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TECHNICAL SPECIFICATION FOR ELECTRICAL SERVICES

PROJECT	**PROPOSED EXTENSION TO EXISTING BUILDING-CRYO LAB**
CLIENT	**PACIFIC COMMUNITY**
PROJECT LOCATION	FNTC ROAD 2, NASINU.
ISSUE STATUS	TENDER ISSUE
PROJECT REFERENCE	3885
DOCUMENT REFERENCE	3885-ELEC SPEC-T1-2023.01.18.DOC

REVISION HISTORY

DATE	VERSION	ISSUE STATUS	AUTHOR SIGN OFF	QA SIGN OFF	FINAL SIGN OFF
2021.01.18	T1	TENDER ISSUE	NP	KB	N/A

1.0 GENERAL

For the purpose of this specification the following definitions apply:

The term “Project” shall be as defined on the tender schedule.

The term “Site” shall mean the location defined on the tender schedule where the Project will occur.

The term “Employer, Client, Principal, and Owner” shall be as defined on the tender schedule.

The term “Project Manager” shall be as defined on the tender schedule.

The term “Architect” shall be as defined on the tender schedule.

The term “Structural Engineer” shall be as defined on the tender schedule.

The term “Services Engineer” shall mean **Edison Consultants Limited.**

The term “Builder" shall mean the company appointed to carry out the main building works for the project.

The term “Electrical Utility Company" shall mean the organisation defined on the tender schedule that supply electricity to the community.

The term “Telecom Utility Company" shall mean the organisation defined on the tender schedule that supplies telecommunication services to the community.

The term “Water Utility Company" shall mean the organisation defined on the tender schedule that supply water to the community.

The terms “Contractor, Tenderer, Nominated Sub-Contractor” shall mean the company bidding for and having subsequently been accepted to carry out the works in this specification.

The term “Contract” or “Sub-Contract” shall mean the works included in this specification and the accompanying engineering drawings, Contract Specifications and relevant Australian and New Zealand Standards to which the project shall be built. The most updated version of the Australian standards shall apply during the period of construction, and this shall supersede the relevant standards version applicable at the time of tendering and contract negotiations.

“Approved” shall mean subject to the inspection and written approval of the Services Engineer before being worked or fitted into the Contract works.

“Indicated” shall mean as indicated in the Contract drawings and specification and by notes, figures, sketches or writing, thereon or by any combination thereof.

1.1 INTRODUCTION

This specification details the requirements for **ELECTRICAL SERVICES** for the supply, installation and commissioning of electrical services. The Electrical Services covers the supply, installation and commissioning of all electrical works depicted on the engineering drawings and all other works necessary to implement this specification.

The Drawings and Specification identify the system, concepts, design and standards of performance and quality required, but do not purport to identify all problem areas and their solution, which shall be the responsibility of the Contractor. By submitting a tender, the tenderer warrants that it is competent in the construction of works of the type specified, and that all work will be suitable for the intended purpose and complying with all relevant statutory regulations.

All sundry and incidental works or equipment necessary for the satisfactory completion of the work shall be

allowed in the pricing submission even if it is not specifically nominated in this documentation.

The electrical contractor shall note that power shall be made available for construction by the electrical contractor. The electrical contractor shall allow for temporary power supply on site including permits with EFL, metering enclosure and protection and isolation works involved with the temporary power supply. This shall be done in accordance with the construction program and all other related services in time for testing and commissioning. The contractor shall advise in good time if there are problems in achieving this, otherwise any costs due to delays shall be at the contractors account.

The scope of work is to include the supply of all labour, installation, testing and commissioning, certification and twelve months (12) warranty and servicing for the electrical and communication services (hereafter called electrical services).

Certify monthly during construction and at practical and final completion that the as constructed works and plant commissioning has been carried out in full accordance with the accepted design, this design brief and specifications and contract drawings and all the necessary codes applicable at the time of construction to ensure that the installation is fit for purpose. This certification is to be provided to the Superintendent through a monthly compliance report addressed directly to the superintendent.

Certificates of compliance for the installation are to be provided to the Engineer prior to acceptance of the completed installation.

1.2 DESCRIPTION OF PROJECT

The description of the project will be defined in the tender schedule.

1.3 REFERENCE DOCUMENTS

This specification is to be read with conjunction in all relevant reference documents and engineering drawings that are part of this project. All work covered by this specification shall be subject to all provisions of the Conditions of Contract.

1.4 STANDARDS AND CODES OF PRACTICE

Standards of workmanship, materials, and details of construction are to conform to the relevant Fiji, Australian and New Zealand Standards with any amendments unless specifically noted in this specification and drawings.

All work in respect to materials and workmanship shall meet or exceed relevant local and overseas engineering standards, best practices and recommended methods. In particular, relevant applicable sections of the following standards shall be deemed part of this specification.

