Don O'Malley & Partners

Consulting Engineers - Building Services

ELECTRICAL SERVICES SPECIFICATION
TENDER DOCUMENT

FOR

REFURBISHMENT OF THE WILLOW UNIT

AT

ST. JOSEPH'S COMMUNITY HOSPITAL

ENNIS, CO. CLARE

Reference No. 7366 - Rev C0.

Date of Issue: 20th November 2026

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Tenderers are advised to read each and every part/section of this tender document carefully.

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SECTION 1

INTRODUCTION

1.0 INTRODUCTION

Description of Building

- St. Joseph's hospital is located on Lifford Road in Ennis.

The Hospital complex comprises a number of interconnected buildings, together with a number of free standing units.

The central Hospital Building comprises:

- Wards 1-7:
- Canteen/Chapel/Laundry
- Administration/Kitchen
- Central boiler houses
- Day hospital – single storey
- Maintenance Building
- Out-Buildings

The proposed works to willow ward is to include minor partition reorganisation, new kitchen upgrade, new sanitary ware and IPS panels, Replacement of doors, new flooring, general redecoration of the unit. Electrical services upgrade works as identified in section 1.1 below

1.1 DESCRIPTION OF WORKS

The electrical installation will comprise of the supply, installation, upgrading, alteration and disconnection of identified servcies and commissioning of the following services

General and Emergency Lighting
LV Power Services
Fire Alarm Services
Nurse call systems
ICT Systems
Security/Door access systems
Electrical Services to Mechanical Plant
Testing, Commissioning and certification
Demonstration and Handover Documentation.

1.2 SCOPE OF WORKS

This document is to be read in conjunction with all architectural, structural, civil and services drawings. A full set of documents are available at the offices of each discipline.

- Rewiring of all electrical small power services from each room area currently fitted with electrical boards just serving small power circuit with each room. This will involve where indicated the removal of existing dado trunking to suit to bed layouts.
- Disconnection and removal of existing general lighting where indicated on layouts and replacement with new.
- disconnection and removal of emergency lighting fitting and replacement with new as indicated on electrical drawing.
- Existing door access to bedrooms to be isolated and capped off.
- New door access to side entrance door
- Mechanical plant wiring (extract fans)
- Testing and Commissioning

NOTE TO TENDERING CONTRACTORS

Notwithstanding the contents of this specification and associated drawings, the Contractor shall be fully responsible for the complete installation of the works to ensure that they can be tested and handed over in fully operational mode.

The Contractor shall include in the tender for all necessary items not specifically mentioned or indicated, to achieve this objective.

The contractor shall also include for a site visit and carry out an inspection of the existing services installations as part of the tender process.

1.3 COMPLETION AND HANDOVER

GENERAL

This section details the requirements and procedures for completion and handover.

Handover Requirements

As a pre-requisite to Practical Completion in respect of the contract works or part thereof, demonstrate to the satisfaction of the engineer that:

- All the contract works are completed
- With the exception of minor snags or limited defects as agreed with the engineer that could be reasonably completed within an agreed programme without causing disruption to the Employer's use of the building or part thereof.
- All spares, keys, tools and other consumables as stated elsewhere have been supplied and handed over to the Employer
- The instruction of the Employer's staff in the use and correct operation of the installation has been completed satisfactorily. In particular, safety devices and controls demonstration
- All commissioning and testing completed including the issue of a final commissioning report signed by an approved competent person
- A complete demonstration of the contract works with fully functional operational controls tested has been undertaken in the presence and to the satisfaction of the engineer
- All necessary certification by the Employer's insurers has been completed
- All approved record documentation including record drawings, operation and maintenance manuals, etc., is issued
- All information required for the health and safety file is issued to the satisfaction of the Planning Supervisor.

The information shall include:

- A written description of plant operation
- Control strategy/logic diagrams recording the final version of configuration software installed at handover.
- Details of system application software configuration
- A points list including hard and soft-points (all points should have a unique mnemonic)
- A description of user adjustable points
- Commissioning record details
- Detailed data sheets for all control components and equipment
- Wiring circuit details including origin, route and destination of each cable
- Basic security access to the system
- Comprehensive instructions for switching on, operation, switching off, isolation, fault finding and procedures for dealing with emergency conditions
- Instructions for any precautionary measures necessary
- Instructions for the routine operation of the control system including simple day-to-day guidance for those with limited technical skill
- Instruction for servicing and system upkeep
- A provision for update and modification

- All necessary Statutory Authority approvals have been undertaken and written confirmation established
- Completion and issue of log books in accordance with Building Regulations. In accordance with CIBSE TM31 Building Log Book (Toolkit (standard templates)

Training of Employer's Staff

Prior to Practical Completion explain and demonstrate the purpose, function and operation of the installations including all items and procedures listed in the operation and maintenance manual

- To the Employer's maintenance staff
- To the operational staff

Submit to the Engineer/Architect for approval a detailed programme for the training of the Employer's staff

Time scale – three weeks before commencement of training

- Employ the services of relevant specialists and suppliers for the purpose of training and instruction

- Provide each person with a comprehensive set of teaching notes and diagrams

- Be responsible for the correct operation and maintenance of the installation during such periods of instruction.

- All costs associated with the instruction of the Employer's personnel and required attendance following practical completion shall be included in the contract price

- Following practical completion and occupation be available for a period as agreed with the Architect to assist the Employer's personnel in the operation of the various system together with the

    - controls specialist
    - commissioning specialist

1.4 MAINTENANCE & SERVICING

The Tenderer shall be responsible for and shall repair, at his own expense, any equipment which proves to be defective – in the Engineer's opinion – with respect

to materials, workmanship or design, which defects become apparent within 12 (twelve) months from the date of practical completion of the Main Contract.

The Contractor shall be responsible for full maintenance and servicing of all plant including bi-monthly, or as required under the codes and standards.

The Contractor shall be responsible for replacement parts or recommended by supplier for the first twelve months after handover to the Client.

Provide any additional work and materials necessary to maintain these services at all times during the duration of the contract works

Down times under warranty

In order to provide the Contracting Authority with a continuous, quality service, it is critical that all equipment be continually operational. The maximum down time for any piece of equipment is 24 hours. Tenderers should provide details of their proposals for minimising down times and eliminating problems.

Spare parts

Should the Contracting Authority decide to undertake some minor in-house maintenance, it would be imperative that the successful Contractor provide all parts within twenty-four hours of request. Tenderers must provide evidence of their ability to meet this delivery time and details of their procedures for ensuring that parts are available.

1.5 MAINTENANCE MANUALS

The Contractor shall include in his tender for the supply of 1 No. sets of operating maintenance manuals and one electronic copy for all items of equipment supplied under this contract.

These manuals shall also indicate the manufacturer or his agent where spare parts etc. can be obtained.

1 No. complete sets of Record Drawings, A1 Drawings and Electronic Compact discs shall also be provided.

Refer to Part 6 of the specification for details regarding contents of the O & M Manuals.

SECTION 2

PRELIMINAIRES

PRELIMINARIES

The Contractor shall review the full preliminaries included the Main Contract as set out by Quantity Surveyor

SECTION 3

GENERAL CONDITIONS OF TENDER

GENERAL CONDITIONS OF TENDER

3.1 FINAL TENDER

This tender is final-based on the final working drawings. This tender is not for approximate P.C. sum purposes. The successful tender will work under the main contractor for this element.

Any conditions appended by the Tenderer, which are at variance with the conditions set out below, shall invalidate the tender.

3.2 AWARD OF CONTRACT

Contractors will not be remunerated for any trouble or expenses they may incur in making up their tenders. It is the responsibility of prospective tenderers to obtain for themselves, at their own expense, any additional information necessary for the preparation of their tender.

The award of contract will be made at the discretion of the client and will be made to the contractor whose tender has determined to be the most economically advantageous tender and who meets the required standards capability and financial responsibility.

Tender prices shall include for all labour and materials required for the execution of the works and shall include for all costs in connection therewith, such as freight and transport, insurance of goods and persons, taxes, duties and other such charges current at date of submission of tender and for all charges arising from statutory legislation effecting the cost of labour. The responsibilities regarding knowledge of the operation or amount of any of these charges shall lie with the tenders and no allowance shall be made for them after submission of tender.

The tender must comply fully with all the conditions set out in the contract documents and the services drawings as listed.

Quoted time of delivery of materials on site and time of completion of the contract together with the extent to which the materials are suitable for their purpose and otherwise acceptable as to performance will be taken into consideration in relation to acceptance of tender.

3.3 DISCLOSING TENDER

Acceptance of tender documents by a tenderer will be held to imply a guarantee that the amount of his tender will not be disclosed by the tenderer to any person

or body prior the lodgement of the tender and that a wholly bona fide tender will be submitted, in default of which the tender shall be deemed invalid.

3.4 REGULATIONS

The services installation shall be carried out in accordance with this specification and shall comply with the following regulations, standards requirements insofar as they are applicable.

Refer to Section on Codes and Standards

The General Conditions of the Contract and the Standard and Specification of the Consulting Engineer.

Wherever the requirements of this specification and/or drawings exceed the requirements of the mentioned regulations, this specification and/or drawings shall govern.

Should any change in the drawings and specification be required to conform to these ordinances, the contractor shall notify the engineers at the time of submitting his bid. After entering into contract, the contractor will be held to complete all work necessary to meet the local requirements without extra expense to the owner.

The contractor shall obtain and pay for all necessary permits as required for all work.

3.5 BILL OF QUANTITIES

The successful contractor shall provide the engineer with a priced Bill of Quantities prior to being included as the sub-contractor in the Main Contractor Works Requirements. The bill shall list separately the material costs and labour costs with the number of man-hours included for in the tender.

3.6 VARIATIONS

The Contractor's price is lump sum fixed price, there will be no variations to the Contract Sum, unless additional works are instructed by the Employer's Representative.
All variations to the contract shall be priced in accordance with the rates in the Bill Quantities.

