inspected and approved by the Supervising Officer prior to that section of the work being covered in. Seven days' minimum notice shall be given to the Supervising Officer of intent to cover or enclose the works.

1.6 Responsibilities (Services Co-ordination)

The tender drawings show design intent only, they are not construction drawings and therefore do not show all bends, tees, sets etc. that are necessary to locate services correctly to avoid clashes and ensure good maintenance access. The M&E Services Contractors shall:

a) Include for all materials etc. as required to provide a complete, fully co-ordinated installation for their services.
b) Complete co-ordination in conjunction with their Subcontractors, the Main Contractor, the Mechanical Services Contractor and the Contract Administrator, both individually and jointly.
c) Ensure that all services are co-ordinated with the building and any other services present and agree the sequence and timing of each element of the installation in a manner that maintains the agreed co-ordinated arrangements and programme.
d) The positions of all equipment and services routes, including trunking, conduit etc, shall be marked out on site prior to their fixing
e) Where architect's room layouts are available these shall be used to determine exact locations.
f) Particular attention shall be paid to ensure that accessories are positioned to suit door openings, fitted furniture, etc.
g) In heavily serviced areas, all main service routes or corridors and as otherwise specified elsewhere in this document, the Services Contractor shall produce drawings/sketches/details allocating space for all electrical and electrical services and demonstrate that crossover points etc. have been agreed in a manner that allows sufficient access to all maintainable items.
h) The Services Contractor shall produce co-ordinated 'as fitted' ceiling drawings at 1:50 scale, based on architect's ceiling layouts, showing all ceiling mounted mechanical and electrical equipment.
i) All drawings etc. shall be submitted following the requirements for working drawings detailed in this specification.
j) Liaise with the Contract Administrator, CDM Principal Contractor and CDM Principal Designer with regard to the assessment and reduction of hazard and risk in accordance with the current CDM regulations.
k) Should aspect ratio changes of ductwork be needed to achieve a fully co-ordinated layout or to allow the systems to fit within available voids / under structural steels, these shall be deemed to have been included within the Services Contractors Tender.
l) Particular care shall be taken to obtain uniform and tidy arrangements of pumps, valves, switchgear, outlets and ceiling mounted equipment. The precise position of a piece of equipment shall normally be determined as follows: -

- Single items of equipment which are visually remote from other electrical or electrical equipment shall be erected at the mounting heights stated in the Specification or shown on the drawings.
- Two or more items of equipment, whether electrical or electrical or both, which are to be

erected on the same wall or ceiling, or which will otherwise be visually close to each other, shall be arranged in a neat and symmetrical group. Symmetry of arrangement shall be obtained by horizontal and vertical alignment through the centre lines and not the edges of equipment; for this purpose, the stated mounting heights may, with the Contract Administrator's approval, be varied slightly.

m) Where necessary, agreement reached with other parties on the positioning of equipment/plant etc., shall be indicated on the Installation Drawings etc. called for in this Specification.

Any disputes shall be referred to the Supervising Officer.

Any section of work found to be covered up without the Sub-Contractor having obtained an acceptance certificate from the Supervising Officer shall be exposed for inspection by the Supervising Officer and the cost of uncovering the works and recovering the works shall be paid by the Sub-contractor.

1.7 Defects Liability

It shall be deemed that the Warranty on the plant shall commence from the issue of the Certificate of Practical Completion, not upon delivery.

Unless otherwise stated, the warranty period shall run for one year from the date of acceptance.

1.8 Retention

There will be a retention to the contract sum to cover rectification works required under the contract. Retention will be set at 5% of the contract sum during the works, dropping to 2.5% at practical completion for the duration of the rectification period. The rectification period shall be set at 12 months.

It shall be deemed that the Warranty on the plant shall commence from the issue of the Certificate of Practical Completion, not upon delivery.

Unless otherwise stated, the warranty period shall run for one year from the date of acceptance.

1.9 Valuation of the Services Contract works

1.9.1 Sub-Letting

State in your Tender names of all firms to whom you propose to sub-let portions of the work. No section of the work shall be assigned or transferred to another company without the prior consent of the Supervising Officer.

1.9.2 Alternative Makes/Delivery Periods

Where a particular manufacturer is specified, alternative makes of equal quality will be considered by the Supervising Officer. However, include in the Tender for the makes specified and give quotation for alternatives separately in an Appendices to the Form of Tender.

The Sub-contractor shall ensure that the dates of deliveries covered by orders placed with manufacturers, suppliers or other Sub-contractors are confirmed at regular periods between the placing of the orders and the date of delivery. To this end, a delivery schedule of all major items must be submitted to the Supervising Officer within 60 days of acceptance of the Sub-contractor's tender.

1.9.3 Builder's Work

The Services Contractor shall be responsible for producing Builders Work drawings and setting out builders work requirements, in conjunction with Gleeds M&E tender design drawings.

The formation of brick or concrete bases for engineering plant, boilers, calorifiers, pumps, switchgear, etc., the building-in of radiator, pipe and cable brackets, the formation of cable trenches, the provision of riddled earth in the trench, both before and after laying, and trench back-filling, the cutting of holes, chasing making good will be carried out free-of-charge by the Main Contractor.

1.9.4 Adjustments to the Sub-Contract Sum

No addition will be made to the Sub-Contract Sum if you have failed to ascertain, before tendering, all the requirements for carrying out the works, which inspection of the site or of the Specification and Tender drawings would have disclosed.

No change will be made to the Sub-Contract Sum unless the variation is authorised by an instruction from the Supervising Officer.

Within 14 days of the date of issue by the Supervising Officer of an instruction varying the content of the Sub-contract works, agree with the Quantity Surveyor the order of value of the variation, submitting documentary support where necessary. Thereafter, proceed diligently, with the Quantity Surveyor to agree the final price for the variation.
Variations shall be valued in accordance with the appropriate Clause of the Contract.

If you require work to be valued on a Daywork basis, the Supervising Officer's permission must be obtained before work commences. Submit two copies of Daywork sheets to the Supervising Officer for examination and signature during the week following the week in which the work is done. Include on the Daywork Sheet the Instruction Number, details of other documentation, the location of the work and the full details of the labour, plant and materials employed.

Include in your Tender for all additional payments for overtime necessary to carry out the Sub-contract works in accordance with these Documents. Where further overtime becomes necessary to overcome problems seek the Supervising Officer's approval in each specific case to the inclusion of these overtime payments in the Final Sub-Contract Sum. Keep detailed records of the labour involved. Submit to the Supervising Officer for approval and signature during the week following that in which the work is done.

At the time of the settlement of account, and as one of the documents referred to in the Contract Conditions, the Main Contractor will obtain a statement from each of the Sub-Contractor's that the sum and/or credits to be included in respect of such Sub-Contractors are accepted in full and final settlement of their Sub-Contracts.

1.9.5 Valuations for Interim Certificates

At the time of every valuation of the works for Interim Certificates, submit via the Main Contractor, to the Quantity Surveyor a statement showing:

i) The gross amount (including cash discount and retention) claimed supported by a detailed approximate priced statement of work executed and materials supplied.

ii) The nett amount received from the Contractor to date excluding Contract charge.

1.9.6 Revision and Variations

Where schemes are subject to revision or instruction, 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 Supervising Officer.

Where scheme revisions are required in the main contract works or other sub-contract works due to the sub-contractor's variation or revision then all cost for such revision will be the sub-contractor's responsibility including the design team consultant's costs.

Where drawings are revised and updated during construction these shall be issued to the Supervising Officer for comments on the revision only.

Only if the Sub-contractor can give proof that a significant departure from the intent of the tender drawings has been necessary will a variation be recorded. This will not include normal detail design development relating to inclusion of nor development of factors within the Sub-contractor's design responsibility.

1.10 Insurance and Indemnification

The Sub-contractor shall include for all insurance other than those for which the Main Contractor is responsible. The Sub-contractor will, in addition, be held responsible for any damage caused to the Main Contract or other Sub-contract works by the execution of this Sub-contract, and the cost of making good any such damage shall be borne by the Sub-contractor.

1.11 Commencement and Completion

The Sub-contractor shall execute his works within the dates described for the Main Contract. The Sub- contractor shall include in his price for any expenses he may incur in completing his works within this programme.

The Sub-contractor's attention is drawn to the fact that his work in his Sub-contract may well entail several visits to the site. No claim in respect of the number of visits to the site or discontinuity of the work will be entertained and the Sub-contractor shall allow in his rates for all extra costs incurred due to this method of working.

The erection programme is to be agreed with the Main Contractor before any materials are delivered to site.

The Sub-contractor, in conjunction with the Main Contractor, will be required to submit a detailed programme of works to the Supervising Officer. The overall time given must comply with the dates already given by the Main Contractor.

1.12 Drying out

The Main Contractor may, by arrangement with the Sub-contractor wish to run the heating system for drying out the building. The Sub-contractor shall make due allowance in the sequence of his work to provide heat for drying out at the stated date in the Main Contractor's programme. This event will not relieve the Sub-Contractor of his obligation to hand over the installation in good order, nor shall the interim period from the time of commencement of use for drying out to the handover, be considered as constituting any part of the Maintenance Guarantee period hereinafter specified.