All works shall comply with the following major standards as well as other codes called upon in this specification:

1.3.1	The National Building Code, Fiji
1.3.2	Local Municipal Authority Regulations
1.3.3	Health and Safety Regulations
1.3.4	AS3000 (AS3000 - 2018)
1.3.5	Energy Fiji Limited Regulations
1.3.6	Telecom Fiji Limited's Regulations

1.3.7	Requirements of the Dangerous Goods Regulations
1.3.8	AS3008.1.1-1998 : Electrical Installations – Selection of Cables
1.3.9	NZS 4219:(1983) - Specification for Seismic Resistance of Engineering Systems in Buildings
1.3.10	NZS 4203 - Code of Practice or General Structure Design and Design Loadings for Buildings.
1.3.11	AS 3147: Electrical Cables –approved and test specification
	AS 2184:1985 Low Voltage switchgear – moulded case circuit breakers to 600VAC
1.3.12	AS 3439.1: Low Voltage Switchgear and Control Gear Assemblies - General
1.3.13	AS3439.3 : Low Voltage Switchgear and Control Gear Assemblies – Distribution Boards
1.3.14	AS/NZS 4506 : Metal Finishing – Thermostat Powder Coatings
1.3.15	AS1939 : Degrees of Protection – Electrical Enclosures
1.3.16	NZS 4232 - Performance Criteria for Fire Resisting Enclosures.
	AS 4111:1993 – Starters for fluorescent lights
1.3.17	AS 3080 : Integrated communications cabling systems for commercial premises (latest edition)
1.3.18	AS 3084 : Telecommunications installations-Telecommunications pathways and spaces for commercial buildings (latest edition)
1.3.19	ANSI/TIA/EIA-568A : Commercial Building Telecommunications Cabling Standard
1.3.20	ANSI/TIA/EIA-569 : Commercial Building Standard for Telecommunication Pathways and Spaces
1.3.21	AS/NZS 1680
1.3.22	AS 4000: 1997 General Conditions of Contract
1.3.23	AS/NZS 3000: 2007 – Wiring Rules
1.3.24	AS/NZS 3008: 1997 - Selection of Cables

1.4 CONTRACTORS TO INFORM THEMSELVES

The Contractor shall familiarise themselves with the site and the requirements of this specification before tendering. No allowance shall be given for the lack of knowledge of the site conditions and the requirements of this specification. Any queries with the requirements of the specification shall be brought to the Engineer's attention prior to tendering for clarification. The Contractor shall be fully responsible for meeting the requirements of the specification thereafter.

The contractor shall be fully responsible for on site security of materials and liaise with the builder on any further security/material storage measures set in place by the builder.

The Contractor shall be responsible for obtaining progress and final EFL inspections, EFL permits and approvals for this work, the costs of the same shall be included in the tender price.

Full allowance shall be made in the tender price for all costs, including taxes, duties, local authority fees and any other applicable costs.

1.4.1 Familiarity with Project Requirements and Site Conditions

It shall be the Contractor's responsibility to inspect the job site and become familiar with the conditions under which the work will be performed. Inspection of the site may be made by appointment with the Client/Project Manager. No allowance shall be given for the lack of knowledge of the site conditions and the requirements of this specification.

1.4.2 Familiarity with Technical Specifications, Drawings and their Intent

Any queries with the requirements of the specification shall be brought to the Engineer's attention prior to tendering for clarification. The Contractor shall be fully responsible for meeting the requirements of the specification thereafter.

1.4.3 Errors, Ambiguities and Omissions

Errors, ambiguities and omissions in drawings or specifications shall be reported to the Engineer for correction before the closing of tenders and lodging of tenders. Unless otherwise expressly stipulated, no additional allowance shall be made because of errors, ambiguities or omissions which should reasonably have been discovered during the preparation of the tender or which may become evident later and which should have been directed to the attention of the Engineer in timely manner. The written decision of the Engineer shall be final.

If neither the specification nor drawings contain any particulars of minor parts, the intention of which is nevertheless clearly to be inferred and which parts are obviously necessary for the proper completion of the works, all such parts shall be supplied and executed at the Contractor's expense.

1.5 CONDITIONS OF CONTRACT

Refer to the architect/lead consultants for the conditions of contract.

Contractors shall ensure that they read and understand all Conditions of the Contract prior to submitting their tender. The contractor will be required to endorse this contract once the contract has been awarded as this will form the basis from which this contract will be administered.

1.6 CO-ORDINATION WITH OTHER TRADES

The Electrical Services Sub-Contractor shall at all times liaise with other Sub-Contractors, the Main Contractor, the Project Manager and the Engineer to ensure that works are carried out in a timely and orderly fashion so as to minimise delays, disturbances and damages to any equipment or property.