The total cost of any variation shall be approved in writing by the engineer before work commences on the variation.

Extras outside the scope of the existing contract shall be carried out for a price to be negotiated and approved in writing by the architect before work is commenced.

3.7 PAYMENTS

Claims by the contractor for interim payment shall indicate separately:-

Percentages of the various works completed as scheduled in the Summary of Prices.

3.8 SUMMARY OF PRICES

The contractor must pay particular attention to the proper completion of the Summary of Prices included and must complete the Summary of Prices strictly under the item numbers listed and should note that any section heading in this specification may apply to one or more of the items in the Summary of Prices.

The contractor shall include in his tender under additional headings, if necessary, and irrespective of the items indicated for all work specified or implied by the drawings and specification.

3.9 GENERAL

It is the intention of this specification to provide for all work and materials necessary for the completion, testing and setting to work of the installation outlined in this specification and to provide for the supply and erection of all necessary or usual accessories for such an installation, whether such work, materials or accessories shall have been individually itemised or described in this specification or not and also to provide for the maintenance of the installation for twelve months after completion.

3.10 WORK TO BE DONE

The work to be done shall consist of laying on a complete installation for the services specified, the supply delivery to site, erection and testing of the entire installation as outlined in this specification and indicated on the drawings.

3.11 LOCAL AUTHORITIES

The contractor shall observe and comply with the requirements of all Statutes and Bye-Laws and serve notice on the Authorities or Owners of water, gas, electricity or other things which may be in any way affected by the execution of the works.

3.12 COMPLETION

The work under the contract shall commence as soon as the program for the works is agreed. The work generally shall be completed in all respects to the entire satisfaction of the engineer on or before the date allowed in the contract for completion

3.13 MAINTENANCE

At the completion of the works, the contractor shall thoroughly clean and clear up all materials, tools tackle and rubbish due to the work under the contract.

From the Date Of Practical completion as ascertained by the Consulting Engineer or Architect, the contractor shall fully maintain all part of the works in good working order, for a period of twelve calendar months. Refer to scope of work for detailed requirements

3.14 STORAGE

Buildings: The contractor shall provide lock-up and canteen facilities for his staff. The contractor shall also provide storage sheds and workshops as necessary for the smooth continuance of the works. Materials may not be stored and preparatory work may not be carried out within the building structure without the previously expressed agreement of the Consulting Engineer. Such agreement, if given, shall not absolve the contractor from liability for damage or injury or otherwise vitiate the contract.

Materials: All goods which are normally stored in the open shall be suitably and adequately protected from the weather and the ingress of dirt to the satisfaction of the Engineer, any materials which are not, in the opinion of the Engineer, adequately protected shall be removed from site on receipt of instructions from the Engineer and replaced by new material, at the Contractors expense.

3.15 MATERIALS

Materials used in the work shall where possible be Irish manufacture.

When materials manufacturers or suppliers are named, the tender shall be based on one of the named manufacturers or suppliers. However, the tenderer may submit separately an alternative costing based on materials of equal quality and workmanship and subject to the Engineers approval.

3.16 SAMPLES

The Contractor when if required shall supply samples and prototypes of all materials or workmanship to the Engineer before the work is put in hand. The samples may be retained before work is put in hand.

The samples may be retained by the Engineer until the main bulk of the material shall be delivered to the site. Samples will be required by the Engineer only where reasonable and where examination of quality by drawings and description would be inadequate.

3.17 CONTRACTOR'S DRAWINGS

The contractor shall prepare as requested by the Engineer any necessary dimensioned working drawings for the proper completion of the Contract.

Two copies of each required drawing shall be submitted to the Engineer in the first instance. The Contractor shall provide six final copies for distribution upon return to him of one approved preliminary copy.

The contractor shall make an allowance for the production of co-ordination drawings between electrical and mechanical services. The contractor shall produce co-ordination drawings before the installation of any services.

3.18 PLANT

The Contractor shall provide all necessary labour, materials, tools, tackle, slings, scaffolding, haulage, instruments and apparatus for delivery and erection for the works, and for the completion and testing of the works to the entire satisfaction of the Engineer.

3.19 SETTING OUT

Positioning: The Contractor shall set out the whole of the works and be responsible for the correctness of the positions, levels and dimensions of the several works according to the drawings and written instruction of the Engineer as well as for the positioning and marking of openings, plinths, bases and of holes to be cut in the structure.

Routing: The exact courses and positions of all services and other items of equipment shall be duly laid out and marked on the job by the Contractor and approved before execution as the best possible course and position, having regard to all considerations including that of temperature and the relation for these items to the other services plant.

Checking: The Contractor shall furnish all materials, labour and instruments necessary to enable the setting out to be checked.

Errors: The Contractor shall make good any incorrectly set out works and shall be liable for costs of making good any work incorrectly carried out.

3.20 PROTECTION

The Contractor shall pad ladders and similar equipment so that damage is not done to the building structure or the finishes thereof. The Contractor shall be liable for costs of making good should any damage be caused to the structure by oil, grease, or similar goods, or by ladders or like equipment.

3.21 BUILDER'S WORK

The Main Contractor shall provide the following attendance on the contractor, who shall give reasonable notice to the Main Contractor of his specific requirements.

- Distribution of materials around the site
- Forming of floor ducts and wall chases
- Forming and cutting of structural openings and recesses
- Grouting of brackets, supports and holding down bolts
- Making good after the above work

General Attendance: The contractor shall be provided with general attendance, free of charge, general attendance shall include only allowing use of scaffolding, mess rooms, sanitary accommodation providing space only for office accommodation and for storage of plant and materials (offices, lock-up stores to be provided by the Named Specialist, if required), providing light and water, cleaning away rubbish.

- Use of temporary roads and approaches
- Provision of timberwork and frames

The contractor shall be responsible for providing the following:

- Setting out and marking of Builder's work.
- Preparation of drawings of Builder's work.

Special Attendance: The contractor shall be provided with special attendance as listed below:

- Taking delivery, unloading, taking on store
- Hoisting materials

- Power for fixing
- Scaffolding
- Protecting completed installation

NOTE: Anything not provided free of charge as above shall be deemed to be provided for in the contractor's tender sum.

Please note - The contractor shall fully list out and describe as part of their tender return any special attendance from the main contractor not listed above.
Omission to do so will be at the cost to the contractor

3.22 RECORDS

The Contractor shall, during the course of the works, maintain a fully detailed record of all changes from the Tender drawings to facilitate easy and accurate preparation of "As Fixed" drawings and to ensure that these drawings are in all respects a true record of the installation.

On completion of the contract the Contractor shall submit to the Engineer completed "As Fixed" drawings of the system for record purposes.

After the approval of these drawings by the Engineer, the Contractor shall hand over 3 sets of prints of the drawings to the Engineers, one set of which shall be mounted on hardboard and sealed.

3.23 MAINTENANCE MANUALS

The Contractor shall supply to the Consultant Engineer 1 No. sets of Maintenance Manuals & a soft copy for all items of equipment supplied by him on the Contract. These manuals shall indicate clearly all areas where periodic maintenance is required and also full details of manufacturers of equipment or their agents.

3.24 TUITION

The Contractor shall allow for operating the completed works under full working conditions and for instructing the person or persons nominated by the Client in the correct and most efficient operation of the works for a minimum period of four weeks.

3.25 LOCAL LABOUR

Persons engaged upon the works should insofar as practicable and without affecting the efficiency of the work be recruited from the area.

3.26 VISITING THE SITE

The Contractor must visit the site at time of tendering to ensure that he has included for all items necessary to complete the installation and to leave same in a complete working condition to the satisfaction of the Consulting Engineer.
No extras or variations shall be allowed for additional work that could have been ascertained by visiting the site.

3.27 PHASING

N/A

3.28 SPECIAL CONSIDERATION

The nominated contractor shall provide all necessary labour, plant and material required for satisfactory execution of the contract, including unloading, distributing, handling and hoisting of materials and fabricated units. All builder's work including making good and redecorating is to be included in the tender.

The contractor shall execute his works in conformity with a programme to be agreed with the Client, which enables the Contractor to complete the entire project within the contract period.

This tender should include for complying with the Safety, Health and Welfare at Work (Construction) Acts and Regulations current at the date of tender and any requirements of the Project Supervisor (Construction Stage).

The successful Contractor must also comply with the following:

- Be the holder of a current Tax Clearance Certificate
- Be a member of the CIF Pension/Sick Pay Scheme
- Freedom of Information Act

3.29 DEFINITIONS

Throughout this document the term "Client" shall be deemed to refer to:
Health Service Executive
Capital & Estates,
Holland Road,
National Technology Park,
Limerick

Throughout this document the term "Architect" shall be deemed to refer to:

Hassett Leyden & Associates
Roslevan Shopping Centre,
Tulla Road,
Ennis,
Co. Clare

Throughout this document the term "Engineer" shall be deemed to refer to:

Don O'Malley & Partners.
92 O'Connell Street,
Limerick

3.30 FREEDOM OF INFORMATION ACT

Information in relation to this tender may be made available on demand in accordance with Freedom of Information Act 1997 and 2003. You are asked to consider if any of the information supplied by you in the tender should not be disclosed because of its sensitivity. If this is the case, you should, when providing the information, identify same and specify the reasons for its sensitivity. The Client will consult with you about sensitive information before making a decision on any Freedom of Information request received.

If you consider none of the information supplied by you as sensitive, please make a statement to that effect. Such information may be released in response to a "Freedom of Information Request".

3.31 CONTRACTORS LIABILITY

Employers' requirement for Contractor to effect insurance in respect of liability for risk

Note: It will be necessary before work commences on site for the Contractor to produce his insurance policies for inspection by the Employer to verify that he is insured in accordance with statutory requirements and the terms of the Contract. Failure on behalf of the Contractor to present such policies for inspection or failure on behalf of the Employer to inspect such policies will not relieve the Contractor of any of his liabilities in this respect.