1.13 Regulations

1.13.1 General

Materials, products and completed systems in this contract shall comply with the following:

STANDARDS	
Construction (Design and Management) CDM regulations 2015	Current Building Regulations (or Scottish Building Regulations where applicable).
Asbestos at Work Regulations and Amendments	National Joint Utilities Group Publications
Control of Pollution Act	Current BS5266 Emergency Lighting
Health and Safety at work Act	Current IET Wiring Regulations (BS7671)
COSHH Regulations	Electricity at Work Regulations
Electricity at Work Act	Clean Air Act and Clean Air Regulations.
Insurance Company Requirements	LDSA Fire Safety Code.
Current BS5839 Fire Alarm Design	Part L and all second tier documents.
London Building Act and / or Building (Inner London) Regulations where applicable.	Current Disability Discrimination Act and associated guidance notes
Security Alarm Systems PD 6662 and BS 8243	
Current BS EN 12464 -1 Light and Lighting – Lighting of Work Places	
Health and Safety Executive ACoP and Guidance – Legionnaires Disease – Control of Legionella bacteria in water systems	
Installation to meet the requirements of the EHO, Fire Officer and Building Control Officer	

The sub-contractor shall notify the Supervising Officer of any revisions or addition to the foregoing as they are published during the installation of the works. The Supervising Officer will give appropriate instructions in each case.

The sub-contractor shall pay all charges made by an Authority approving any part of the sub-contract works.

1.13.2 CDM Regulations

The Construction (Design and Management) Regulations 2015 apply to this project and the sub-contractor shall be fully aware of the duties laid down in these Regulations.

The CDM Principal Designer will collate the pre-construction information and make available to the Principal Contractor for this project, in this case the Main Contractor.

The Principal Contractor will be responsible for the development and implementation of the Construction Phase plan during the construction phase.

The sub-contractor shall ensure he obtains a copy of the Construction Phase Plan and any amendments and ensure that their personnel comply with any construction phase rules as identified in the Plan and have been given suitable training.

The sub-contractor shall ensure that the CDM Principal Designer or Principal Contractor is provided with all the required information including Method Statements.

1.14 Suitability of Materials and Products

Materials and products shall be supplied to suit the pressures, temperatures voltage and other conditions of use normally expected to apply after the installation is completed and also to withstand the tests specified herein or in any documents referred to herein.

1.15 Ordering Materials and Products

The Sub-contractor shall order the necessary materials and products immediately upon the Supervising Officer instructing the Sub-contract works or any part thereof, to proceed. The Sub-contractor must not delay Practical Completion, or completion of any part of the works, by delays in ordering or delivery of materials and products.

To avoid any possible delays to Practical Completion the Sub-contractor may submit details of alternative manufacturers or types of materials and products for consideration by the Supervising Officer. The Supervising Officer will give appropriate instructions in each case.

1.16 Handling and Storage of Materials and Products

The Sub-contractor shall:

i) Deliver, off-load, store and transport about the works all materials and products in the manner recommended by their manufacturer.

ii) Provide adequate safe, covered storage and protection for all new materials and products.

iii) Store containment, lighting trunking and similar products on properly made racks and adequately support to prevent bending and distortion.

iv) Close ends of threaded conduit and protect threads by means of purpose made caps.

v) Store gaskets carefully to avoid damage. Rubber gaskets shall be stored in a cool place, free from draughts or placed in boxes containing powdered chalk and stored in a cool, dry place.

vi) Protect electrical cables from physical damage and seal ends.

Where materials and products cannot be stored in dry buildings, they shall be raised clear of the ground and supported. They shall be protected from damage by frost, water and building work with covers or other appropriate means.

Materials and products must not be stored by placing directly on earth or any other damp or corrosive surface.

Materials and products shall be adequately coated to prevent damage by oxidation, etc., and this coating shall be maintained until ready for final finishing.

1.17 Samples of Materials and Products

At the request of the Supervising Officer, the Sub-contractor shall submit, for examination and approval, samples of materials and products proposed for use in the Sub-contract works.

Samples shall include but not be limited to labelling, luminaires, radiators, valves, grilles, room sensors, socket outlets, switches and like items, particularly where the aesthetic appearance is of prime importance.

Samples shall also be required to demonstrate standard of finish and colour. Approximate or 'similar' colour samples will not be accepted.

Samples approved by the Supervising Officer shall either:

i) Remain in the possession of the Supervising Officer until the end of the Defects Liability Period or,

ii) Be embodied in the Sub-contract works.

Where samples are not available, the Sub-contractor shall submit such detailed drawings as the Supervising Officer may require.

1.18 Protection to Fixed and Unfixed Items of Plant

i) The Sub-contractor is to take all measures necessary to screen and protect all plant, equipment and accessories, whether in storage, in course of erection or erected, from the ingress of dust, moisture or foreign bodies, or from damage or marking by other trades to Practical Completion of the Sub-contract works.

Failure to arrange for such protection will make the Sub-contractor liable for all consequent reinstatement.

ii) All parts of the installation liable to corrosion are to be properly cleaned and painted with heat resistant and/or corrosion resistant paint at works and a further coat immediately after erection.

iii) Any plant, equipment and accessories found to be unduly marked by tools or damaged, corroded or distorted by any cause will be rejected by the Supervising Officer and must be replaced by the Sub-contractor at his own expense.

iv) Final painting or finishing coats will be carried out by the Main Contractor unless otherwise indicated in the Particulars Specification hereinafter.

v) When final finishes are provided to equipment at Manufacturer's works, all such finishes are to be of an approved material, process and colour and the Sub-contractor shall ensure adequate provision for the protection during transit, storage during and after erection to avoid damage to the finishes. The Sub-contractor shall inspect all paint and equipment immediately on delivery and shall not accept any that are damaged.

vi) The Supervising Officer must be notified and the damaged works be subject to inspection before remedial work commences.

vii) The Sub-contractor shall be responsible for the protection of his work during execution, but the Main Contractor shall be responsible for necessary casing and protection after the Sub-contractor's work has been executed.

1.19 Deleterious Materials

Refer to main contract preliminaries.

1.20 Housekeeping and Site Cleanliness

It shall be the Sub-contractor's responsibility to keep his working area clean and tidy at all times and remove all rubbish to a dump or other place on the site on an agreed regular basis.

Prior to any air system being started all of the following must be 'signed off' as being complete by the Supervising Officer.

i) Temporary protection of air inlet if site conditions require.

ii) Cleanliness of ductwork.

iii) Dust sealing of all structural and architectural components within the air stream (floor void and ceiling voids included).

1.21 Condition of Site on Completion

On completion of the contract, the Sub-contractor shall remove from the site all tools and plant used for the execution of the Works together with all rubbish, packing cases and redundant material or equipment, and he shall make good or reimburse for making good any damage to buildings, roads or other parts of the site, where in the opinion of the Main Contractor such damage has been caused by or is the responsibility of the Sub-contractor.

1.22 Tender Drawings and Documents

The Sub-contractor shall treat the details of this Specification and attached documents as confidential and return them to the Supervising Officer after he has prepared his Tender.

1.23 Disagreement

In the event of any disagreement between the parties of the Contract as to the requirements of the Specification, definition of terms or value of works done, the matter shall, in the first place, be decided by the Supervising Officer, and, if such decision be challenged by either of the parties shall be referred to arbitration under the provisions of the signed Contract.

1.24 The Project

The Building Services Consulting Engineer has been appointed by the Employer to act in the following capacity:

i) To act as the employer's technical adviser on matters relating to the engineering services in the building.

ii) To identify the Client's requirements in regard to the provision of engineering services in the building.

iii) To prepare the Specification and design intent for a Services Contractor to fully tender the works. The drawn information and accompanying specification have been produced to RIBA Stage 3, meaning, performance specification/design intent. The Contractor is responsible for taking the scheme from Stage 3 through to Stage 7.

iv) To represent the employer's interest in the design process and to monitor design decisions.

v) To inspect and regulate the quality of the materials and workmanship during installation.

vi) To witness performance testing on completion and recommend acceptance of the installation.

vii) To identify and seek rectification of defects in materials, workmanship and performance of the Engineering installation.

To fulfil this role, the Consulting Engineer requires the active co-operation of the Contractor. At the commencement of the Design Phase and the Installation Phase it will be necessary to establish how this co-operative working may be put into effect for the benefit of the project.

1.25 Scope of Works

The scope of this project is to design, supply, install, test and commission a new lighting and emergency lighting system within the Tamworth Building at the College of Policing, Ryton. The scheme is to include, but not limited to new electrical lighting circuits, luminaires, emergency luminaires and lighting controls.