1.7 EXCLUSIONS

The contractor shall allow for all works depicted in the engineering drawings and specifications. No exclusions to this contract shall be allowed, and if so, this shall deem to be a non conforming tender.

1.9 QUANTITIES AND SCOPE OF WORKS

The contractor shall ensure that the tender is correct in terms of quantities of materials, equipment and services. The contractor shall ensure that the tender is correctly priced and arithmetically accurate.

1.10 RESOURCES

The Contractor shall ensure that they have the necessary resources in terms of skilled personnel, equipment, materials, testing equipment and finances to carry out these works for the duration of the works, including the defects liability period.

1.11 UPDATED CONSTRUCTION INFORMATION ON SITE

The Contractor shall ensure that the current issue of all engineering drawings and other relevant information is kept on site and that the on site supervisor shall not use outdated engineering drawings. The engineering drawings shall be kept in a secure location and be protected with clear plastic covers and hard backing boards. Any documented changes which are not kept on site by the site supervisor shall be the responsibility of the contractor.

1.12 SITE MEETINGS

A representative of the Contractor, who is fully qualified in all aspects of Electrical Services works, shall be required to attend all site meetings called by the Project Manager or his representative. The representative of the contractor shall be fully conversant with all aspects of this project, including the latest site developments, prior to attending meetings. The said representative shall have been authorised by the Contractor to make decisions on the Contractor's behalf, which shall be deemed binding on the Contractor.

1.13 WORK PROGRAMME

The Tenderer shall submit a programme of works with their tender in Gantt Chart Form, specifying Tasks, Duration, Resources and dependencies between scheduled tasks. The critical path activities and milestones shall be identified. This programme shall be kept updated at all times for the entire duration of the project.

1.14 TENDER COMPLIANCE

All tenders submitted shall be fully compliant with no tags, exclusions, counter-offers or any deviations from the requirement of the specifications and drawings. Alternative sales agreements or upfront payment requirements shall be considered non-compliant. The tender shall state explicitly that their tender is fully compliant.

Alternative, non-complying tenders may be submitted providing detailed information on alternative offering or any deviations. Alternative offers shall be submitted, clearly marked, in separate sealed envelopes. The engineer shall reserve the right to reject such non complying tenders.

Strict conformance to this specification is required to ensure that the installed system will function as designed, and will accommodate the future requirements and operations of the Client. All specified operational Features must be met without exception.

The equipment to be supplied will be considered only if it meets all sections of the technical specifications. Any deviations of system performance outlined in this specification will only be considered when the following requirements have been met:

1.14.1 A complete description of proposed alternate system performance methods with three (3) copies of working drawings thereof for approval by the Client/Architect/Engineer, to be submitted with the tender.

1.14.2 The Contractor shall submit a point-by-point statement of compliance for all sections (including sub-

sections), in this specification to ascertain that the tender is a fully complying one. The statement of compliance shall consist of a list of all paragraphs within each section of this specification. Each clause shall be answered with one of the following statements:

Response	Definition
Fully Complies	The equipment/system/installation methodology complies fully in all respects with the specification clause.
Partially Complies	The equipment/system/installation methodology offered does not comply fully but offers most or a substantial part of the requirements of the particular clause.
Does Not Comply	The equipment/system/installation methodology offered provides none of the requirements of the particular clause.
Understood and Accepted	The Contractor understands and accepts the conditions imposed by the particular clause and as such is fully included in the tender.
Not Accepted	The Contractor does not accept the condition imposed by the particular clause and as such is not included in the tender. The Contractor shall state as to why this requirement has not been accepted.
Submitted Herewith	The Contractor has submitted the information, material or sample as required by that particular clause.

Where the tender bid does not comply with the paragraph as written and the Contractor feels the proposed system will accomplish the intent of the paragraph, a full description of the function as well as a full narrative description of how its proposal will meet its intent shall be provided.

Any submission that does not include a point-by-point statement of compliance as described herein may be subject to disqualification.

The Client and the Engineer shall reserve the right to reject any such non-complying tenders.