SECTION 4

SCHEDULE OF CODES AND STANDARDS

4.0 SCHEDULE OF CODES AND STANDARDS

Notwithstanding the details of the specification, the contractor must note that, where applicable, t his installation must conform in every respect with the full requirements of the following Codes of Standards.

IS10101	National Rules for Electrical Installations
IS3217	Code of Practice for emergency lighting.
IS3218	Code of Practice for fire detection and alarm systems for buildings and system design, installation and servicing.
ISEN62305	2006 Code of Protection against lightning
BS5839 Part 9	Code of Practice for emergency voice communication systems.
BS5588 Part 8	Code of Practice for means of escape for disabled people.
CIBSE Guide K	CIBSE guide for electrical installation.

The contractor must ensure that the installation is carried out to the codes of standards above and all other relevant Irish, British and European Standards.

SECTION 5

HEALTH AND SAFETY REGULATIONS

5.0 HEALTH & SAFETY REGULATIONS

The Contractor shall take account of the general principles of prevention as stated in the following:

(1) Safety Health and Welfare at Work (Construction) Regulations.

(2) Health and Safety Authority: "Guidelines to the Safety Health and Welfare at Work (Construction) Regulations".

(3) Architects Council of Europe: "Memorandum on Council Directive 92/57/EEC".

(4) Construction Industry Research and Information Association: "Control of Risk: A Guide to the Systematic Management of Risk from Construction", Report FR/CP/32.

Safety, Health and Welfare of Workpeople Safety Regulations

The Contractor shall note the Preliminary Safety and Health Plan prepared by the Project Supervisor for Design Stage, information included within this report and include all costs relating to compliance with that set out within the various Sections of the Preliminary Safety and Health Plan.

The Contractor shall include for complying with the Safety, Health and Welfare at Work Acts and Regulations current at the date of tender.

The Contractor shall include for providing all necessary information as requested by the Project Supervisor for the Construction Stage to enable the preparation and completion of the Safety File excluding drawings and specifications which shall be provided by the appropriate member of the design team and relevant nominated sub-contractors.

The Contractor shall include for providing assistance to the appropriate member of the design team and to relevant nominated sub-contractors in preparing "As Built" drawings for inclusion in the Safety File.

The Contractor shall hand over all documentation in connection with the Safety File and full information must be handed over for sign off, to the PSDP prior to Practical Completion Certificate been issued

Procure and maintain insurance cover and provide indemnity in respect of any claim incurred by reason of the performance of functions and duties of the project supervisor for the Construction Stage of the Project.

Assist in preparing and completing the Safety File.

The Contractor shall be required to provide full assistance in the implementation of the following duties:

a) Co-ordinate the Health & Safety aspects of the Construction Stage.

b) Prepare a Health & Safety Plan.

c) Continual updated Health & Safety Plan.

d) Full description on Health & Safety submitted with O.M. Manuals.

The operation and maintenance manuals shall contain the following information:

(All manuals shall be in ring binders format.).

1. Description on how to use O. & M. Manuals.
2. Content page.
3. Contractual and legal details.
4. Contact list including name, number and address.
5. Date of expiry of defects liability period.
6. Date of final completion.
7. Guarantee certificates for all components, elements and plant.
8. Warranties for all components, elements and plant.
9. Full description of utility services and their isolators, valves and switches.
10. Description of installed services.
11. Equipment schedule and commissioning data sheets.

    The equipment schedule should list the following:

    - Type
    - Model reference
    - Serial number
    - Location
    - Duty/performance
    - Name and address of manufacturer/supplier
    - M. & E. loads.
    - Dimensions

The commissioning date should list the following:

- Measured data and results
- Measured points
- Test equipment used
- Test equipment calibration test certificates and details.
- A statement of results against design.
- Commissioning test certificates.

12. Parts identification and recommended spares.
13. Spares policy
14. Operational description of all systems.
15. Recommended strategy for operation and control.
16. Maintenance schedules for plant and equipment as recommended by manufacturer/supplier.

    The maintenance schedule shall include:

    - Specific time intervals.
    - Parts for replacements.
    - Running hours for maintenance.
    - Required tools and training.

17. Name and address for all manufacturers.
18. Provide complete list of manufacturer's literature for all plant and equipment.
19. As installed drawings.
20. Drawing register.
21. Copies of demonstration attendance lists.
22. Laminated location charts.
23. Location of field controls.

5.1 PROJECT DESCRIPTION

The electrical installation consists of the following:

- Rewiring of all electrical small power services from each room area currently fitted with electrical boards just serving small power circuit with each room. This will involve where indicated the removal of existing dado trunking to suit to bed layouts.
- Disconnection and removal of existing general lighting where indicated on layouts and replacement with new.
- disconnection and removal of emergency lighting fitting and replacement with new as indicated on electrical drawing.
- Existing door access to bedrooms to be isolated and capped off.
- New door access to side entrance door
- Mechanical plant wiring (extract fans)
- Testing and Commissioning

5.2 DRAWING AND SPECIFICATION

The Electrical installations is to be installed in accordance with the "Tender Documentation for Mechanical Installations" at Refurbishment to Willow Unit at ST. Josephs Community Hospital , Upgrade works".

5.3 PHASING OF THE WORKS

The Mechanical Contractor are required to carry out the works in line with the Main Contractors programme.

5.4 OTHER WORK ACTIVITIES

The Electrical Contractor is required to co-ordinate their works with the main contractors work on site.

The Contractor is required to visit the existing site and carry out a full and detailed site inspection/survey of locations and familiarise themselves with the existing building, building construction, existing services installations, incoming utilities, external plant and site surroundings etc. The contractor should allow for all necessary works, temporary works, out of hours works, weekend works etc to successfully complete the project

5.5 KNOWN EXISTING SERVICES

There are numerous underground services surrounding the site locations. Where excavation is required for any services the contractor shall ensure all excavations do not damage or interfere with existing utility services, or services supplies.

The contractors shall identify and familiarise themselves with same i.e., incoming mains, gas and E.S.B., and data/communication telecoms supplies and ensure these services are suitably protected.

Over ground Services

There are overhead cables on the Site – The Contractor to take due care

5.6 PARTICULAR RISKS

The general rules of health and safety should be applied when working on a building site. The contractor must adhere to the health and safety method statements as set out under the main contract.

5.7 COMPLIANCE

We can confirm that our design considers all the requirements as out lined in S.I No. 299 of 2007 and we have taken every practical step ensuring that the installations we design can be safely installed, used and maintained.

5.8 GENERAL PRINCIPLES OF PREVENTION

a)	The avoidance of risk.
b)	The evaluation of unavoidable risks.
c)	The combating of risks at source.
d)	The adaptation of work to the individual, especially as regards the design of places of work, the choice of work equipment and the choice of systems of work, with a view, in particular, to alleviating monotonous work and work at predetermined work rate and to reducing their effect on health.
e)	The adaptation of the place of work to technical progress.
f)	The replacement of dangerous articles, substances or systems of work by non-dangerous or less dangerous articles, substances or systems of work.
g)	The development of an adequate prevention policy in relation to safety, health and welfare at work, which takes account of technology, organisation of work, working conditions, social factors and the influence of factors

	related to the working environment.
h)	The giving to collective protective measures priority over individual protective measures.
i)	The giving of appropriate training and instructions to employees.

SECTION 6

GENERAL SPECIFICATION

CONTENENTS

6.1 Main Distribution – Low Voltage Switchgear N/A

6.2 Low Voltage Power Distribution

6.3 Mechanical Plant Wiring

6.4 Wiring to Extract Fans

6.5 Earthing and Boarding System

6.6 Power Containment System

6.7 General and Emergency Lighting

6.8 Fire Detection System

6.10 Nurse Call System

6.11 Testing and Commissioning

6.12 Labelling

6.13 Maintenance Manuals

6.14 Completion and Handover

6.15 Guarantee

6.0 GENERAL TECHNICAL SPECIFICATION

6.1 MAIN DISTRIBUTION – LOW VOLTAGE SWITCHGEAR (N/A)

6.2 LOW VOLTAGE POWER DISTRIBUTION

The Contractor shall supply and install all sub-circuits and final circuits in accordance with IS10101.

All sockets circuits shall have individual AFFD RCBOs.

The minimum conductor cross sectional areas to be used throughout for 13 Amp. power circuits shall be 4.0. sq. mm LSF cables.

Final Sub-Circuits Cables

All sub-circuit cables shall be installed as set down and described elsewhere in this document. Final sub-circuit cables, unless otherwise stated, shall be 600/1000 volt grade, LSF insulated stranded copper conductor type in accordance with BS 6004, 1969 and amendments thereto, run on cabletray and/or trunking as set down and described elsewhere. Cables shall be colour coded to comply with IS10101 Regulations.

Lighting circuits shall be run in 1.5 sq.mm cable radial circuits with a separate circuit for each 1kw load.

Emergency lighting circuit shall be run in 1.5 sq. mm core cable.

All fire alarm cables shall be mineral insulated copper sheathed cables to BS 6207 as specified.

Socket Outlets (Standard Type)

Socket outlet assemblies shall incorporate insulated shutter to screen the LIVE and Neutral sockets. Such shutters shall be mechanically operated by insertion and removal of the plug.

Switched socket outlet assemblies shall have a mechanical interlock device to prevent the withdrawal of the plug with the switch in the ON position. (This applies to 3 phase sockets only).

Socket outlets (including switched socket outlets) on single phase, 230 volt installations, shall be two-pole with earthing pin.

Socket outlets (including switched socket outlets) on 3 phase, 400 volt installations shall be three-pole with scraper-type earth contacts.

Socket outlets (including switched socket outlets) on 3 phase and neutral, 230/400 volt installations shall be four-pole with scraper-type earth contacts.