The project has been designed to RIBA stage 3, performance specification/design intent. Therefore, the Contractor shall allow for full taking this scheme from stage 3 through to stage 7 to include design development, full working drawings for construction, as hereafter described, for the whole of the project:

- Mounting/fixing of equipment and electrical plant
- Builders Work Requirements
- Design responsibilities to Stage 4 and completion to stage 7
- Removal of the existing lighting and emergency lighting system within 4no. Classrooms/Training Rooms
- New lighting and emergency lighting to 4no. Classrooms/Training Rooms
- Final Circuits to new lighting/emergency lighting
- Containment
- Full & Final Electrical Services Co-ordination and co-ordination with all other trades

1.26 Review for Quality Control

The design of services, the quality of equipment, material and finishes selected shall reflect the quality engineering installations required by the Employer.

Due consideration shall be given particularly to the provision of servicing, future maintenance and replacement of components or complete plant items.

The contractor shall, during the Design Development Programme, demonstrate the quality of his design and specification by submitting for comment or review, the following; preliminary or draft specification, calculation data, manufacturer's drawings, quotations and technical literature, or such other information, including samples that may reasonably be necessary.

Such information shall be submitted at the Design Contractor's expense and in good time, so that any possible change arising from the quality review does not jeopardise the Design Development Programme.

1.27 Structural Co-ordination

The contractor shall study fully the limitation of the existing structure, surveyed levels structural beam configurations and new construction levels.

Gleeds M&E Tender drawings detail indicative/preliminary electrical plant bases/mountings/fixings etc. The Contractor (in conjunction with the M&E Sub-Contractors) shall finalise and confirm all details for the required mounting and fixing of the electrical equipment/plant and shall reflect this upon their 'Construction Issue' electrical drawings. Furthermore, all final electrical plant bases, mounting, fixings etc shall be confirmed to the Structural Engineer and be submitted to him, giving information of dimensions, loading, structural metal support systems and their locations etc within four (4) weeks of appointment.

1.28 Design Standards

The design of the Electrical Services installations shall comply with Codes of Practice and Industry Standards accepted nationally such as:

i) Local Authority Building Regulations.
ii) Relevant and current International and British Standard Specifications and Codes of Practice.
iii) C.I.B.S.E. Guides.
iv) BSRIA Application Guides
v) Offices, Shops and Railways Premises Act.
vi) Other Acts, Bylaws, Regulations or Statutes that may be cited by Controlling or Regulating Bodies and Authorities as part of their Approvals and consents.

As soon as is practical, meetings shall be arranged by the Sub-Contractor with all Regulating Bodies whose consent is necessary before the works can proceed.

IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO OBTAIN ALL NECESSARY APPROVALS REQUIRED FROM THE VARIOUS AUTHORITIES AND REGULATING BODIES.

1.29 Documentation to be Provided by Services Contractor

1.29.1 Formats Required for Any Information Issued

The Services Contractor shall include for all information issued to the client and design team to be provided in the following electronic formats: -

Required Formats	
Description of Document	Format Required for Issue. (All format versions shall be the latest version generally available at time of issue)
Drawings, to be issued in both of these formats concurrently:	AutoCAD drawings in .dwg format for all drawings. PDF, without any restrictions on printing, copying, searching etc (applies to all PDF's described below.)
Document issue sheets, RFIs etc.	PDF
Output from calculation, modelling or part L software. To be issued in both of these formats concurrently:	ZIP compressed file of calculation input files with all information necessary to allow others to run the same calculations. PDF of any output / summary reports with sufficient information to allow results to be viewed and commented on by all parties.
Manufacturer's instructions, certificates, warranties etc.	PDF, original from manufacturer where available, else colour scanned in version by Services Contractor.
Commissioning Results	PDF generally until final versions agreed then issue in PDF and editable version such as Excel spread sheet.

Required Formats	
Description of Document	Format Required for Issue. (All format versions shall be the latest version generally available at time of issue)
Certificates etc.	Original signed copy, along with PDF of the same.
H&S O&M manual	Bound printed copies and electronic copy of the same.
Any information / document not already detailed above.	PDF, original from manufacturer / supplier where available, else colour scanned in version by Services Contractor.

The above is in addition to the issue of official / hard copies as required by the contract documents.

PDF documents shall be scanned generally at 300DPI, except drawings where greater resolution is required in order to view the detail.

1.29.2 Installation (Or Working) Drawings

The Tender drawings issued are provided to show indicative primary routes, design intent, component order etc. They are to be considered a final technical design; however, they do not reflect working or fabrication or construction drawings. The Services Contractor shall develop the tender drawings in order to provide a complete set of working and fabrication drawings for the installation works. The drawings and installed systems shall:

1) Include all fittings etc., in order to comply with this specification.
2) Be based upon measured site dimensions and under no circumstances shall scaled dimensions from drawings be accepted.
3) Include minimum spacing as specified.
4) Be fully co-ordinated as detailed elsewhere in this specification.
5) Be provided to the following scales:
    a) Plant rooms, external compounds and the like, risers, electrical switch rooms and cupboards and meter rooms 1:20
    b) Internal wall elevations for positioning of outlets, components etc. 1:20
    c) Site distribution, incoming services etc. 1:100 as long as sufficient detail can be shown, else include larger scale details or complete drawing shall be 1:50.
    d) Details of brackets, supports and any special fixings 1:10
    e) Manufacturers detail drawings of items of equipment 1:20
    f) Any drawing not listed above 1:50.

6) Be provided in electronic format and:
    a) The Services Contractor shall agree the number of paper copies to be issued for comment with the engineer, for tender purposes assume 6.
    b) The Services Contractor shall agree the number of paper copies to be issued for construction with the engineer, for tender purposes assume 10.
    c) Manufacture / installation works shall not commence until the drawing has been returned without any outstanding comments from the engineer, all comments shall be addressed prior to final copy being issued for manufacture / installation.

1.29.3 Record Drawings

The Services Contractor shall provide record drawings that are:

1) Based upon the installation drawings.
2) An accurate record of the actual installation including any deviations from the working drawings that have occurred on site.
3) Fully co-ordinated as detailed elsewhere in this specification.
4) Indicate the layout identity, size and position of all services installed.
5) Provided in electronic format and:
   a) Services Contractor shall agree the number of paper copies to be issued for comment with the engineer, for tender purposes assume 3.
   b) Services Contractor shall provide one full set of paper copies for each maintenance manual.

Final sets for each manual shall include:

- Reduced A3 colour copy inserted unfolded in A3 clear plastic wallets, all drawings to be visible without removing from wallets.
- Full size copy folded and inserted into clear plastic wallets.
- USB memory stick containing electronic copy in formats described elsewhere in this specification.

1.29.4 Specialist Suppliers Drawings

The Services Contractor shall provide installation/fabrication drawings from all Specialist suppliers or manufacturers in accordance with the following:

- 2 prints shall be provided for comment.
- 6 copies of the final drawings are required for construction.
- 4 copies of the record drawings are required for the O & M manuals.

1.29.5 Labels and Charts

Each item of plant and equipment shall bear a metal nameplate giving the maker's name, serial number and relevant performance data. In addition, all items of plant and equipment shall be fitted with a bolted or screwed on engraved plate, having identification marks and number corresponding to the Schedule of Plant and Equipment in the Operation and Maintenance Instructions and stating the description of the plant and its relative number if more than one.

2 & 3

Scope of Electrical Services

2.0 General Description

2.1 Scope of Works

The works shall comprise the design, supply, installation and commissioning of new electrical services - new lighting and emergency lighting to 4no. Classrooms/Training Rooms within the Tamworth Building at the College of Policing, Leamington Road, Ryton-on-Dunsmore, Coventry, CV8 3EN.

Scope of work includes but is not exclusive to the following:

- Design development from the Stage 3 design intent drawings and performance specification to Stage 4 design & completion to stage 7.
- Removal of the existing lighting and emergency lighting system within 4no. Classrooms/Training Rooms.
- Builders Work Requirements as identified within this specification.
- All necessary supports and fixings.
- The design, supply and installation of containment systems as necessary for the proposed installation.
- Assessment of the existing electrical infrastructure.
- The design, supply & installation of lighting, emergency lighting and control equipment systems as indicated on the tender drawings inclusive of new final circuits and/or electrical supplies.
- Loading and unloading, and storage of materials.
- Setting to work, testing, commissioning and certification.
- Design development, prepare working drawings, builders work requirement drawings and as fitted drawings.
- Operating and maintenance manuals including system description and fault finding.
- User instruction.
- Full service of equipment in accordance with manufacturers recommendations at the end of the 12-month defect period. This to include documentation of any result changes from commissioning.

Programme/Out of Hours Working

The contractor shall make due note of the contract programme. The contractor shall make due allowance for all out of hours work required to undertake the work within programme, and to ensure all shutdowns/service isolations etc do not have a negative impact on the operation of the existing installations.

2.2 Design Criteria & Standards

2.2.1 General

The enclosed tender documents are based on the following System Design Criteria.

The Electrical Sub-Contractor shall review the attached System Design Criteria and ensure that all materials and components provided (where not specified in the enclosed Tender Documents), are compliant.

The Electrical Sub-Contractor shall especially note the illumination levels to be achieved in each area along with the control methodology as indicated on the design intent drawings.

2.2.2 Standards Applicable

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

Comply with all statutory instruments and regulations, relating to the area of the site current at the date of tender.