1.15 SUBMITTALS REQUIRED BY CONTRACTOR

The following items of information are required to be submitted **with** the tender submission:

1.15.1 Detailed technical data sheets for equipment proposed to be used for this project. This shall include circuit breakers, fuses, switchboards, light fittings. The tender shall be non compliant if this information is not provided.
1.15.2 Contractors Project Execution and Management Plan
1.15.3 Contractors Quality Assurance Plan
1.15.4 Contractors Safety and Occupational Health Plan
1.15.5 Project Timeline and Work Programme.
1.15.6 Schedule of proposed equipment and materials
1.15.7 Schedule of proposed suppliers and manufacturers
1.15.8 Inspection, Testing and Commissioning procedures
1.15.9 Company Profile For Project - Personnel Resumes, Resources and tools, instrumentation and equipment
1.15.10 Typical Inspection Test Plan (ITP) Sample
1.15.11 Typical Progress Inspection Report Sample
1.15.12 Typical Commissioning Sheet Sample
1.15.13 Typical Final Certification Sample
1.15.14 Warranty Statements For Major Items of Equipment Offered

1.15.15 Manufacturer / Producer Statement Sample
1.15.16 Brief Maintenance Plan including sample maintenance record sheets
1.15.17 Tender Forms and Price Schedules
1.15.18 Tender Submittal Checklist

The following items of information are required to be submitted **after** the contract award and during the construction programme:

1.15.18 Detailed Inspection and Test Plans (ITP's)
1.15.19 Progress Reports
1.15.20 Confirmed and Updated Timelines based on Builders Timeline
1.15.21 Workshop drawings for purpose fabricated items such as switchboards and distribution boards
1.15.21 Detailed manufacturers data sheets
1.15.22 Detailed manufacturers and contractors warranty statements
1.15.23 Equipment and Material Samples
1.15.24 Completed Inspection Test Plans (ITP)
1.15.25 Completed Progress Inspection Reports
1.15.26 Detailed and Completed Commissioning data sheets
1.15.27 Final Certification Documents
1.15.28 Detailed Maintenance Plan including with actual maintenance record sheets
1.15.29 Comprehensive As – Built Documentation and As – Built Drawings

The Contractor shall note that the project methodology plan documents shall contain the following information:

1.15.30 Detailed procedures of carrying out the work
1.15.31 Skill level and numbers of personnel required to carry out this work
1.15.32 Materials, Equipment and instrumentation required
1.15.33 Calibration procedures for test equipment
1.15.34 Formatted sheet for witnessing, commenting and signing off of the work done.

Submit for review workshop drawings for the complete electrical installation, which shall include:

- Switchboard amendment shop drawings at 1:10 scale with equipment schedule, elevations, sections and single line diagrams.
- Generator schematics and control logic description
- Generator installation shop drawings including electrical, control cabling design
- Fabrication details for purpose manufactured items

Submit for review technical data and brochures for all equipment being used for electrical services with sufficient technical data and visual pictures to allow for an informed review. This shall be submitted prior to submitting samples to optimise the process for all those involved. This will also reduce the number of samples required.

This shall be for all accessories and equipment proposed including:-

- Cable tray, trunking and ducting
- All communications devices and cables

1.16 PROJECT SITE AND WORK CONDITIONS

It shall be the Contractor's responsibility to inspect the job site and become familiar with the conditions under which the work will be performed. Inspection of the site may be made by appointment with the Client/Project Manager.

All work shall be conducted during normal working hours, 8:00 a.m. to 5:00 p.m., Monday through Friday, by properly coordinating the work with the Client.

Contractor is to make monetary and resource allowances in their tender submission for all restrictions and other limitations imposed on this site.

The Contractor shall remove rubbish and debris resulting from his work on a daily basis. Rubbish not removed by the Contractor will be removed by the Client and back-charged to the Contractor. Removal of debris and rubbish from the premises shall be coordinated with the Client on a daily basis.

1.17 NOTICE TO TENDERERS

The Contractor shall note that all correspondence between the Engineer and himself during the tender period will be via the services engineer. All queries shall be addressed to:

THE PROJECT MANAGER
EDISON CONSULTANTS LTD
22 MARION STREET SUVA
FIJI
TEL: (679) 330 7060
E-MAIL: nishal.prasad@edisonconsultants.com

The Project manager will then issue NTT's to all of the services contractors. This response shall be referred to as Notice to Tenderers or NTT.

NTT's shall be deemed to constitute an addendum to the tender documentation. If there is any conflicting information between the NTT's, engineering drawings or technical specifications; the latest NTT that has been issued shall take precedence over the rest of the documentation.

Note that the preferred mode of transmission for tender queries shall be via hand delivery or facsimile to the Project manager. Queries sent via e-mail will also be accepted.

All tender queries shall be provided in writing to the engineer no later than 5 working days before the tender closing date. The Engineer will not be held accountable to answer any queries after this date.

1.18 TENDER BRIEFING MEETING

The Principal's of each tendering company **shall make themselves available to attend a project briefing** meeting which will be called by the Project Manager shortly after the issue of tender documents. Dates and times will be confirmed after tender issue. All attendees shall familiarize themselves with the tender documents prior to this meeting. Attendance by the Contractors Principal to the briefing meeting is a requirement of this tender specification.