13 Amp. rated socket outlets (including switched socket outlets) shall have rectangular shaped two-pole contacts and earthing pins.

Socket outlet ampere ratings shall be:

2,5,15,16,25,30,32,45,60+63 and 200 Amp. rated socket outlets (including switched socket outlets) shall have round shaped pole and earthing pins or alternatively round shaped pole pins and flat or rectangular shaped earthing pins or contacts.

General purpose sockets generally shall be mounted 450mm above finished floor level. All other heights shall be indicated on the drawings or specified in the particular specification.

Socket Outlets (Indicating Type)

Indicating type socket outlets switched or unswitched shall comply with the previous applicable clauses with the addition of an indicator light.

Clamping facilities and neoprene bush shall be included to secure and protect the flexible cord.

Safety Isolating Transformers for use with Portable Motor Operated Tools

The nominal rate output voltages shall be 110 volts for motor operated tools and volts for portable electric hand lamps. The rated output shall be 400V.

Plugs

Plugs shall be of the same type, rating and manufacture as the socket outlet.

Plugs shall have an effective and efficient means of securing and protecting the flexible cord at the point of entry into the plug.

Plugs of ratings 2,5,15 Amp. at 220/250 volts shall be of the heavy, non-tracking, moulded bakelite pattern with adequate and easy thumb and finger grip.

Plugs in excess of 15 Amp. shall have porcelain or heavy duty, non-tracking moulded bakelite interior with metal enclosures.

13 Amp. rated plugs shall have an easy accessible and removable cartridge type fuse of rating particularly specified otherwise.

The Contractor may for convenience re-arrange the sub-circuits providing they adhere to the IS10101. Regulations and providing notice in wiring and the approval of the engineer is given, prior to changes being carried out.

Sub-circuit cables shall conform to the relevant clauses under Section No. 6.0 L.V. Distribution Cables.

Industrial Type Sockets

16 Amp. single phase industrial type sockets and 32 Amp. 3 phase industrial type sockets shall be circuited and wired in 6.00m^2 LSF cable.

Local Isolation to Machines/Plant etc.

Local isolation switches to all motors, fans and electro/mechanical equipment etc. shall be provided.

All isolators shall be fitted with 'Auxiliary Contacts' with 1 phase or 3 phase isolators and wired accordingly back to the contractors fitted in the MCC panels.

Local lock stops, emergency stops shall be provided where specified and required.

Exact positioning of the local isolators and local lock strips/emergency stops shall be wall mounted where convenient, where this is impractical robust galvanised steel brackets shall be provided.

Mounting heights for local isolating switches shall generally be mounted 1000mm above finished floor level.

Relevant information pertaining to ampere capacity shall be stated on drawings.

Accessories

Accessories shall comply with the relevant British Standards or IEC and suitable for either inductive or resistive loads as the case may be.

Accessories shall be suitable for working voltage of 220/250 volts as particularly specified, but all accessories shall be capable of withstanding a voltage of 500 volts during any test.

Current ratings of accessories shall be as shown on the drawings or particularly specified.

Accessory terminations shall be of minimum capacity to contain two (2 No.) final circuit cables at each terminal, the cables, each of minimum rating, equal to the accessory.

All non-current carrying metalwork shall be earth bonded.

Accessories shall be contained in approved galvanised steel or cast iron enclosures as particularly specified.

Accessories shall be of the fully recessed, semi-recessed or surface pattern as particularly specified.

Accessories for use within a building (damp, wet or hazardous locations) shall be of an approved standard type.

Accessories for use outside a building (including damp or wet locations within a building) shall be of an approved weatherproof type.

Accessories for use in hazardous locations shall be of an approved flameproof type to the Class particularly specified.

Splash-Proof Switches

Splash-proof switches shall have quick-make, quick-break action contacts assembled on a porcelain or high grade, heavy duty, non tracking bakelite base. Cover plate shall be of all insulated plastic material construction in frame form t which is attached a tough clear PVC membrane by means of a weather-seal gasket.

Cover plate assembly shall be suitable for attachment to a standard conduit box.

6.3 MECHANICAL PLANT WIRING

The Contractor shall include for all electrical work associated with the wiring of the mechanical services installation. Location of all plant and equipment requiring electrical supplies are as shown on the drawings. The contractor shall include for testing and commissioning mechanical services installation. The Contractor shall also include for Client tuition on operation and maintenance aspects of electrical control circuits associated with the mechanical services equipment.

Equipment to be wired by the electrical contractor and supplied by the mechanical contractor include: Namely mechanical extract fans,. All small fans shall be wired though speed controllers and all motors shall have automatic starters with thermal overloads.

6.4 EXTRACT FANS

The extract fan installation shall be carried out as indicated on the drawings.

All cabling shall be carried out in conduit with final connections to the fans being carried out using metallic flexible cable.

Extract fans shall be served from the appropriate distribution centre and the contractor shall include in his tender for the supply and erection of all starters and for the erection only of the speed controllers.

Extract fans complete with speed controllers shall be supplied and installed by others.

6.5 EARTHING AND BONDING

The earthing system shall be TN-C-S. Power system earthing shall generally consist of separate circuit protective conductors of type and size as indicated on the drawings.

All incoming services and utilities shall be electrically bonded together with bonding conductors of type and size as indicated on the drawings. These shall be bonded to the Main Earth Terminal (M.E.T.) which is located adjacent to the main L.V. Switchboard.

All extraneous metalwork and plant shall be electrically bonded to M.E.T. The main L.V. Switchboard Earth Terminal and Lightning System shall be bonded to the M.E.T. The complete earthing installation shall comply with the requirements of IS10101.

The combined impedance to earth at the M.E.T. must be less than 1 ohm. The M.E. T. shall be connected to the E.S.B. P.E.N. conductor, and to a dedicated buried earth mat at the point of entry to the building. A second earth shall be provided if the required impedance is not achieved.

Earth Electrodes

The earth electrode shall be:

(1) a copper or galvanised iron pipe or rod of a least 12mm diameter having length of a least 1250mm driven vertically into the ground.

or

(2) a straight length of at least 4500mm of bare copper or galvanised iron pipe or rod, or a straight length of at least 4500mm or bare copper or galvanised steel wire of at least 25mm cross-sectional area, buried in the ground at least 500mm deep.

or

(3) with the agreement of the E.S.B, the metal sheath of an E.S.B underground supply cable.

N.B. A gas or water pipe must not be used as an earth electrode. It should, however, be bonded to the earthing system of the installation.

(4) in domestic, agricultural and commercial installation with a main fuse rating not exceeding 150 A, copper clad high tensile steel rod of at least 9mm diameter having a length of at least 1200mm driven vertically into the ground may be used as the earth electrode.

The earthing lead connecting the main earth terminal and the earth electrode shall consist of an insulated stranded copper conductor of at least $6mm^2$ area. The earth lead shall be connected to the electrode by means of a substantial non-ferrous metal clamp covered with Denso Tape.

Where methods (1), (2) or (4) are employed, the main earth point shall be housed in a concrete surround and fitted with an approved inspection cover giving access for disconnection of the earth load for test purposes. The earth connection shall be fitted with a permanent indelible label engraved:

"SAFETY ELECTRICAL EARTH DO NOT REMOVE"

Systems with Directly Earthed Neutral Point and Exposed Conductive Parts Connects to the Neutral Pole (TN System)

This system is commonly referred to as the 'neutralised system'. The principal feature of this system is that one pole of the supply (generally the neutral) is directly earthed and the exposed conductive parts of the installation are connected to that pole by means of the protective conductor. Where this type of earthing is utilised, the installation shall comply with IS10101.

Note: In this system, a low impedance is provided between the protective conductor and the neutral conductor of the supply by means of a neutralising connection, to ensure disconnection by means of the over-current device. An earth electrode is provided to equalise the potential of the protective conductor.

TN System: Direct Supply at Low Voltage

Where the installation is supplied directly from the Supply Authority's low voltage network, the neutral pole of the supply and the protective conductor shall be electrically connected at the supply intake by means of a conductor of cross-section not less than that of the largest size protective conductor in the installation. This connection may be made only by the Supply Authority or by a person duly authorised to do so on its behalf. A special earthing terminal shall be provided to facilitate the connection. There shall be no other electrical connection between the neutral and the protective conductor except where specially permitted otherwise in these Rules. The protective conductor shall be connected to earth in the vicinity of the supply intake.

TN System: Private Supply or Supply from High Voltage Transformer

Where the installation is supplied by a generator or by a transformer which forms part of the installation, the neutral conductor and the protective conductor shall be electrically connected, at or near the generator or transformer, by means of a conductor with a cross sectional area not less than that of the largest protective conductor in the installation.

The neutral conductor and the protective conductor may be combined in a single conductor not less than 10mm^2 copper. If from any point in the installation a combined neutral and protective conductor becomes two separate conductors with resulting separate functions, there shall be no electrical connection between these two conductors at any point beyond the point of separation, except where permitted otherwise in these Rules.

The protective conductor shall be earthed near each power transformer or generator. Multiple earthing, at points distributed as evenly as possible, shall be provided where necessary in order to ensure that the potential of the protective conductor remains as close as possible to earth potential in case of fault.

System with Directly Earthed Neutral Point and Exposed Conductive Parts Separately Earthed (TT System)

This type of earthing system, the neutral pole of the supply is connected directly to an earth electrode, and the exposed conductive parts are connected individually, in groups or as a whole, by means of a protective conductor to one or more earth electrodes independent of the neutral pole earth electrode. All exposed conductive parts of the electrical equipment or device shall be connected to one another and to the same earth electrode or electrically interconnected group of earth electrodes. Exposed conductive parts, which are simultaneously accessible, shall be electrically connected to one another and to the same electrode or electrically group or earth electrodes. This system of earthing shall not be adopted where a neutralised system can be provided.