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

- Relevant British & European Standards
- Relevant CIBSE design guides / commissioning codes / technical memoranda etc.
- Current Building Regulations
- BESA (HVCA) Guides & Good Practice Notes
- Statutory Obligations
- Health and Safety at Work etc. Act 1974
- Management of Health & Safety at Work Regulations 1999
- The Working Time Regulations 1998
- Public Health Acts
- Electricity Acts
- Electricity at Work Regulations 1989
- The Workplace (Health, Safety and Welfare) Regulations 1992
- The Construction (Design and Management) Regulations 2015
- The Control of Substances Hazardous to Health (COSHH) Regulations 2002
- The Control of Substances Hazardous to Health (Amendment) Regulations 2003
- Control of Asbestos Regulations 2012
- Personal Protective Equipment at Work Regulations 1992
- The Construction (General Provisions) Regulations 1961
- The Lifting Operations and Lifting Equipment Regulations 1998
- Other relevant Safety Regulations
- Relevant Health Technical Memorandum & Health Building Notes
- Public Utility Company and/or Statutory Authority regulations, specifications, and requirements.
- Client Requirements
- British Standards and Codes of Practice.
- BS 7671 - Requirements for Electrical Installations (IET Wiring Regulations).
- BS5266 – Emergency Lighting
- BS5839 – Fire Alarm
- PD 6662 and BS 8243 – Security Alarm
- Insurance Company Requirements.
- LDSA Fire Safety Guides.
- IEC Standards.
- NACOSS Standards
- NSI Standards
- The Factories Clean Air Act
- Design to fully meet the requirements of the local Environment Health Officer, Fire Officer and Building Control Officer

The above standards are continually being updated, with new standards also becoming applicable. The Services Sub-Contractor shall ensure that the Specialists / personnel completing the manufacturing / installation works are familiar with the latest standards applicable at Tender and completes all works in accordance with these standards.

Where discrepancy is found between this specification and the relevant standards the Services Sub-Contractor shall obtain written clarification from the engineer prior to submission of tender. Where a discrepancy has not been clarified prior to tender submission the Services Sub-Contractor shall include the most onerous requirements.

The contractor shall carry out all works in a professional and workmanlike manner. The contractor shall include for all works necessary to provide a complete and working installation.

2.2.3 General Requirements

The Services Sub-Contractor shall be responsible for the design, supply, installation and commissioning of all necessary electrical services to suit the building layouts and Client requirements. This section of the Specification details the design standards that the Services Sub-Contractor shall be required to adhere to in the development of the design and installations of the Building Services for the project.

2.2.4 Design Development

The project has been designed to Stage 3, design intent. Therefore, the whole project is Contractor Design and the responsibility for developing the design lies with the Contractor. The Services Contractor shall be responsible for the design, production of working drawings, production of record drawings, builders work drawings and 'As Fitted' drawings as detailed elsewhere in this Specification.

The Services Contractor shall be responsible for all design work associated with producing builders work drawings and all builders work information associated with the electrical installations.

The Services Sub-Contractor shall allow for attending any meetings necessary to provide full design and co-ordination of the mechanical installation with all other trades.

The Services Sub-Contractor shall assess all plant room sizes, riser sizes, void depths and service routes ensuring that the Architect and Main Contractor is fully aware of their requirements and can accommodate them.

2.2.5 Design for Accessibility, Maintenance and Replacement

The complete services installation shall be installed to facilitate future maintenance operations as well as future replacement of the service / plant. The details below give minimum standards to be adopted in the design for various items; the list is not exhaustive and does not detract from the designer's obligation to meet current guidance such as the CDM regulations, H&S requirements and Building Regulations etc.

Services plant and equipment shall be installed in dedicated plant areas such as switch rooms, plant rooms, external compounds and the like, in these areas the following shall be provided:

a) Where services require frequent inspection / maintenance (i.e. every 0-12 Months).
   - Access shall be easy and accomplished via purpose made panels without the need for special tools etc. (except where locking devices are used for safety purposes).
   - Access shall be from a level surface without the need for steps or the like.
   - Space shall be provided such that any consumable item can be easily removed and replaced without the use of any Specialist lifting equipment.
   - Access shall not be via ladders, staircases or preferably lifts shall be provided to all plant areas.

b) Where services require less frequent inspection / maintenance (i.e. every 1-5 years).
   - Access shall be unobstructed by adjacent services / plant.
   - Access shall be achieved without the need for Specialist plant or machinery.
   - Servicing / replacement shall be achievable without dismantling or effecting adjacent systems.

c) Where services require infrequent inspection / maintenance and for replacement of complete items of plant:
   - A practical and safe method of replacement shall be provided (such as removable louvres and a landing platform) along with suitable location for crane or the like.
   - Replacement shall be achieved in a cost effective manner, i.e. without excessive dismantling of the building facade, adjacent plant and services or disruption to the normal operation of the building.
   - The works shall be able to be completed in a relatively short period of time (Less than 48 hours).

Distribution of Services shall generally be via service risers, bulkheads and ceiling voids, in these areas the following shall be provided:

a) Where services require frequent inspection / maintenance (i.e. every 0-12 Months).
- Access shall be easy and accomplished via purpose made panels without the need for special tools etc. (except where locking devices are used for safety purposes).
- Access shall be from a level surface avoiding the need for steps or the like wherever feasible (i.e. avoid routing services above staircases where access would be difficult).
- Space shall be provided such that any consumable item can be easily removed and replaced without the use of any Specialist lifting equipment.
- Access for cleaning / inspection shall not be obstructed by adjacent services (i.e. do not route cable trays such that they obstruct duct access doors).

b) Where services require less frequent inspection / maintenance (i.e. every 1-5 years).
- Access shall be unobstructed by adjacent services / plant.
- Servicing / replacement shall be achievable without dismantling or effecting adjacent systems.

c) Where services require infrequent inspection / maintenance and for replacement of complete items of plant or systems.
- A practical and safe method of replacement shall be provided (such as removable bulkheads) along with suitable location for scaffolding or the like.
- Replacement shall be achieved in a cost effective manner, i.e. without excessive dismantling of the building fabric or damage to finishes, removal of adjacent plant and services or disruption to the normal operation of the building.
- The works shall be able to be completed in a relatively short period of time (Less than 48 hours). This shall be in a phased manner if necessary.
- Access shall be achieved from less sensitive spaces where feasible (i.e. from service corridors rather than the main entrance lobby).

Where services are installed in the occupied zone:

a) Where services require frequent inspection / maintenance (i.e. every 0-12 Months).
- Access shall be easy without the need for special tools etc. (except where locking devices are used for safety purposes).
- Access shall be from a level surface avoiding the need for steps or the like wherever feasible (i.e. avoid locating lights on the landing of staircases where access would be difficult).
- Replacement shall be achieved without the need to damage the building fabric or finishes.

b) Where services require less frequent inspection / maintenance (i.e. every 1-5 years).
- Access shall be unobstructed by adjacent services / plant.
- Servicing / replacement shall be achievable without dismantling or effecting adjacent systems or building finishes.

c) Where services require infrequent inspection / maintenance and for replacement of complete items of plant or systems.
- A practical and safe method of replacement shall be provided (such as removable bulkheads) along with suitable location for scaffolding or the like.
- Replacement shall be achieved in a cost effective manner, i.e. without excessive dismantling of the building fabric or damage to finishes, removal of adjacent plant and services or disruption to the normal operation of the building.
- The works shall be able to be completed in a relatively short period of time (Less than 4 hours).

This shall be in a phased manner if necessary.

- Access shall be achieved from less sensitive spaces where feasible (i.e. from service corridors rather than the main entrance lobby).

Details of access for maintenance / replacement shall be provided in a design statement during the design process for comment and the agreed philosophies included in the O&M manuals upon completion of the works.

The Contractor should ensure that all equipment procured weighing over 20kg is supplied complete with proprietary lifting eyes.

2.2.6 Fire Precautions

The contractor shall make due allowance for the inclusion of all necessary fire stopping and the like where services pass through fire compartments and floors.

2.2.7 Building Regulations Part M and Equality Act 2010 Compliance

Building Regulations Part M has several recommendations for the construction of new or alterations and extensions to non-domestic buildings. The Client should confirm early on in the design process any site/project specific requirements which shall need to be incorporated within the design of the building services to ensure these are included for.

The location and detailing of all wall mounted switches and controls shall take into account ease of operation, height, and distance from corners, contrast, visibility and unobstructed access.

The operation of switches, sockets and controls should not require the simultaneous use of both hands. Large switch pads are recommended.

Large push pads - Large Push Pads are easier to operate and locate and should be available in public areas. The Disabled Living Foundation states a wide large push pad is one that can be operated by use of a fist or even an elbow. MK provides wide rocker switches in its Logic Plus and a number of its decorative ranges that can be operated in this way.

Totally flush or recessed controls shall be avoided, as these are not accessible to people with limited dexterity.

Colour and tonal contrast shall be used to ensure controls are distinguishable from their background. A coloured back drop on outlets mounted on walls, skirting trunking or dado trunking could provide a solution.