1.19 OCCUPATIONAL HEALTH AND SAFETY

The Contractor shall ensure that all personnel are fully trained in matters relating to work safety. The Contractor shall ensure that their personnel are fully equipped with all required safety equipment and that a strict regime of safety protocol is followed on site, meeting local OHS (Labour Department) Authority requirements.

1.20 NON – COMPLYING TENDERS

All tenders submitted shall be fully compliant with no tags, exclusions, counter-offers or any deviations from the requirement of the specifications and drawings. Alternative sales agreements or upfront payment requirements shall be considered non-compliant. **The tenderers shall state explicitly that their tender is fully compliant.**

Alternative, non-complying tenders may be submitted providing detailed information on alternative offers or any deviations. The Client and the Engineer shall reserve the right to reject any such non-complying tenders.

1.21 CONSTRUCTION DRAWINGS

An updated set of “construction drawings” shall be kept on site by the supervisor in charge of electrical services for review by the engineer as and when required by the engineer or his representative.

Three (3) sets of drawings that document all works to be carried out under this contract including details of works, equipment location, and proposed cable routes shall be submitted to the Engineer for review prior to commencement of the installation. The drawings shall be submitted together with technical details of all equipment proposed to be used in this project. These shop drawings shall be prepared in AutoCAD 2000 or later format. Alternative formats or bitmap images are not acceptable as engineering shop drawings.

The drawings shall show sufficient details to enable the proper manufacture, installation and/or construction of the works. The drawings shall show plans, schematics, elevations and sections where appropriate.

Detailed drawings for manufactured items such as switchboards and generator room layouts and detailed engineering drawings are required to be submitted to the Engineer for approval PRIOR to committing to manufacture. These drawings shall show actual equipment layout and dimensions, include elevations, sections and detailed views.

1.22 AS-BUILT DOCUMENTATION

The Contractor shall produce as-built drawings for each element of work completed as part of this Contract Works. One (1) set of as-built drawings and manuals and the Contractor’s commissioning test results shall be provided to the Engineer for his review at the completion of the works. Any identified inaccuracies on the as-built drawings, manuals and commissioning data shall be rectified by the Contractor at no additional cost to the Client, with a further one (1) set of revised drawings re-submitted for review until they are satisfactory to the Engineer.

When the as-built documents are considered to be satisfactory by the Engineer, three (3) hard copies and three (3) soft-copies (stored in CD-ROM discs) of these documents shall be submitted to the Engineer.

A copy of the as-built documents shall also be included in the final Operating and Maintenance Manual.

Scanned drawings which replicate that issued by the Engineer will not be accepted.

1.23 TENDER SUBMISSION

Details of tender submission shall be as per the tender cover letter.

Bids shall be submitted on the tender form. One copy of the tender form shall be submitted and one copy retained by the Contractor for his records. All blank spaces for bid prices shall be filled in type. Any exceptions, exclusions or tags to the tender documents shall be fully explained in the same.

The Contractor shall ensure that the tender includes all work necessary to fulfil the requirements of the specifications and drawings. The contractor shall ensure that all material and equipment quantities are correct.

All bids shall indicate the following:

- The contractor's projected duration of installation works
- All exclusions in this contract. Note that unless specified otherwise, it shall be deemed that all requirements of the tender documentation have been included in the bid.
- Validity period of the tender bid shall be explicitly stated.

The Contractor shall ensure that the tender pricing schedule is arithmetically accurate.

1.24 INSPECTIONS, TESTING AND COMMISSIONING

1.24.1 Project Test Procedures and Test Plans

The Contractor shall submit detailed project procedures, QA forms and plans in good time to the engineer for review. The Contractor shall make any amendments requested by the Engineer and re-submit until a satisfactory result is achieved. These project plans and QA forms shall form the basis of Quality assurance, inspections, testing, commissioning and final certification.

1.24.2 Requirements of Construction, Inspections, Testing, Commissioning

The Contractor shall provide ALL of the plant, equipment, tools, materials and instrumentation required to carry out construction and tests at the Contractor's cost.

The Contractor shall ensure all of the equipment is suitable for testing procedures and that all instrumentation is accurately calibrated. The Contractor shall provide trained technicians and/or other trained personnel at the Contractor's costs, required to carry out the testing procedures.

The Contractor shall ensure that their site supervisor, technicians and sub-contractors are available for all inspection, testing and/or commissioning of the installation as required by the engineer.

The Contractor shall make good, repair, replace and/or reinstall any equipment or materials that are found to be unsatisfactory as a result of site inspection by the engineer. Such work or re-work shall be at the Contractors cost at no additional cost to the contract.

The Contractor shall ensure that the relevant local authorities witness testing as they may require and

provide sign-off on the same.

The Contractor shall ensure that the Engineer is given the opportunity to witness all tests at all times including those conducted by the relevant local authorities.