Note: In this system disconnection is by mans of the protective device operated by the fault current flowing to earth electrode must be sufficiently low to ensure the correct operation of this protective device.

Equipment Bonding

Equipment bonding shall be carried out in accordance with the IS10101 as specified. Equipotential bonding requires the use of main bonding conductors, and where necessary, local bonding conductors.

Main bonding conductors shall connect the extraneous parts of the main engineering services (such as pipe-work for gas, water, central heating, or ducting for air conditioning) to the main earthing terminal.

The connections to the incoming services shall be made as close as possible to their point of entry to the building.

This bonding conductor shall have the same conductivity as that of the main bonding conductor.

Main bonding conductors shall consist of insulated stranded copper conductors with a cross-sectional area not less than 4 sq.mm.

Local bonding conductors shall, where necessary, connect extraneous conductive parts to the protective conductors.

Local bonding system shall be connected to the protective conductors of all apparatus and of socket outlets in the particular location where it is applied.

Notwithstanding the requirements of bonding to the protective conductor shall not be necessary for metal parts, which on account of their small size and disposition, are unlikely to become live in the event of a fault.

Note: Such parts may be cable clips and clamps, nameplates, short isolated lengths of metal conduit used for mechanical protection of cables, short lengths of cautionary wire supporting sheathed cables, metal chains not in contact with flexible cords used for the suspension of lighting fittings (excluding discharge type lighting fittings), metal lampshades supported by insulated lampholders.

Local bonding conductors shall consist of insulated stranded copper conductors with a cross sectional area not ness that 1.5mm$^{2.}$

Bonding conductors shall be installed in accordance with the requirements for protective conductors.

Metallic structures which form apart of bonding connections shall have conductance at least equal to that of the bonding conductors in their vicinity.

6.6 POWER CONTAINMENT SYSTEMS

Cable Tray

Cable tray runs shall be supported and fixed as stated by the manufacturers recommendations i.e. permissible cable tray load per kg per meter and liner

distance between each support. Generally cable trays shall be supported at 1200mm intervals.

Steel cable trays shall be heavy duty pattern, return flange Grade 7, perforated slotted holes, galvanised finished to comply with current B.S. 2989 – 1982, B.S. 729 – 1971.

Steel cable tray shall be of standard lengths.

Cable trays fixed to walls, be they on edge or flat, shall be supported by stand-off brackets.

Cable tray shall be spaced at least 150mm clear of piping and ducting of other services.

Perforated Metal Cable Tray

Perforated metal cable tray shall be formed from plain sheet steel indicated in the table below and finished in zinc chromate paint.

Bends shall be of the same material, thickness and finish as the cable tray and shall have an inner radius of 50mm and a straight length of 100mm at each end.

Tees shall be of the same material, thickness and finish as the cable tray.

Dimensions of Cable Tray

Width	Depth of Flange	Thickness of Steel
100mm	12mm	1 mm
150mm	12mm	1.5mm
300mm	20mm	1.5mm
600mm	50mm	2.0mm

Cable Ladder

The cable ladder system shall be complete with all necessary ladder clamps, equal tees, reducers, cable drop out, equal crosses, horizontal elbows at 90^0 and at 45^0, vertical bends and appropriate manufacturers fixing accessories.

Heavy duty cable ladder widths shall be as specified on the drawings.

Actual minimum cable ladder widths shall be as specified on the drawings.

Permissible cable load in kg per meter and linear distance between each suspension support per meter shall be in accordance wit the manufacturing

requirements. Sagging or deflection in the cable ladder system shall not be accepted by the Engineer.

Generally cable ladder shall be supported at 1200mm intervals unless specified information from the manufacturers states differently, refer to manufacturers loading graphs.

Cable ladder shall be manufactured from pre-galvanised steel sheet BS 449 (19mm).

Installation of Conduit

Conduit shall be of stranded type as specified in the NREI Part 1 clause 5.7.1 and shall be galvanised screwed throughout.

Conduit erection shall be completed before cables are drawn in. Adequate allowances shall be made for variations in building dimensions so that conduits or cables are not subjected to undue stress.

The internal surfaces of conduit installations shall have no sharp edges or protruding parts, which might damage the insulation of cables.

An inspection box of adequate size shall be provided at any point where a cable connection is made.

Conduit fittings without inspection facilities shall be used only in the following locations:

a) The ends of conduits immediately behind a lighting fitting outlet box or inspection fittings.

b) Elbows or tees located not more than 500mm from a readily accessible outlet box in a conduit run not exceeding 10m between two outlet points, provided that all other bends in that conduit run are not more than the equivalent of one right angle.

All unused conduit entries shall be sealed off and all removable covers firmly secured to complete the enclosure.

Suitable drainage outlets shall be provided at points where condensation is likely to collect. Adequate natural ventilation shall be ensured.

Conduit is considered to be an exposed conductive part, which shall be connected to the protective conductor in the installation.

Flexible metal conduit shall not be used as the protective conductor, therefore a separate earth wire shall be provided inside the conduit binding the apparatus to the solid conduit system.

Conduit runs shall be determined on site by the Contractor and agreed with the Engineer before work commences. Conduit shall be run at least 150mm clear plumbing and mechanical services.

Conduit run on the surface shall run through horizontal or vertical or parallel with the features of the building.

Conduit buried in concrete shall have at least 35mm depth of cover over its entire length. Conduit buried in plaster shall have at least 5mm depth of cover over its entire length.

The length of thread on the ends of conduit shall suit the length of internal thread in the end of the fitting or accessory. Excess length of thread will not be permitted. All threads shall be painted with metallic paint before the next fitting is screwed on and shall be screwed up tight to make a good mechanical and electrical connection.

Conduit couplings. Standard conduit couplers shall be used to terminate conduits adaptable boxes, distribution boards, switchgear, switch boxes etc. A male brass bush shall be screwed into the coupling from inside the box to make a good mechanical and electrical connection. All "running couplings" must be securely locked with locking nuts.

Conduit shall be supported at regular intervals, not exceeding 1.2m on horizontal runs and 1.5m on vertical runs. Surface supports shall be spacer bar saddles with brass fixing screws.

Conduits in chases shall be fixed by means of heavy gauge crampits at least 40mm long.

The number of cables drawn into any conduit shall be in accordance with Table B. 5m of the IEE Regulations or shall be such that a space factor of 40% is not exceeded.

Installation in Trunking

Metal trunking shall be constructed of sheet steel minimum gauge 16 s.w.g shall be anti-rust threaded i.e. zinc coated, and stove-enamel finish.

Every entry to finished trunking shall be placed to prevent ingress of moisture. All removable covers shall be securely fixed after wiring is completed.

Every trunking bend shall be of an inner radius not less than 2.5 times the minor dimension of the trunking.

Trunking shall be secured at a maximum spacing of 4m but in all cases BS 499: 1959 shall be observed with respect to deflection under load.

The continuity of the trunking system shall be maintained by copper strip securely fixed across every trunking joint.

The number of cables installed in trunking shall be such at a space factor of 35% is not exceeded.

Cables in trunking shall be laced together at 3m intervals and labelled to indicate the circuit source.

6.7 GENERAL LIGHTING AND EMERGENCY LIGHTING

General Lighting

All luminaires shall be LED.

All control gear and wiring shall be securely fixed to battens/enclosures to avoid vibration and the noise level of the complete fittings and shall be such as to ensure adequate heat dissipation under all service conditions so that tubes and control gear give optimum performance in light output and length of life.

All internal wiring shall be with copper conductors. Cables shall be clipped at intervals of not more than 100mm and a standard colour code shall be used for the wiring of all fittings. The following colours shall be used:

Phase/live	-	Red/Brown
Neutral	-	Black/Blue
Control Gear	-	Any identifiable colours other than above.

The wiring shall terminate in a three way fixed terminal block located adjacent to the point of entry of the supply cables and suitable for connection of main incoming supply. Fittings shall have fused terminal blocks with correctly rated fuses type BS 1362 to match the complete electrical load of each fitting.

All fittings shall be suitable for operation on 230 volts, 50Hz, A.C. supply.

All fittings shall be fully tested following assembly of the complete unit and guaranteed for twelve months against faulty workmanship and materials.

The design of all enclosed/recessed fittings shall be such that the light from the fitting is evenly diffused over the complete surface area of the diffuser and that the fittings are dust and insect proof – minimum IP 40.

All fittings shall be so designed that maintenance or replacement of parts/accessories can be easily carried out from the underside of the fitting following removal of the diffuser.

The tender shall state the BZ classification of each fitting listed in the attached schedule.

Emergency/General Luminaires

The luminaires and lamp standards shall be supplied in accordance with the attached schedule.

A quantity of the various lamps used on the project amounting to 5% of the total number of each lamp type shall be supplied under the Contract and handed over to the Client on final completion of the Contract.

Lighting Sub-Circuits

The general lighting installation shall be carried out in copper stranded core 1.5 sq.mm (unless otherwise stated).

Where false ceilings are installed, the final connection to each luminaire shall be via KLIK units.

Final length of each flexible connection shall not exceed 1000mm.

Lighting load per circuit shall not exceed 1kw unless indicated otherwise. Contactor controlled circuits and photo electric cell-controlled circuits are as indicated on the drawings.

The conduit system shall not be relied upon for earth continuity and a separate earth continuity conductor shall be run throughout the conduit and trunking distribution system.

Emergency Lighting System

The Emergency Lighting System will be designed and manufactured to comply with the following standards:

IS3217: CODE OF PRACTICE FOR EMERGENCY LIGHTING

All luminaries are to be designed and tested to comply with IEC 598, BS 4533, EN 60.598 and ICEL 1001. Manufacture to be in accordance with BS 5750 Part 2 quality systems.

The emergency lighting design is to indicate clearly all escape routes under normal power failures.