Contrast - “Controls that contrast visually with their surroundings are more convenient for visually impaired people”. Part M states that switches outlets and controls will satisfy the regulation if there is a contrast of 30% Light Reflective Value (LRV) between a front plate and wall. White has an LRV of 100, and black 0. MK has developed switches and sockets with graphite front plates for contrast to walls with an LRV of 70 or more i.e. white / cream. MK’s Prestige Plus Compact and Power Link Plus are available in Charcoal to provide contrast with white accessories.

Consideration shall also be given to the use of tactile buttons and controls. These should be embossed and not engraved.

2.3 Contractor Design Works

2.3.1 General

The whole of this project is subject to Contractor Design. The drawings and specification have been produced to RIBA Stage 3 to depict design intent only. The Contractor shall allow for taking the scheme from stage 3 from the design intent drawings through to stage 7 to include working drawings.

2.3.2 Mounting & Fixing of M&E Equipment/Plant

Gleeds Tender drawings detail indicative/preliminary electrical requirements. The Services Contractor shall develop the design, finalise and confirm all details for the required mounting and fixing of equipment/plant and shall reflect this upon their 'Construction Issue' drawings. Furthermore, all final plant bases, mounting, fixings etc shall be confirmed to the Structural Engineer and be submitted to him, giving information of dimensions, loading, structural metal support systems and their locations etc within four (4) weeks of appointment.

2.3.3 Builders Works Requirements

The Services Contractor shall allow to undertake all necessary builders work as required to facilitate the electrical services installation works described within the specification and associated drawings. Builder's work shall include but not be limited to:

- M&E Services Holes
- Backfilling/making good to existing paved/landscaped areas (following removal of existing/redundant external services).
- Provision of new trench(es) to allow for the installation of new electrical service & control system services.
- Plant Bases.
- Fire stopping.
- Making good of building fabric.
- Cleaning, painting etc.

The Services Contractor shall be responsible for the preparation of builder's work drawings and details (1:50 scale), including all channels, cases, pockets, trenches, holes and the like which require to be formed in the building structure. Such drawings and details shall be prepared in consultation with the Clients Representative.

2.3.4 Fire Stopping

The services contractor/specialist shall make a note of the individual fire compartmentation of the building and where electrical services pass within these areas, they shall be fire stopped in accordance with the Building Regulation and Fire Officer's recommendations by the services contractor/specialist. The services contractor/specialist shall provide a schedule of all fire stopping works, and a marked-up drawing shall be provided with the O&M showing the works. A sticker must be affixed to the area of fire stopping within the building, which matches with the schedule and the drawing.

2.3.5 M&E Services Co-ordination

Please refer to Section 1.6 (Responsibilities – Services Co-ordination).

3.0 Electrical Installations

3.1 Description of Work

The Services Contractor shall allow to undertake all electrical installations as required to put the new installation into operation including but not limited to:

Scope of work includes but is not exclusive to the following:

- Design development from the Stage 3 design intent drawings and performance specification to Stage 4 design & completion to stage 7.
- Removal of the existing lighting and emergency lighting system within 4no. Classrooms/Training Rooms.
- Builders Work Requirements as identified within this specification.
- All necessary supports and fixings.
- The design, supply and installation of containment systems as necessary for the proposed installation.
- Assessment of the existing electrical infrastructure.
- The design, supply & installation of lighting, emergency lighting and control equipment systems as indicated on the tender drawings inclusive of new final circuits and/or electrical supplies.
- Loading and unloading, and storage of materials.
- Setting to work, testing, commissioning and certification.
- Design development, prepare working drawings, builders work requirement drawings and as fitted drawings.
- Operating and maintenance manuals including system description and fault finding.
- User instruction.
- Full service of equipment in accordance with manufacturers recommendations at the end of the 12-month defect period. This to include documentation of any result changes from commissioning.

Programme/Out of Hours Working

The contractor shall make due note of the contract programme. The contractor shall make due allowance for all out of hours work required to undertake the work within programme, and to ensure all shutdowns/service isolations etc do not have a negative impact on the operation of the existing installations.

The Services Contractor shall be registered and approved members of Constructionline, The National Inspection Council for Electrical Installation Contracting (NICEIC) and The Electrical Contractors Association (ECA). In addition, the Services Contractors are required to have NPPV1 and SC clearances to work on site unaccompanied. All Services Contractors shall provide evidence of these clearances and qualifications within their tender submittal.

3.2 Strip Out

The Services Contractor shall allow to isolate disconnect, remove and dispose of the existing lighting, emergency lighting and lighting controls within/serving the 4no. Classrooms/Training Rooms as indicated on the drawings, in their entirety within the Tamworth Building. Disposal of redundant items and equipment shall be in strict accordance with current waste regulations noting disposal of the fluorescent type lamps must be in accordance with The Waste Electrical and Electronic Equipment Directive (WEEE Directive).

The existing lighting, emergency lighting and lighting controls within/serving the 4no. Classrooms/Training Rooms shall be safely isolated, disconnected and removed in their entirety. During removal of the existing final circuits/cables, it is understood routing of these existing cables may be within in-accessible voids and areas/locations. All effort should be made to remove all the existing cables however, if this is not practical or additional demolition/breaking out required, the Services Contractor shall be permitted to cut cables leaving redundant in situ ensuring these are left in safe condition.

Any electrical services located/found to be redundant of any electrical disciplinary during the strip out works and installation of the new lighting, emergency lighting and lighting controls shall be safely isolated, disconnected and removed from site/disposed of.

3.3 Asbestos Containing Materials

Asbestos containing materials (ACM's) cannot be ruled out in this project. Therefore, prior to commencing work, the Services Contractor shall have sight of and review the asbestos register/survey for the project and shall satisfy himself of the whereabouts of any potential ACM's.

The Services Contractor shall remain vigilant at all times. If any asbestos is suspected, then work is to cease in that area immediately and only resumed once authority to do so has been given.

3.4 Design

The design output from Gleeds is that of a RIBA Stage 3 design intent. The Services Contractor shall be responsible for the design development of the Stage 3 drawings, production of working drawings, builders work drawings, record drawings, and 'As Fitted' drawings as detailed elsewhere in this Specification.

The Services Contractor shall be responsible for any design work associated with producing builders work drawings and all builders work information associated with the electrical installations.

The Services Sub-Contractor shall allow for attending any meetings necessary to provide full design and co-ordination of all other trades.

The Services Sub-Contractor shall assess all proposed plant areas & room sizes, riser sizes, void depths and service routes ensuring that the Design Team and Main Contractor is fully aware of their requirements and can accommodate them.

3.5 Incoming Electricity Power Supplies & Existing Sub Distribution System

The existing electrical infrastructure and sub-distribution system shall be retained in situ. New electrical services/supplies/final circuit wiring required for the new lighting, emergency lighting and control systems shall be derived from the retained distribution boards (DB/B and/or DB/C) located within the Tamworth building ground floor plant room and comply with the latest electrical regulations BS:7671 18th Edition including amendment no.2.

The existing distribution equipment shall be retained in situ however, the contractor shall allow to assess the existing distribution equipment as to its suitability for re-use and the installation of additional electrical services as described within this specification.

Should the existing distribution equipment be un-suitable, a provisional sum of £5,000.00 has been allowed to replace existing distribution boards and ancillary equipment as required.

In the event any existing distribution equipment is replaced, any existing retained final circuits shall be re-terminated within the new distribution board/boards in the identical configuration as is existing and fully tested and certified upon completion.

3.6 Lighting, Emergency Lighting & Controls

The Services Contractor shall design, supply, install, test and commission a new lighting and emergency lighting system, to the areas of the Tamworth building as shown/indicated on the tender drawings. Illumination level calculations are to be provided for each area by the Services Contractor in accordance with the requirements of the Society of Light and Lighting (SLL) and Cibse Guides in particular LG7 Lighting Guide for Offices.

New final circuits shall be installed by the Services Contractor for the new lighting, emergency lighting and control systems. Electrical supplies shall be derived from local distribution boards as indicatively proposed on the drawings. Should the Services Contractor identify more practicable final circuit supplies and/or routes, these shall be verified and proposed during their Stage 4 design process.

The new lighting and emergency lighting shall be manufactured by Dextra (or equal and approved):

Dextra Lighting
Contact: Steve Derry
Tel: 07718 966 584

All luminaires shall have a LED light source and be provided with a 5-year manufacturer's warranty.

The Services Contractor shall supply, install test and commission the full lighting scheme in accordance with this specification and tender drawings.

It shall be the Services Contractor's responsibility to test and commission the lighting installation and leave operational.

All new luminaires shall be installed in accordance with the manufacturer's recommendations.

All lighting solutions shall comply with CIBSE Lighting Guides in particular LG7 and/or the SLL Code For Lighting.

Lamps for Luminaires:

All luminaires shall be LED
All lamps shall be 4000k colour temperature
All luminaires to have an LED lifetime of L90 @ 60,000hours.