Note the relevant authorities testing and certification is not sufficient for compliance with this specification. The Engineer will require to witness and sign-off all testing and commissioning work stated above and this shall be deemed binding on the contract.

Commissioning and testing shall generally include:

- Checks of all work for completeness including checks against wiring diagrams, and checks of labelling.
- Testing of continuity and unique identification of all conductors in cables.
- Testing of insulation of all cables using a 500V megger for 230V circuits and a 1000V megger for 400V circuits. MIMS cables shall be tested in accordance with the manufacturer's recommendations, no sooner than 24 hours after installation, but within one week prior to energisation.
- Checks that all terminals are securely fastened.
- Checks that all equipment is safe to operate, and that overloads, protection equipment, safety devices and interlocks have been properly set and are all in working order.
- Checks of operating sequences and functions of all devices, and rotation and current draw of motors.
- Phase load testing and rebalancing of phases. Measure volt drop on fully loaded circuits as directed by the Engineer.
- Specialised testing of switchboards and the like and power factor correction systems as specified under their respective technical sections of this Specification.
- Infrared testing of all terminations and connections of switchboards and the like when operating at least at 60% loaded.
- Check polarity at all outlets and phase rotation of supply at all three phase outlets.
- Check that luminaires are working and that switching functions are in accordance with the specification and drawings.
- Check power factor of the installation as a whole when fully loaded.
- Check correct setting of adjustable circuit breakers and adjust as necessary.
- Measure the load current in each phase of all motors and check the appropriate setting of overload devices.
- Test and record the effectiveness of the main earth and the earth neutral link.
- Hipot testing of HV cables shall be in accordance with AS 1429 or IEC 502.

The testing, witnessing and/or signing-off these works by either the Engineer or the Local Authority, does not relieve the Contractors obligations in respect of warranties and performance requirements. Any works found to be defective, faulty or otherwise unacceptable during the defects liability period shall be rectified by the Contractor at no additional cost to the contract. The contractor shall ensure that any items or equipment is warranted for a minimum of twelve (12) months from the date of issue of practical completion.

1.24.3 Progress Inspections, Testing and Reporting

The Contractor shall submit **fortnightly** progress reports during the construction phase describing the progress of Contractors works on site. It shall also mention any tests conducted or any deviations from the tender documents.

It is a requirement of this specification that all works are **progressively** tested; such tests need to be measured accurately, observed, recorded and signed-off by the contractor on relevant QA forms and submitted to the engineer for review PRIOR to inspection and signoff on the same by the engineer. The defects and/or omissions identified in the progress reports and defects reports and testing shall be **progressively rectified and re-tested** at no additional cost to the contract.

The satisfactory completion of both the works and the progress tests shall constitute the value of works for the purposes of assessing progress claims. Furthermore, the progress test results shall form part of the testing and commissioning data which will need to be incorporated in the as built drawings and manuals file to be submitted to the engineer for approval as per section 1.22 of this specification.

The Certificate of Practical Completion does not become due until site testing and commissioning is completed to the satisfaction of the Engineer, the Contractor's Certificate of Completion outlining compliance to the design is issued to the Engineer together with that from the regulatory authority, correct as built drawings and manuals are submitted to the engineer as well as defects mentioned in the engineers latest defects reports are rectified to the satisfaction of the engineer.

1.24.4 LOCAL AUTHORITIES

The contractor shall be responsible for coordinating these works with the relevant local authorities as required to execute these works in a timely and legally compliant manner. The local authorities shall include but not be limited to the following:

1.6.1 Energy Fiji Limited (EFL)
1.6.2 Telecom Fiji Limited (TFL)
1.6.3 Water Authority of Fiji (WAF)
1.6.4 The National Fire Authority (NFA)
1.6.5 The Department of Town and Country Planning
1.6.6 The Local Town Council
1.6.7 The Department of Labour and Occupational Health & Safety

The Contractor shall ensure that all necessary applications for executing the works are made and approvals obtained from the relevant local authorities. The Contractor shall be responsible for obtaining the necessary applications forms, completion of the same, including those items requiring client/owner and payment of fees for the same.

The Contractor shall make allowances in the tender prices for the costs associated with permits, applications, progress inspections, final inspections and final certifications.

The Contractor shall give all necessary notices, obtain all necessary permits and pay all fees in order that the work may be carried out, and shall furnish all certificates as evidence that the works installed comply with laws and regulations. Bring to the attention of and clarify any unusual aspects of the installation with

the relevant Authority during the permit application period.

The Contractor shall be responsible for obtaining power authority (EFL) and local authority inspections; permits and approvals for this work, the costs of the same shall be included in the tender price.