Emergency luminaries shall be positioned to ensure all fire call points and fire fighting equipment can be readily located.

The minimum illuminance for the following shall be adhered to:

Defined escape route: not less than 1.0lux
Undefined escape routes: not less than 0 .5 lux.

Under emergency light conditions, the illuminance shall not fall below 0.5 lux.

The emergency lighting system shall comprise self-contained emergency fittings. Self-contained emergency luminaires are to be maintained/non-maintained as scheduled.

Each self contained luminaries will comply with European Directives and BS5266. This states that emergency lighting is maintained and tested in accordance with the following test procedure.

Daily: Check indicator light and all maintained luminaries for correct operation.

Monthly: Test for a short period not exceeding a quarter of the rated duration.

Six Monthly: Test as above for at least one hour of 3 hour rated systems or for a quarter of the rated duration.

Annually: Test as above for full duration.

Subsequently: Test yearly for the full duration.

The wiring of the emergency luminaries shall be carried out in accordance with IS3217:1989 and the IEE wiring regulations and statutory requirements applicable to the type of building. The Electrical Contractor shall make their self aware of all local byelaws and regulations.

All cabling used shall be LSF insulated cable.

The source of supply shall be from the same local protective device as that of the normal lighting.

Each fitting shall be fitted with 12V nickel cadmium battery unit with 3 minimum capacity, 14 hour recharge time, 220V, 50Hz mains supply fully automatic solid state charging control unit. The fitting shall be fitted with a warning light to indicate that all circuiting is complete and correctly and intensively tested sealed relay to automatically switch the battery set into circuit on mains failures.

All batteries shall be rated for at least 4 years of normal operation.

All exit signs shall be fitted with signs complying to the European Sign Directive Format (Health & Safety) (Signs & Signals Regulations 1996). Unless being used to extend an existing installation when they may be the same format as those previously fitted if complying to BS 5499 (Part 1).

The viewing distance of any exit sign shall not be more than 200 times the height of the sign if internally illuminated or 100 times the height of the sign if externally illuminated.

Each luminaire is to be wired to normally closed mulli-pole relay, which are energised by a central test unit to interrupt the supply.

1 No. emergency lighting test unit shall be installed within each final board. A main central test unit shall be provided at the main board location.

External Lighting

The Contractor shall include for the rewiring of the external lighting installation as indicated on the drawings. He shall include for the supply, delivery to site and erection of all luminaires as shown. All luminaires shall be manufactured to IP 55 and shall have local photo electric cells and isolating contactors fitted to automatically isolate lighting at times when natural lighting is adequate.

Control of the lighting shall be by means of photoelectric cell and time clock as supplied and installed by the electrical contractor.

All external doorways shall have vandal-proof bulkhead light fittings mounted overhead with local switching just inside the doorway. These shall be complete with emergency lamps and remote inverter packs ad indicated on the drawings.

The electrical contractor will liaise with the building contractor to ensure that sufficient ducting is installed to allow installation of the external lighting. The setting out and location of the lighting will be agreed on site during the works.

6.8 FIRE DETECTION SYSTEM

The Contractor shall include for the alteration works including Installation removing of three number void detectors, testing and commissioning of the fire alarm system, demonstrating the operation of the equipment to the Client's representatives, handing over Maintenance Manuals, Test Certificates and Working Drawings.

The system shall be designed installed, tested and commissioned in accordance with IS 3218 to standard L1.

An L1 type automatic fire alarm and detection system of the addressable/analogue type shall be provided by the Contractor. Its purpose will be:

The primary purpose of the fire alarm system shall be to give warning to staff in order that appropriate action may be taken in the event of a fire.

The fire alarm system shall be arranged such that the operation of any contact in each zone shall automatically activate a continuous signal in that zone.

Buzzers/bells pulse signal will sound in adjacent zones and on levels above and below. The contractor shall develop the C&E matrix and issue for review by the engineer.

In the event of assistance-evacuation being required the operation of a bias switch on each alpha-numeric panel will alert staff via the main analogue display panel. This bias switch will always operate when a fire call is registered on the panel.

The system shall comprise control and indicating equipment, fire detectors, break glass units and alarm sounders. The system shall be configured using the loop principal enabling bi-directional communication with all detection devices. The system shall operate on a programme loaded onto the system by the specialist supplier at the appropriate time. The cost of the programme, its setting up, downloading and debugging shall be included by the Contractor.

It shall be wired in 1.5 sq mm PH120 cable for detector circuits and 2.5 sq. mm PH120 cable for sounder circuits, red LSF sheathed in the ceiling voids and concealed behind architectural features to serve break glass units and alarm sounders. The cabling shall be segregated throughout its routes.

The system shall generally consist of the following:-

Main control panels with fire loops and alpha numeric display located generally as indicated on the drawings.

Main network repeater panels with alpha numeric display located at the main entrances and giving details of all addressable devices.

Addressable trigger devices consisting of smoke detectors, heat detectors and manual call points. Automatic detectors shall provide an analogue output.

Alarm sounders consisting of normal and low tone bells and buzzers.

Automatic closing programmed smoke doors.

The central equipment shall have the following capabilities/functions:-

Constantly interrogate each addressable trigger devices at 3 second intervals, assess its operation and in the event of an address entering in abnormal condition, initiate an alarm. This alarm shall identify the individual address and the status of the abnormal condition in three grades.

- Pre-warning;
- Alarm
- Fault

Constantly monitored trigger circuits with 8 sounder outputs as standard expandable up to a minimum of 16 and again, in the event of a fault occurring initiate an alarm.

All devices shall be continually monitored for operation/sensitivity, a pre-alarm being raised if any device is disconnected or nears a fail safe limit due to contamination.

Smoke detectors, heat detector break-glass units and alarm sounders shall be installed in accordance with the sitting recommendations of the standard.

The number of sounders on one circuit shall be limited by the system as advised by the specialist supplier.

In installing the system, the Contractor shall arrange the detection loops to ensure that adequate capacity is left on the loop for additional use and that the length of such loops is not exceeded due to providing coverage to the remote buildings.

The fire alarm panel shall be selected with capacity for at least one additional loop card over and above those required for the building itself.

Audible alarm sounders shall be of electronic siren and shall be suitable for internal or external use as appropriate to their location.

The fire alarm system shall incorporate a 'walk test' relay unit. This unit shall be mounted adjacent to the alarm panel and shall be key operated. When the key is used, the following shall occur during testing of the fire alarm system :-

The fact that the walk test unit has been activated shall be signalled to the central monitoring station.

Any alarm activated during the test period will not be signalled to the central monitoring station.

When an alarm is activated during the test, an adjustable timing relay in the unit will automatically silence the alarm sounders within the building after a preset time period.

The central monitoring panel shall incorporate relays or signalling facilities for the means of initiating action by the electromechanical and security systems.

Direct hard wired (in the same type of wiring as sounder circuits) connections shall be made to:

Fire fans so to start them up and damper controls.
Release security doors.

The Contractor shall supply and install a 4-pair B.M.S. cable from the walk test unit and status relays in the fire alarm panel to the B.M.S. outstation in the plant room. These relays shall signal to the central monitoring station, the status of each fire zone, common fault/fire conditions and walk test in progress. The cable will be terminated at the outstation by others.

Except where modified by this specification and any other related document, the fire alarm and detection system shall be designed, installed, tested and commissioned in accordance with the general principles and technical guidance of IS 3218. The system shall be tested and commissioned by the manufacturer and an acceptance certificate shall be issued to the Engineer upon completion.

A diagram or zone identification drawing shall be provided in a timber frame giving clear indication of the various fire alarm zones. This shall be wall mounted adjacent to the main control panels and main repeater panels.

The normal power supply for the system shall be derived from the local distribution board by means of an MCB suitably labelled and supplying no other circuits. With an unswitched fused spur next to the panel standby power supply shall be provided by means of a secondary battery with automatic charger. The battery shall be of a type that has a long life (not less than four years) under the conditions of use likely to be experienced in the system.

Circuits for the system shall not be grouped together nor installed in the same conduit to trunking as circuits for other LV/ELV to telecommunication services.

Manual call points shall be located as indicated or as agreed and where internal finishes permit shall be flush mounted in locations where they will be readily seen.

However, where they will be viewed from the side (e.g. in corridors) they shall be surface mounted, or semi-recessed, in order to present a side profile area of not less the 750 mm^2 (ref. IS EN 54).

Unless otherwise indicated or agreed, automatic fire detectors, audible and visual alarm devices shall be located as indicated; detectors shall be surface mounted in flush circular boxes; audible devices shall be likewise and visual devices shall be flush mounted.

Before commencing the wiring installation, the Contractor shall have in his possession a wiring diagram purpose made for this installation, prepared by the specialist supplier and approved by the Engineer.

The Contractor shall carry out commissioning of the system in liaison with the specialist supplier. The commissioning of the system shall be programme in such a way that each stage of the exercise is carried out in a logical manner

Inspection of installation.

Insulation and earthing tests of all cables and wires (generally this will be carried out in the course of cable installation).

Initial operational testing.

Full commissioning test.

Using a 500V d.c. test instrument, insulation tests to earth and between conductors shall be carried out in accordance with IS10101, by the Contractor. All the apparatus shall be disconnected so as not to damage any items of sensitive electronic circuits or equipment. All tests shall be noted in the logbook. Wiring that has been subject to a test with a 500V Megger shall be discharged to earth before being connected into electronic equipment as the electricity stored between the cores and the sheath or between the cores will be sufficient to destroy sensitive micro-circuits.

Earth continuity and earth loop impedance tests (where appropriate) shall be made in accordance with IS10101 and noted in the logbook.

In addition to those stated above, the system shall also comply with the following requirements:

The system shall identify, locate and log each event using analogue addressable detectors and field devices and integral printer for hard copy, including date and time function.

Fire detectors shall transmit "voltage out current back" digital signals directly proportional to smoke or heat present at each detector.