Emergency Lighting:

The Services Contractor shall design, supply, install, test and commissioning a 3-hour duration emergency non-maintained lighting system comprising of integral batteries and inverters within the luminaires. The system shall be designed to meet the requirements of BS5266. Testing of this type of system shall be carried out via local key switch type switches installed by the contractor.

Lighting Controls:

Lighting Control Modules "LCM" and PIR's are identified indicatively on the drawings. The Services Contractor shall ensure the LCM's are compatible and offer a minimum amount of outgoing ways to accommodate the lighting as required. Dextra lighting offer a range of LCM's and PIR's within their REACTA range of devices.

The Services Contractor shall ensure all leads between the LCM's and luminaires/PIRs are suitable for simple connection such as 6 pole locking connection leads.

Lighting controls shall generally comprise of a manual retractive switching operation offering an on/off operation of the luminaires. In addition, PIR type devices are also installed offering an automatic off operation should the PIR run on time be exceeded. The PIR devices shall be installed in locations within the rooms ensuring continuous operation of the lighting during occupancy and commissioned with a minimum run on time of 30 minutes.

The contractor shall allow for all the required commissioning of the lighting control system in accordance with the clients requirements.

3.7 Containment Systems

The Services Contractor shall design, supply & install a new containment system and ensure that sufficient containment is allowed for the new electrical services. Retaining and re-using the existing containment systems

is permitted however the Services Contractor shall allow to assess the existing containment and ensure it is suitable for re-use.

Where existing containment systems are found to be suitable and are retained, new lighting/emergency lighting and control systems cabling are permitted to be installed within, however new final circuits shall not be installed on any ELV type containment systems, minimum separation between ELV/LV cables shall be maintained in all areas as indicated within section 3.20.

New cable containment shall be routed through ceiling voids and fixed to walls within plant rooms and risers at ground floor level, rising to the first floor using sections of vertical riser containment and distributed again through the appropriate floor level and ceiling space.

All accessories including brackets shall be from the same manufacturer as the containment system. Site fabricated accessories shall not be accepted.

All cabling and wiring shall be supported throughout their entire length. The containment systems shall conform to the requirements of this specification and the latest edition of BS7671 (The IET Wiring Regulations). This shall include the provision of metallic fixing methods to wiring systems and support methods that will not collapse in the event of a fire.

3.7.1 Low Voltage Containment

Primary containment for final circuit wiring shall be a galvanised steel trunking system installed surface fixed to walls and within ceiling voids and accessible areas such as risers, ceiling voids and plant rooms with secondary runs and tertiary run outs in metal/plastic conduit.

Where new recessed wall switches and/or wall lighting are proposed to be installed, the existing recessed/surface fixed containment shall be assessed and re-used by the Services Contractor. Should these existing vertical routes be unsuitable to be retained, the Services Contractor shall identify all the routes required and seek approval from the client to install surface fixed galvanised conduit/PVC trunking and/or new recessed chases housing new containment within the building fabric as required.

The positioning and arrangement of the vertical connectors shall be carefully detailed and coordinated with the building features.

Surface fixed containment shall be used within plant rooms and vertical risers; conduit shall be galvanised steel fixed using spacer bar saddles.

Proprietary earth continuity straps shall be fitted to all trunking, cable tray and cable baskets to provide electrically continuous wire way systems.

3.8 System of Wiring

System of Wiring		
Circuit Type	**Location**	**System of wiring to be employed**
Lighting	Throughout	6491B LSZH singles contained within existing/new trunking/conduit

The Services Contractor will be required to co-ordinate the routes of containment/trunking with all other services and the local area.

Fire Stopping

The Services Contractor shall make a note of the individual fire compartmentation of the building and where electrical services pass within these areas, they shall be fire stopped in accordance with the Building Regulation and Fire Officer's recommendations by the Services Contractor. The Services Contractor shall provide a schedule of all fire stopping works, and a marked-up drawing shall be provided with the O&M showing the works.

A sticker must be affixed to the area of fire stopping within the building, which matches with the schedule and the drawing.

3.9 Cable Colours

All cable colours shall be in accordance with the requirements of the latest BS 7671.

3.10 Mounting Heights

The following indicates the mounting height of electrical accessories:

Light switches	-	1200mm AFFL to the top
Wall mounted staircase and corridor lights	-	2100mm AFFL to the centre

3.11 Accessories

Good quality accessories shall be specified for all parts of the installation.

Wiring accessories shall generally have white finish as MK Logic plus or equivalent, however, contrasting faceplates/switches shall be used to meet the requirements of Part M in particular within Dado Trunking if applicable.

Plant areas shall have metal clad type accessories as MK Metalclad Plus or equivalent as per the existing installation.

All accessories (except in plant areas) shall be fixed flush, recessed into the fabric of the building.

All Areas -	MK Electric flush white moulded plastic Logic + range (double earth and outboard rockers where appropriate). Grey/Anthracite finish within Dado Trunking.
Plantrooms -	MK Electric surface fixed metal clad plus range c/w surface fixed metallic conduit and trunking installation.

3.12 Protection Against Electric Shock

The IET Wiring Regulations allow alternative methods of protection against electric shock. For the purpose of this Specification, protection against direct contact with live parts shall generally be using the following measures:

1. Provision of RCD/RCBO devices.
2. Protection by insulation of live parts.
3. Protection by enclosures.
4. The basic protection measure for protection against indirect contact shall be by earth equipotential bonding and automatic disconnection of the supply. All necessary earth bonding as is detailed in the Wiring Regulations (Section 411) shall be carried out.

Protection devices providing automatic disconnection shall generally be miniature circuit breakers and residual current devices. The characteristics of these devices, the earthing arrangement and the circuit impedances shall be co-ordinated to provide protection against indirect contact with live parts.

3.13 Electric Shock Notices

All statutory signage on Electric Shock, First Aid Procedures and Shock warning notices shall be provided and installed by the Services Contractor.

3.14 Protection Against Thermal Effects

Attention is drawn to Chapter 42 of the IET Wiring Regulations, which outlines measures to be taken in respect of protection against thermal effects.

3.15 Protection Against Overcurrent

Except for electric motors and associated circuits, circuit protection against overload and short current shall be provided by a single device.

The overload and short circuit characteristics of each device together with circuit impedance satisfy the IET Wiring Regulations in respect of overload and short circuit protection, discrimination and circuit disconnection times in the event of earth fault conditions. Ensure that no alterations, however caused, will negate this co-ordination procedure.

3.16 Electric Shock Notices

All statutory signage on Electric Shock, First Aid Procedures and Shock warning notices shall be provided and installed by the Services Contractor.

3.17 Protection Against Thermal Effects

Attention is drawn to Chapter 42 of the IET Wiring Regulations, which outlines measures to be taken in respect of protection against thermal effects.

3.18 Protection Against Overcurrent

Except for electric motors and associated circuits, circuit protection against overload and short current shall be provided by a single device.

The overload and short circuit characteristics of each device together with circuit impedance satisfy the IET Wiring Regulations in respect of overload and short circuit protection, discrimination and circuit disconnection times in the event of earth fault conditions. Ensure that no alterations, however caused, will negate this co-ordination procedure.

3.19 Earthing

The Services Contractor shall supply and install a complete earthing and bonding installation to comply with the requirement of BS 7671 (and in particular Section 543.7 of Chapter 54) and BS7430 Code of Practice for Earthing.

At switch panels and other metallic electrical enclosures, reliance shall not be placed on the enclosure to form part of the protective conductor. Earthing tags or clamps and continuity conductors in conjunction with a suitable earthing bar shall be employed. All metallic exposed pipework shall be equipotentially bonded.

For the purpose of this Specification, conduit and/or trunking systems shall not be relied upon to form the protective conductor. Earth continuity or protective conductors shall be installed for each final circuit, which shall comply with Regulation 543.

The resistance between any point of the conduit/trunking installation and the local distribution board shall not exceed 0.1 Ohm. Conduits and distribution gear shall be earthed by means of earth continuity sockets.

3.20 Segregation of Services

Services shall be segregated as follows: -

1. Circuits operating at low voltage and connected to the mains supply (Band II).
2. Circuits for radio, impulse clocks, alarm and call systems (Band I).
3. Fire alarm circuits (Band I). (Must be run separately to all other circuits)
4. Emergency lighting where central battery systems are employed (Band II). (Must not be in the same wiring system as Fire alarm circuits.
5. Telephone circuits (Band I).
6. Computer data wiring where defined in other sections of this document (Band I).

Band I and Band II cables shall be installed with a minimum separation distance as follows:

- Different Bands of Cables shall be installed in separate compartments of trunking/enclosed containment and/or on separate containment systems.
- A minimum separation distance of 50mm shall be maintained between Bands (even if cables are installed in separate containment systems).
- Where open containment systems are installed (basket/tray/ladder) a minimum distance of 150mm is required between cables.
- Metallic screening may be installed between Bands of cables installed on open containment however, 50mm of separation should still be maintained.
- All metallic containment shall be suitably earthed along the entirety of the containment system.
- Under no circumstances should Fire Alarm cables be installed with any other circuit/cable. Fire Alarm cables shall be installed in their own compartment within containment or separately on open containment. Screening is permitted however minimum distances still apply.