It is understood that the following cost items only, are excluded from the tender price and are normally met by the Client directly:

- Supply Authority's cost of providing power supply, which covers the supply authority costs for providing HV cables, transformers and high voltage switchgear.
- Consumer deposits covering cost of energy consumption
- Supply Authority Final Inspection Fees.

Full allowance shall be made in the tender price for all costs, including taxes, duties, local authority fees and any other applicable costs as described above.

1.25 SUB - CONTRACTORS

Any nominated sub contractor that is nominated by the electrical contractor shall be the responsibility of the main electrical contractor, who will be liable for any damages or otherwise for any faults or incompetencies incurred by his subcontractor.

1.26 SUPPLY OF ITEMS BY OTHERS

Mechanical equipment's is to be provided by others however electrical contractor is to allow for cables and isolators as depicted on engineering drawing.

1.27 MAINTENANCE AND DEFECTS LIABILITY

Contractor shall provide a general description and maintenance plan as part of tender submission. After award of tender, the Contractor shall submit a detailed maintenance plan for the Engineer's approval. A copy of the manufacturer's warranty shall be provided with close-out documentation and included with the operation and installation manuals.

The close out documentation shall be provided by the electrical contractor and the contractor shall detail all outstanding works required to complete the project in order to attain practical completion. The engineer shall reserve the right to amend this close out works list, inspect, verify that defects have been completed, according to the engineer's defects report as well as add to or amend the contractors incomplete works detailed in the close out scope.

The equipment manufacturer and/or supplier shall maintain a service organization with adequate spare parts. Any defects that render the system inoperative shall be repaired within 24 hours of the Client notifying the Contractor.

A logbook shall be provided to record each service activity that has been performed at each visit, the conditions of the system and equipment at the visit, and any defects found during the visit including rectification tasks. The logbooks shall be located on site as directed by the Engineer. Each maintenance visit shall be recorded with details of work done including any measurements taken. The maintenance record sheet shall be signed off by the technician carrying out the works and shall be countersigned by the client's representative. Copies of the maintenance records shall be submitted to the client AND the Engineer.

All maintenance activities shall be carried out by competent personnel who are trained in these activities.

1.27.1 General Maintenance Requirements

- Carry out monthly maintenance of all works under this contract for a period terminating twelve (12) months from the date of award of practical completion of the whole of the Contract Works by the engineer.
- Replace or repair any faulty equipment or materials, or the results of unsatisfactory workmanship, free of charge.
- Carry out maintenance and testing as required by relevant standards and local authority regulations.
- Provide replacement of consumables at Contractors cost.
- Provide maintenance records, duly filled and copies submitted as required
- Maintain a stock of spare parts required for the generator, switchgear etc. This includes (but not limited to, oil filters, fuel filters, air filters, general spare parts, kits etc)
- Contractor to make available personnel to attend to any maintenance or emergency calls with a minimum of 3 hour response time on 24 hour x 7 day basis, during the defects liability maintenance period. This must include regular preventative and corrective maintenance on the standby diesel generator during the defects liability period.

1.28 PROJECT COMPLETION

1.28.1 Practical Completion

Practical Completion Status for works under this contract shall be granted only after all of the following conditions are fulfilled to the satisfaction of the engineer:

- Submission of correctly completed ITP's
- Submission of all progress inspection reports
- All final testing and commissioning has been completed and all works specified by this document are installed and operating correctly
- Client instruction and training manuals for the same have been submitted
- Submission of progressive and final certification by the relevant local authorities
- Written Certification by the Contractor, Suppliers and Manufacturer's that all equipment has been installed and is operating to the capacities and performance levels specified
- Submission of approved and final as built documentation
- Contractors Completed Certificate of Compliance issued to the Engineer.
- Updated Defects list as issued by the Engineer has been rectified to the engineers' satisfaction.

A Certificate of Practical Completion will be issued by the Engineer on satisfactory completion of all of the above.

1.28.2 Final Completion

Final completion shall be considered achieved when the Maintenance and Defects Liability Period has been satisfactorily completed and all specified requirements have been met to the Engineers satisfaction. The following requirements have to be met prior to granting final completion status:

- Final and comprehensive maintenance servicing of all works including record keeping.
- Final inspections with the engineer, the contractor and sub-contractors of all works
- Rectification, repair and/or replacement of any defective works
- Submission of all regular maintenance reports and evidence that maintenance has been regularly and correctly carried throughout the course of the defects liability period.
- Test and operate all plant and equipment. Demonstrate to the Engineer that all plant, equipment

and systems are operating correctly as intended.

2.0 SCOPE AND DESCRIPTION OF WORKS

The scope of work includes the supply, installation, commissioning, obtaining final permits from the Energy Fiji Limited and maintenance during the defects liability period of all Electrical Services specified herein.

All works necessary to provide a fully functional and compliant system as detailed in this specification and drawings shall be carried out. These works shall include any minor works and/or materials not explicitly stated but necessary to implement the services required.