Each type of device shall have its own "type" signal.

Smoke detectors operating on the photo-optical and ionisation principles shall be available. Heat detectors shall be used where smoke detectors are not suitable.

All detectors shall be interchangeable on an electronics-free facility.

All field devices shall have means to periodically test their capability to transmit a fire signal automatically.

Manual call point operation shall produce an alarm within 1 second and have an integral alarm LED. Short circuit isolators shall be used to limit loss of communication to a maximum of 15 no. field devices. Faults shall be indicated on the panel.

Each detector shall have an integral LED for alarm purposes.

Conventional detectors used in the system, if any, shall be connected via a group address device.

The control unit shall have the facility to print all-event history including corrupt transmissions and detector maintenance data.

The specialist supplier shall commission the system.

Records including drawings and logbook shall be prepared and provided by the Contractor.

Interconnection with access control system to ensure fail-safe.

The Contractor shall include for the supply, installation, testing, commissioning, certification, and hand-over of the fire detection and alarm system and for the adequate instruction and training of the Employer's staff.

The fire detection and alarm will be designed and manufactured to comply with the following standards:

IS3218	Code of Practice for Fire Detection and Alarm Systems for Buildings – System Design, Installation and Servicing.
EN 54 pt 2	Control and indicating equipment
EN 54 pt 4	Power supply Equipment
EN 54 pt 4	Heat Sensitive Detectors-point detectors containing a static element

EN 54 pt 7 Specification for point-type detectors using scattered light, transmitted light or ionization
EN 54 pt 8 Specification for High temperature Heat detectors

Description of System and Equipment

Smoke Detectors

Smoke Sensors shall be intelligent and addressable devices and shall connect with two wires to one of the C.I.E. Signalling Line Circuit loops. Up to 99 intelligent Sensors may connect to one SLC loop.

The Sensors shall use the photoelectric (light-scattering) principal to measure smoke density and shall, on command from the C.I.E, send data to the panel representing the analogue level of smoke density.

The Sensors shall be ceiling-mount and shall include a twist-lock base.

The Sensors shall provide a means of test whereby they will simulate an alarm condition and report that condition to the C.I.E. Such a test may be initiated at the Sensor itself (by activating a magnetic switch) or initiated remotely on command from the control panel.

The Sensors shall provide address-setting on the Sensor head using decimal switches. Addressable Sensors that use binary address setting methods, such as a dip switch, code cards or soft addressing are not acceptable. The Sensors shall also feature an internal identifying code that the control panel shall use to identify the type of Sensor.

The Sensors shall provide dual LEDs. Both LEDs shall flash under normal conditions, indicating that the Sensor is operational and in regular communication with the C.I.E. Both LEDs may be placed into steady illumination by the C.I.E, indicating that an alarm condition has been detected. If required, the flashing mode operation of the Sensor LEDs shall be controlled through the system field program. An output connection shall also be provided in the base to connect an external remote alarm LED.

The Sensor sensitivity shall be set through the C.I.E, and shall be adjustable in the field through the field programming of the system. Sensitivity may be automatically adjusted by the panel on a time-of-day basis.

Using software in the C.I.E, the Sensors may automatically compensate for dust accumulation and other slow environmental changes that may affect their

performance. The detectors shall be listed by LPCB as meeting the calibrated sensitivity test requirements of (EN) BS 5445:Pt.7

View Detectors

High Sensitivity Point-type Detectors in electrical rooms.

The Sensors shall use the on-board laser to measure products of combustion and discriminate against false alarms and shall, on command from the C.I.E, send data to the panel representing the analogue level of products of combustion.

The Sensors shall be ceiling-mount and shall include a twist-lock base.

The Sensors shall provide a means of test whereby they will simulate an alarm condition and report that condition to the C.I.E. Such a test may be initiated at the Sensor itself, by activating a magnetic switch, or may be activated remotely on command from the C.I.E.

The Sensors shall provide address-setting on the Sensor head using decimal switches. Addressable Sensors that use binary address setting methods, such as a dip switch, code cards or soft addressing are not acceptable. The Sensors shall also feature an internal identifying code that the control panel shall use to identify the type of Sensor.

The Sensors shall provide dual LEDs. Both LEDs shall flash under normal conditions, indicating that the Sensor is operational and in regular communication with the C.I.E. Both LEDs may be placed into steady illumination by the C.I.E, indicating that an alarm condition has been detected. If required, the flashing mode operation of the Sensor LEDs shall be controlled through the system field program. An output connection shall also be provided in the base to connect an external remote alarm LED.

The Sensor sensitivity shall be set through the C.I.E, and shall be adjustable in the field through the field programming of the system. Sensitivity may be automatically adjusted to the panel on a time-of-day basis.

Heat Detectors

Heat Sensors shall be intelligent and addressable devices, and shall connect with two wires to one of the C.I.E. Signalling Line Circuits. Up to 99 intelligent heat Sensors may connect to one SLC loop.

The Sensors shall use an electronic sensor to measure thermal conditions caused by a fire and shall, on command from the C.I.E, send data to the panel representing the analogue level the temperature at the sensor.

The Sensors shall be ceiling-mount and shall include a twist-lock base.

The Sensors shall provide a means of test whereby they will simulate an alarm condition and report that condition to the C.I.E. Such a test may be initiated at the Sensors itself (by activating a magnetic switch) or initiated remotely on command from the C.I.E.

The Sensors shall provide address-setting on the Sensor head using decimal switches. Addressable Sensors that use binary address setting methods, such as a dip-switch, code cards or soft addressing are not acceptable. The Sensors shall also store an internal identifying code that the control panel shall use to identify the type of Sensor.

The Sensors shall provide dual LEDs. Both LEDs shall flash under normal conditions, indicating that the Sensor is operational and in regular communication with the C.I.E. Both LEDs may be placed into steady illumination by the C.I.E, indicating that an alarm condition has been detected. If required, the flashing mode operation of the Sensor LEDs shall be controlled through the system field program.

Manual Call Points

Addressable Manual Call Points shall be provided to connect to the Fire Alarm Control Panel Signalling Line Circuit (SLC) Loops.

The Manual Call Points shall, on command from the Control Panel, send data to the panel representing the state of the manual switch. Manual Fire Alarm Call Points shall use a key operated test without the need to break the glass, and shall be designed so that after Emergency operation, they cannot be restored to normal use except by the replacement of the glass element.

All operated stations shall have a positive, visual indication of operation by means of an LED indicator.

Manual Call Points shall be constructed of flame retardant plastic with clearly visible operating instructions provided on the glass.

Manual Call Points shall be suitable for surface mounting, or semi-flush mounting as shown on the plans.

The Manual Call Points shall provide address-setting means using decimal switches. Addressable Manual Call Points that use binary address setting methods, such as a dip switch or soft addressing are not acceptable.

Monitor Modules

Addressable Monitor Modules shall be provided to connect one supervised area of conventional Alarm Initiating Devices (any N.O. volt free contact device) to one of the C.I.E. Signalling Line Circuit (SLC) Loops.

The Monitor Module shall mount in a purpose made surface mount box.

The Monitor Modules shall provide address-setting on the Module using decimal switches. Addressable Modules that use binary address setting methods, such as a dip switch, code cards or soft addressing are not acceptable. The modules shall also feature an internal identifying code that the control panel shall use to identify the type of Module.

In areas with restricted access, the Monitor Module shall be available in a miniature version.

Programmable Outputs

Addressable Control Modules shall be provided to supervise and control the operation of one conventional indicating circuit of compatible, 24 VDC powered, polarised audio/visual indicating appliances. For fan shutdown and other auxiliary control functions, the control module may be set to operate as a Volt Free relay contact.

The Control Module shall mount in a purpose made surface mount box.

The indicating circuit may be wired for a maximum of 1 Amp (Inductive) or 2 Amps of Resistive A/V Signal operation, or as a Volt Free Contact (Form C) Relay. The relay coil shall be magnetically latched to reduce wiring connection requirements, and to ensure that 100% of all auxiliary relay or indicating circuits may be energised at the same time on the same SLC.

Audio/visual power shall be provided by a separate supervised power loop from the main C.I.E. or from a supervised remote power supply.

The Control Modules shall provide address-setting on the module using decimal switches. Addressable Modules that use binary address setting methods, such as a dip switch, code cards or soft addressing are not acceptable. The modules shall also feature an internal identifying code that the control panel shall use to identify the type of module.

All field equipment to be installed as per spacings and other considerations outlined in IS3218. This includes positioning a detector within 1.5m of every lift shaft.

All field equipment to be described in the fire alarm program in a manner to be agreed with the client.

Handover

The electrical sub-contractor will co-ordinate commissioning and testing of the fire alarm system.

The system will be fully tested prior to hand-over

All smoke detectors will be tested with artificial smoke
All heat detectors will be tested with heat.
The control panel to be commissioned as per manufacturers recommendations and batteries to be sized according to manufacturers recommendations.
A record of testing will be retained and handed over as part of the final document package.

The sub-contractor will provide 3 sets of Fire Alarm hand-over documents including equipment data-sheets and operational manuals, also as-built drawings.

The specialist supplier will submit a maintenance contract for routine testing as specified in IS3218.

6.10 NURSE CALL SYSTEM

The electrical contractor shall be responsible for all cabling within the building to facilitate the upgrade works.

All cables shall be contained within conduit and trunking.

Final terminations carried out on control cables by named specialist installer.

Refer to drawings for details and schedules in this document for full details

The points to be included are nurse call points, toilet pull cords and indicator lights.

The indicator lights will be wired independently from the nurse call unit from the nearest existing indicator light. The nurse call point in the bedroom shall be wireless to the main receiver, the toilet alarm will be wired to the bedroom nurse call point by 4c screened cable.

6.11 TESTING AND CERTIFICATION/VERIFICATION

The Contractor shall witness at the manufacturer all of the electrical tests carried on all plant and equipment.