3.21 Sizing of Final Circuits

The final circuit cable sizes designed by the Services Contractor shall be calculated in accordance with the IET Wiring Regulations, to satisfy the requirements of rating, voltage drop and earth impedance.

For this particular project, it shall be assumed that 1.5% of the nominal voltage has been dropped on the sub-mains systems feeding the control panel centre, leaving a further 2.5% for final circuits.

Advise the engineer if any proposed alteration shall result in any maximum circuit length being exceeded, together with any consequential changes that may become necessary (i.e. conduit size).

3.22 Wiring of Plant and Equipment Including Wiring Colour Codes

Equipment shall be wired in accordance with manufacturer's approved connection diagrams. Ensure that the drawings have been approved before associated wiring commences.

Where cable connections are made into equipment, a numbered marker sleeve shall be fitted to each cable core, which shall correspond to the manufacturers wiring diagram.

All wiring installations will be carried out using colours as defined by IET Wiring Regulations.

This includes harmonised wiring colours, with modifications as detailed below.

1. Single phase circuits will be wired using Brown (Live), Blue (Neutral) and Green/Yellow (Earth).

2. 3 phase circuits will use Brown (for all three Live conductors), Blue (Neutral) and Green/Yellow (Earth).
3. Where a multi-core cable, utilising phase colours Brown, Black and Grey needs to be used, phase conductors are to be sleeved with suitable heat shrink material in Brown, with permanent sleeved phase markers, L1, L2 and L3.
4. This is as recommended by the Society of Electrical and Mechanical Engineers (SCEME) through representations on the UK Wiring Regulations Committee (JPEL/64). It is done to avoid the potential confusion of using Black or Blue as a phase colour.

Where cable connections are made into distribution boards, Motor Control Centres, isolators, starters, motors, BMS panels and the like, numbered marker sleeves shall be fitted to each cable core, which shall correspond to the distribution board schedule and to the following convention: -

Way 1, Phase 1 – 1/L1
Way 1, Phase 2 – 1/L2
Way 1, Neutral 1 – 1/N1
Way 1, Neutral 2 – 1/N2
Way 1, Earth 1 – 1/E1
Way 1, Earth 2 – 1/E2

Ring main conductors should additionally be identified to distinguish between the two legs, i.e. Leg A: 1/L1A, 1/N1A, 1E1A and Leg B: 1/L1B, 1/N1B and 1/E1B.

Any distribution boards, switchpanels or other items of electrical equipment which has mixed versions of the old and new wiring systems must contain adequate warning notices, suitably sized in Yellow/Black, with the following warning as a minimum: -

CAUTION THIS INSTALLATION HAS WIRING COLOURS TO TWO VERSIONS OF BS 7671 GREAT CARE SHOULD BE TAKEN BEFORE UNDERTAKING EXTENSION, ALTERATION OR REPAIR THAT ALL CONDUCTORS ARE CORRECTLY IDENTIFIED

Any further labelling or suitable warning measures deemed necessary to make the status of all conductors clear must also be included.

Phase rotation for all phase sensitive equipment must be correctly identified and be corrected at motor drive/terminal end only.

Ensure that all wiring connections are correctly made before any equipment is set to work.

Cable tails to terminals shall be of sufficient length and be neatly dressed and arranged to prevent development of tension in the cable or on the terminations.

3.23 Conduit and Accessories

Steel conduit and accessories shall be heavy gauge welded to BS 4568. The finish shall be galvanised Class 4. Conduits shall be threaded to butt closely together in couplings and sockets. Except at running couplings, threads shall not be exposed and these shall be cleaned, primed and painted immediately after installation. Where the conduit finish is damaged during installation, the conduit shall be cleaned and painted with zinc-rich paint.

All conduit drops in chases in plastered walls to be painted with red oxide paint before plaster is applied. All accessories used shall be of the cast iron type, i.e. no pressed steel accessories will be accepted. All conduit drops in chases shall have a coupler inserted in the run 300mm from ceiling level.

PVC Conduit - High impact LSF type to be used – non-combustible and self-extinguishing.

Connections to accessory boxes on a concealed installation shall be via a smooth bush and coupling.

Conduits on exposed surfaces shall be fixed at intervals not exceeding 1200mm, also within 300mm of floors, ceilings and boxes at each side of every bend. Fixing of conduits shall be as follows: -

Fixing methods	
Type of Installation	Method of Fixing
Wall chases	Crampers or ordinary saddles
Ceiling, roof or floor voids	Spacer bar saddles
Surface mounted on ceiling	Spacer bar saddles
Surface mounted on walls	Distance saddles

The number of single core 600/1000 Volt grade cable drawn in at each conduit shall be as set out in the IET Wiring Regulations. The minimum conduit size shall be 20mm diameter.

The conduit system shall be complete and tested before any cabling is drawn in (See 2.7g).

Provision for drainage of condensation shall be provided in accordance with the IET Wiring Regulations.
No conduit shall be installed in floor screeds, unless specifically stated.

Chasing of walls, should this be required, must be carried out in accordance with the structural engineer's recommendations where appropriate. Under no circumstances shall horizontal chases exceed 500mm in length. Back to back chasing is also not permitted.

3.24 Flexible Conduit

Where metal conduit is specified, flexible conduit shall be of the interlocked steel tape type with a PVC sheath to BS EN IEC 61386-23:2021+A11:2021. Terminations shall be by means of compression glands.

An appropriately sized, insulated circuit protective conductor shall be drawn into the tubing and connected to earth terminals at each end.

3.25 Cable Trunking

For general purpose, cable trunking shall conform to BS 4678, Part 1, Class 3 galvanised. The gauge of the trunking shall be, 1.2mm up to and including 150 x 50mm, all other sizes up to and including 150 x 150mm shall be 1.6mm thick sheet steel. Where larger trunking is specified, the gauge of the trunking shall be detailed elsewhere in the Specification or on the accompanying drawings. Trunking shall be properly aligned and covers closely butted and secured.

Manufacturers' standard accessories, e.g. bends tees, flares, etc., shall be employed throughout. Bends, Tees etc. shall be of the gusset or radius types. Sections of trunking shall be bolted together by sleeve couplings and local copper supplementary bonding connectors. Where trunking with a painted finish is specified, the surface of the trunking shall be scraped clean at all jointing pieces and beneath earth bonding studs. Multi-compartment trunking shall be welded internal fillets, and properly manufactured crossovers at junctions.

Cable retaining straps shall be provided at 750mm intervals wherever the cover is not on top.

For the support of cables, metal pin racks shall be fixed at 2m intervals inside trunking installed to guard against undue mechanical strain.

Where trunking passes through floors, ceilings and walls, the cover shall be cut and fixed to project 75mm either side of the obstruction. When the structure is made good, this section of cover will not be removable. Internal fire resisting barriers shall also be fitted.

Conduits shall be connected to the trunking by earthing sockets and male hexagon brass bushes. Insulated, single core earth continuity conductors shall be fitted.

Where multi-compartment trunking is required, the Controls Sub-Contractor shall fix printed labels to each compartment side wall at 3m intervals to denote the use of the compartment.

3.26 Cable Tray

Cable trays shall be constructed of steel of minimum 18 S.W.G. thickness and shall be of the type and make specified in the particular clauses.

Standard accessories shall be used at each change in direction. However, where necessary, site cutting is permitted provided that all edges are cleaned up and painted before erection.

A minimum space between the building structure and tray of 50mm shall be allowed.

Cable tray shall be supplied and installed where more than two wire armoured or MICC cables share a common route.

Cables shall be fixed to the tray using proprietary straps, saddles or cleats as appropriate, at intervals specified in the IET Wiring Regulations for the type and size of cable.

Spacing of tray supports shall be in accordance with the manufacturer's recommendations.

3.27 Fixings And Fabrications

All steel screws, nuts, bolts and washers used for fixing ferrous materials to the building structure shall be sheradised. Non-ferrous fixings shall be employed when fixing non-ferrous materials.

Fixings to brickwork shall not be made in the mortar joint.

When fixing to structural steelwork, clamp-on devices shall be used unless otherwise approved.
Proprietary fixing devices shall be used throughout, e.g. Rawlbolts, Rawlplus, Plastiplugs etc.

Fixings inside dry partitions shall be by wood screws to timber blocks glued, using impact adhesive, to an internal face of the partition. Instruct the builder on size and location of these timber blocks. Where necessary, provide extension rings for accessory boxes so that the edge of the box is just recessed.

All steelwork fabrications prepared shall be wired brushed to remove all scale and rust, treated with zinc chromate and painted with two coats of a rust inhibiting lead free primer.

All steelwork fabrications, cut-outs, etc., shall be smoothed free from all burrs or rough edges, and protection against abrasion to cables added where appropriate.

No welding to building steelwork or structures shall be permitted without the written consent of the engineer/contract administrator.

Screws or studding shall, after installation, be reduced in length so that no more than two threads are exposed. All cut ends shall be treated with an approved rust inhibiting primer.

3.28 Wiring Grade Cables for Conduit or Trunking

For general wiring, the cable shall be 600/1000 Volt grade, single core, stranded copper with LSF/LSZH insulation complying with BS 6491B or BS 6724 LSZH.

Where LSF/LSZH cables are specified in plantrooms, they shall be of the high temperature specification for operating at temperatures up to 90°C.

Where higher heat resisting grades of insulation are specified, silicone rubber insulated cables to BS 6007 shall be employed. Where the temperatures will not exceed 150oC such cables shall be identified throughout their length. For higher temperatures, cables shall have varnished glass-fibre insulation.

During installation, the cables shall be combed to facilitate drawing in and future replacement. Inside trunking, cables forming final sub-circuits shall be tied together at 2m intervals to ease identification. The use of PVC self-adhesive insulating tape shall not be permitted for this purpose. Cables shall be installed without joints.

Live conductors of lighting circuits shall be taken direct to switches, whilst associated neutral conductors shall be looped at lighting points, unless 4 terminal ceiling roses are specified in the detailed Technical Clauses of this Specification.

Cables shall be colour coded in accordance with the IET. Wiring Regulations.

In addition to phase identification, the cores of cables connecting control gear, thermostats, valves etc shall be fitted with identification sleeves bearing the same markings as the terminals of the apparatus to which they are connected. All switch wires for lighting circuits shall be identified by means of an orange sleeve at each end.

3.29 Flexible Cords

Cords shall be 300/300 Volt or 300/500 Volt insulated and of conductor cross-section 1.0mm.sq. or greater.

For connections to terminals of lampholders and heaters, cores shall be glass-fibre insulated glass braid/varnish sheathed for a service temperature of 180oC.

For applications where the temperature does not exceed 60oC, cords shall have LSF/LSZH insulation and sheath.

Use of proprietary brass stuffing glands is to be made in all cases where flexible cables are used.

3.30 Low Voltage Power Cables (Armoured)

Low voltage power cables shall generally be wire armoured to BS 6346, BS 5467 or BS 6724 as detailed elsewhere in this Specification.

Cables shall be fixed to tray or direct to a surface using cable cleats. The intervals for fixing shall be as stated in the IET Wiring Regulations or as stated by the cable manufacturer where no regulation applies. Where fixed to cable trays, power cables having an overall diameter of 10mm or less may be strapped to the tray using PVC covered metal strip of appropriate colour fixed using brass pins and nuts.

At all terminations, the sheath and armour shall be secured by brass compression glands and of a type suitable for both cable and location. The glands shall be complete with both earthing tag and plastic shroud. Connections to the earthing tag shall be by brass nuts and bolts. At the point of termination for PVC SWA cables feeding any equipotential zone, the cable shall terminate in a BICC type BW gland with integral earth and 481AA insulated adapter. All glands shall be outdoor type suitable for prevention of ingress of water type E.W. complete with shroud.

Any underground jointing of PVC SWA cables required shall be achieved using proprietary resin joint kits manufactured by Messrs. BICC Limited, AEI Limited or equal and approved.

Cores shall be phased out either coloured core insulation or coloured sleeve markers shall identify the phases.

Cables buried in the ground shall be in a trench 700mm deep with 100mm of sand laid in the bottom, the cable lid on the sand then covered with 150mm of sand. Interlocked arched based cable protection covers stamped 'Electric Cables' shall be placed over the full length of the route then backfilled with sifted earth, free from rocks and stones well rammed, and 200mm below finished ground level a 100mm wide PVC tape with the letters 'Electric Cables' stamped or printed overall, shall be laid the full length of the route and the ground the reinstated to existing ground level.

NOTE Where groups of cables are installed in a common trench, cable protection covers are to be of sufficient width to cover all cables, this may be achieved using two or three rows of narrow tiles if required.

Cable markers, concrete block type, with inset label stating size and type of cable(s) and function(s), shall be placed in the route at the maximum of 50 metres apart, and at each change of direction with a minimum of two markers per route, and at entry to a building a pillar type marker giving the same information. The markers shall be block and pillar type 'Electric Cable' markers as H.J. Baldwin Ltd., with 'Traffolyte'.

The Controls Sub-Contractor shall provide all covers, markers, tapes, etc. The laying of sand, covers, tapes, concrete and markers shall be by the Main Contractor but the Building Services Sub-Contractor shall ensure and be responsible for the compliance with requirements. Where a direct contract exists, the Contractor shall be responsible for all provision and installation.

Prior to the cable(s) being laid the engineer shall be informed and arrangements made for an inspection to be made at each stage.

Where cables are to be buried in waterlogged ground or have to cross streams, then cable with a polyethylene sheath shall be employed. The extent of any such cabling is detailed elsewhere in this Specification or on the associated drawings.

Where multicore cables are employed, each core shall be numbered and numbered markers at each end shall identify the terminal number of the equipment to which the core is to be connected.

Below the armour clamp of all terminations, a non-corrosive identification band shall be fitted giving details of the type and size of cable in 5mm stamped letters and figures.

Where power cables pass through walls or floors, they shall pass through properly formed openings which shall be fire stopped after installation using a proprietary foam.

Where power cables are laid in a common trench with other services, particularly communication cables. There shall be a minimum separation of at least 300mm between these services.

3.31 Tests

Conduits and cables shall be tested during the progress of the work before their concealment as follows:

1. Continuity of protective conductors and equipotential bond of conduit, metal sheaths etc.
2. Continuity of current carrying conductors.
3. Immediately prior to completion and in the presence of the engineer of Clerk of Works carry out the initial inspection and testing detailed in the IET Wiring Regulations.
4. Test results are to be documented on test charts containing the following information for each circuit.

a) Design current (IB).
b) Earth loop impedance (Ze) at furthest point.
c) Line neutral impedance at furthest point.
d) Loop resistance (R1 + R2).
e) Continuity of ring final circuit conductors.

f) Insulation resistance readings.
g) Polarity test.
h) RCD test where applicable.
i) In addition to the aforementioned information, each chart shall contain details of the external characteristics appertaining to the distribution board.

3.32 Provision of Labelling and Charts

The Services Contractor shall supply and install a clear labelling system indicating circuit references on each light switch, socket outlet, fused connection unit and isolator etc. The labels shall be laser printed self-adhesive labels with black lettering on a white background.

Distribution boards & Control Panels shall be clearly identified and labelled with Traffolyte engraved labels with 10mm high black lettering on a white background. The labels shall be securely fixed with screws.

The Services Contractor shall supply type written circuit charts contained within clear plastic wallets fitted securely to the inside of each distribution board. The circuit chart shall contain such information as the circuit type, what it is supplying, design current and cable sizes.

3.33 Identification, Notices and Documentation

In addition to the general requirements for O&M manuals, documentation, labelling etc. detailed elsewhere in this specification the following shall be provided:

1. Labels to indicate the purpose of switchgear and control gear, unless there is no possibility of confusion.
2. Labels shall be manufactured from traffolyte and be bolted to equipment, unless otherwise specified.
3. Distribution board schedules and 'As fitted' drawings shall contain such information as is required to satisfy Clause 514-3 of the Regulations.
4. Operation/maintenance manuals shall contain the following items: -

a. Circuit Chart for each Distribution Board.
b. Test Chart for each Distribution Board.
c. NICEIC/IET Test Certificate.
d. NICEIC/IET Completion Certificate.

Supply and fit such notices as may be required by Regulations 514-4 to 514-8 inclusive.

4

Summary of Tender

4.0 Summary of Tender

4.1 General

The Tenderer is required to insert, under each sub-heading, the sums required for the erection of work described within the Specification and contained on the Tender Drawings.

The sums included shall contain all costs and expenses which may be required in, and for, the erection of the work described, together with all risks, liabilities and obligations set forth and implied on the Contract Documents.

Where special risk liabilities and obligations cannot be dealt with, as above, then the cost thereof is to be separately stated by the Tenderers.

4.2 Tender Summary

The prices inserted by the Tenderer in this Summary shall be fixed Price in accordance with the Contract Particulars and shall be fully inclusive of all obligations contained within the Tender Documents for the complete Electrical Services Installation.

An associated cost shall be inserted for each item listed, failure to fully complete this tender sum analysis shall deem the tender return non-compliant.

TENDER SUMMARY	
ITEM	**£**
Preambles/Preliminaries	
Design to stage 4 and design development	
Production of working drawings	
Removal of the existing Lighting, Emergency Lighting and Lighting Controls within 4no. Classrooms/Training Rooms	
Design, supply and installation of new containment systems and adopting/altering the existing containment systems	
Design, supply, install, test and commission a new lighting system, emergency lighting system and controls to 4no. Classrooms/Training Rooms	
Builders work	
Testing, commissioning and certification	
Operation & Maintenance Manuals	
Record Drawings	
Building User Guide	
Client Training	
Service at end of 12-month rectification period	
Provisional Sums 1. Replacement of the existing electrical distribution equipment 2. Additional lighting, emergency lighting and controls as may be required by the client	 5,000.00 1,000.00

TOTAL TENDER SUM EXCLUSIVE OF VAT £

Signed .....

Company .....

Address .....

.....

Tel .....

Date .....