The Engineer will select at random and cross check test results obtained by the Contractor. Electrical installation commissioning tests carried out on site.

Switchgear

Routing tests carried out to IEC 439 and IS10101 works prior to dispatch to site:

- Insulation Tests
- Functional Tests
- Continuity Tests
- Visual Inspection Test
- Equipment Type Test Certificate

The testing and commissioning on all electrical circuits shall be carried out in accordance with the is10101 National Wiring Rules.

The Contractor shall carry out the following tests:

Visual Inspection

A visual inspection shall be made of the completed installation in order to verify that it complies generally with IS10101.

Where inspection of certain parts would not be practicable in a completed installation these shall be inspected during the course of erection.

Visual inspection shall precede testing and normally be carried out with the installation disconnected.

Continuity of Conductors

Continuity of protective conductors and equipotential bonding conductors.

A continuity test shall be made in accordance with Annex 61A in order t verify that they are electrically sound and correctly connected.

Insulation Resistance of the Electrical Installation

The insulation resistance between each live conductor and the protective conductor shall be not less than appropriate value given in Table 61A when tested at the specified voltage.

Protection by Separation of Circuits

The separation of circuits shall be verified in accordance with:

- SELV
- PELV
- Electrical Separation

Verification of Conditions for Automatic Disconnection of Supply including Earthing and Bonding

Verification of the efficacy of the measures for protection against indirect contact by automatic disconnection of supply including earthing and equipotential bonding shall be made as specified below.

Polarity Verification and Test

The identity of each phase and neutral conductor shall be verified.

It shall be verified that no fuse, single-pole switch or single-pole control device is installed in a neutral conductor.

It shall be verified that the incoming phase conductor is connected to the back contact of each screw-in fuse.

The polarity of connections to wiring accessories such as socket-outlets shall be verified for compliance with the manufacturer's instructions or markings.

Connections for 3 phase motors shall be checked for correct direction of rotation.

Electrical Strength Tests

A test shall be made on equipment built or modified on site and not type tested, for example, site built busbar assemblies. A voltage test shall be carried out in accordance with the relevant standards.
Protective devices shall, where necessary, be submitted to functional tests to check that they are properly installed and adjusted.

Submittals of Test Certificates

The contractor shall produce test certs for all tests carried out indicating test results. Each test cert. shall be signed by the contractor.

All signed test certs. and commissioning certs. shall be included in the Operational Maintenance Manuals.

6.12 LABELLING

All socket outlets, spur outlets and general power outlets shall be identified at the outlet with suitable engraved labels.

Labels shall be white IVORINE type with black lettering.

Labels shall be screwed to walls adjacent to each outlet using brass round head screws.

Each label shall contain the circuit for the outlet and the distribution centre from which it is derived i.e. DC1/S/R1 for socket circuit.

All cables will be labelled at its origin and its final termination point. The cable label will include the following information – the size and type of the cable, the cables distribution board reference and the final destination for the cable. The label will be attached to the cable with cable ties. All protective devices shall be clearly labelled so that the circuit being protected may be easily recognised. The main switchboard will also be clearly labelled. The label will consist of a 100 x 60mm white IVORINE with black text. The label will clearly indicate the purpose of the switchgear units.

All isolators shall be clearly labelled to indicate their specific purpose. The voltage rating of each isolator will also be indicated.

Electrical distribution boards and boxes, cable link boxes, switchgear, control gear and all other such apparatus shall have plastic labels.

6.13 MAINTENANCE MANUALS

The Contractor shall include in his tender for the supply of 1 No. sets of operating maintenance manuals for all items of equipment supplied under this contract.

These manuals shall also indicate the manufacturer or his agent where spare parts etc. can be obtained.

1 No. complete sets of Record Drawings, A1 Drawings and Electronic Compact discs shall also be provided.

6.14 COMPLETION AND HANDOVER

GENERAL

This section details the requirements and procedures for completion and handover.

Handover Requirements

As a pre-requisite to Practical Completion in respect of the contract works or part thereof, demonstrate to the satisfaction of the Architect that:

- All the contract works are completed
- With the exception of minor snags or limited defects as agreed with the Architect that could be reasonably completed within an agreed programme without causing disruption to the Employer's use of the building or part thereof.
- All spares, keys, tools and other consumables as stated elsewhere have been supplied and handed over to the Employer
- The instruction of the Employer's staff in the use and correct operation of the installation has been completed satisfactorily. In particular, safety devices and controls demonstration
- All commissioning and testing completed including the issue of a final commissioning report signed by an approved competent person
- A complete demonstration of the contract works with fully functional operational controls tested has been undertaken in the presence and to the satisfaction of the Architect
- All necessary certification by the Employer's insurers has been completed
- All approved record documentation including record drawings, operation and maintenance manuals, etc., is issued
- All information required for the health and safety file is issued to the satisfaction of the Planning Supervisor.

The information shall include:

- A written description of plant operation
- Control strategy/logic diagrams recording the final version of configuration software installed at handover.
- Details of system application software configuration
- A points list including hard and soft-points (all points should have a unique mnemonic)
- A description of user adjustable points
- Commissioning record details
- Detailed data sheets for all control components and equipment
- Wiring circuit details including origin, route and destination of each cable
- Basic security access to the system
- Comprehensive instructions for switching on, operation, switching off, isolation, fault finding and procedures for dealing with emergency conditions
- Instructions for any precautionary measures necessary
- Instructions for the routine operation of the control system including simple day-to-day guidance for those with limited technical skill
- Instruction for servicing and system upkeep
- A provision for update and modification
- All necessary Statutory Authority approvals have been undertaken and written confirmation established

- Completion and issue of log books in accordance with Building Regulations. In accordance with CIBSE TM31 Building Log Book (Toolkit (standard templates)
- Air permeability test certificate in accordance with Building Regulations
- Should adequate record documentation not be available Practical Completion will not be granted

Reading of Meters

Record readings of all water, gas and electricity meters immediately on completion of the works and forward to the Architect

Initial Supply of Additional Spare Parts

Submit to the Client a quotation, priced in detail, for the initial supply to the Employer of the additional spare parts identified elsewhere and including for:

- Checking that each spare part is suitable for the replacement of the corresponding part supplied with the item of plant or equipment
- Checking receipt, marking and numbering in accordance with the schedule of spare parts
- Referencing to the plant and equipment list in the operation and maintenance manual
- Painting, greasing, etc., and packing to prevent deterioration during storage
- Time scale
- Within weeks of request (no) 3

Recommended Tools

Prior to Practical Completion submit to the Architect a schedule of tools and portable instruments as stated elsewhere and recommend any that should be obtained and kept in stock by the Employer for maintenance of the installations included in the works.

Time scale – weeks before Practical Completion (no) 3

- State against each item the manufacturer's current price, including packaging and delivery to site

Identify those items that are additional to those specified for inclusion as stated elsewhere

- Submit to the Architect a quotation, priced in detail, for the initial supply to the Employer of the additional tools identified under the clause headed 'recommended tools'

Include for the following:

- Checking that each item is suitable for the intended application
- Checking receipt, marking and identifying
- Referencing, where appropriate, to the plant and equipment list in the Operation and Maintenance Manual
- Protecting, greasing, etc., and packing to prevent deterioration
- Providing a suitable means of storing and securing same
- Time scale – within number of weeks of request 3

Training of Employer's Staff

Prior to Practical Completion explain and demonstrate the purpose, function and operation of the installations including all items and procedures listed in the operation and maintenance manual

- to the Employer's maintenance staff
- to the operational staff

Submit to the Architect for approval a detailed programme for the training of the Employer's staff

Time scale – weeks before commencement of training (no) 3

- Employ the services of relevant specialists and suppliers for the purpose of training and instruction

- Provide each person with a comprehensive set of teaching notes and diagrams

- Be responsible for the correct operation and maintenance of the installation during such periods of instruction.

- All costs associated with the instruction of the Employer's personnel and required attendance following practical completion shall be included in the contract price

- Following practical completion and occupation be available for a period as agreed with the Architect to assist the Employer's personnel in the operation of the various system together with the

    - controls specialist
    - commissioning specialist

Training

- Number of persons to be included for training is 3

- Include for not less than indicated number of operating days for this purpose and demonstrate the safe day to day running and maintenance of all systems, plant and equipment

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

- Carry out initial training at the works of the controls supplier
- Include hands on experience of equipment and software similar to the installation
- Include instruction on the procedures for testing and routine inspection of sensors and actuators to enable the operator to assess the nature of faults and extent of remedial action required
- Provide all appropriate reference and training manuals
- Complete initial instruction prior to commissioning of the installed system
- Provide site instruction on the installed system
- Include for training operating staff (no) 3
- Include for not less than indicated number of operating days for this purpose and demonstrate the safe day to day running and maintenance of all systems, plant and equipment

Operation of Systems Before the Production of Drawings and/or Operating and Maintenance Manuals

- Provide attendance, at no expense to the Employer, to put into service, operate 24 hours a day and maintain the systems to the Employer's requirements, including the provision of suitable competent labour, in the event that the Record Drawings and/or Maintenance Manuals are not available when the works would, in the opinion of the Architect, otherwise qualify for Practical Completion.

- In the event of the Sub-Contractor failing to provide this service satisfactorily the Employer shall be entitled to make his own arrangements and recover the full cost through.

6.15 GUARANTEE

The Tenderer shall be responsible for and shall repair, at his own expense, any equipment which proves to be defective – in the Engineer's opinion – with respect to materials, workmanship or design, which defects become apparent within 12 (twelve) months from the date of practical completion of the Main Contract.

The Contractor shall be responsible for full maintenance and servicing of all plant including bi-monthly, quarterly inspections of the fire safety systems.

The Contractor shall be responsible for replacement parts or recommended by supplier for the first twelve months after handover to the Client.