The Contractor shall make allowance in terms of cost and time for all necessary equipment and materials required to implement this specification whether or not explicitly stated and whether or not permanently installed upon completion.

2.1 SCOPE OF WORKS SUMMARY

The scope is defined on the tender schedule.

2.2 WORKS BY THE BUILDER

Electrical contractor shall allow for costs of all civil and structural works required for electrical services if it is not captured in the builder's scope. These works will be done by the builder and charged to the electrical contractor.

2.2.1 Sealing of Penetrations (By Contractor)

Provide fire rated sealing of all services penetrations as follows:

(a) Sealing around cable trays, ducts, conduits, cables etc which pass through acoustic barriers and fire rated structures shall be a certified method to maintain the STC rating of a wall, slab or ceiling being penetrated.
(b) Sealing between cables and sleeves where movement is to occur
(c) Provide and maintain water proofing of all penetrations throughout construction
(d) Fire seal all fire rated walls, floors, ceilings and ducts
(e) All works to be sealed to adjoining elements as appropriate.

2.2.2 Holes in Roofs

Unless otherwise shown, the Electrical Contractor will provide under flashing holes in roofs including kerbs, as necessary to allow for installation of cables, conduits, flues etc necessary for the electrical installation.

The Electrical contractor will also provide overflashing of each penetration to ensure a fully weatherproof installation.

All trimmer beams between purlins or other reinforcement necessary to support equipment installed through or on the penetrations shall be supplied and installed by the subcontractor to suit his plant and equipment, unless otherwise shown on the drawings.

2.3 OTHER RELATED WORKS

2.3.1 Hydraulics Services

Power supply for domestic cold water pumps.

2.3.2 Mechanical Services

Provide power supplies as indicated on the engineering drawings to the mechanical equipment's.

2.3.3 IT/Communications Equipment

Provide power supplies to the communications rack as nominated in the drawings.

2.3.4 Fire Protection Services

Not applicable for this project.

2.3.5 Auxiliary Power Supplies

Allow to provide a dedicated 16 Amps feed from the main switchboard to the generator control panel. This is required to allow static charging of the generator batteries during normal power periods. Allow to supply and install a new 4mm sq TPS cable in orange conduit to the generator location.

2.3.5 ADDITIONAL WORKS DONE BY OTHERS

Should the electrical contractor require any other works, not detailed above to be carried out by others, he shall provide details of the same in his tender. Should such a list not be provided, it will be considered that the electrical contractor has allowed for the same in his final price.

3.0 EQUIPMENT AND MATERIALS

3.1 MAIN SWITCHBOARD

Not applicable for this project.

3.3 AUTOMATIC POWER FACTOR CORRECTION UNIT (APFCU)

Not applicable for this project.

3.4 DISTRIBUTION BOARDS

Distribution boards shall consist of proprietary modular units assembled to form a complete functional unit suitable for wall mounting.

Cable entry shall be from the top and bottom.

Busbar assemblies for three phase DB's shall be supported in metal pan and shall accept single pole and triple pole MCB's and be rated for 20kA/0.1 sec minimum. Busbars shall be “comb” type rated 100A and supported by attachment to circuit breakers.

Provide and install distribution board fitted with a main isolator, MCBs and contactors as required. MCBs shall have a minimum fault rating of 6kA to AS/NZS 60898 and shall be securely fixed.

Busbar assemblies for three phase DBs shall accept single pole and triple pole MCBs and rated for a minimum of 20kA for .1 sec.

Each way of the distribution boards shall be identified with a label clearly showing the phase and circuit number. A printed identification card shall be provided within each switchboard door and a description of the circuit and its location shall be clearly printed on this card against the circuit number.

3.5 CABLES

The size and type of cable shall be as shown on the Drawings. Unless otherwise specified cables shall have a voltage rating of 600/1000 volt complying with AS/NZS 3008.

The number of cores in each cable shall be as shown on the Drawings. Where one earth continuity conductor (ECC) or neutral screen (NS) is shown, these shall be in addition to the number of cores indicated. Signal and communication cables may be shown as the number of twisted cable pairs. Provide all cables shown on the Drawings and Schedules, and all lugs, links, terminals, glands, clamps, clips, saddles and ties necessary to complete the installation of the cables. Where cables are to be jointed, provide all junction boxes and in-line jointing kits.

Take full account of voltage drop and grouping factors when sizing cables. Minimum cable sizes for sub-circuit cabling shall be 1.5 mm2 for lighting and 2.5 mm2 for power.

Cables shall not be cast directly into concrete, plaster or masonry. Where such cabling is to be installed it shall be drawn through conduits set in as construction proceeds.

Special care shall be taken with the installation of cabling to ensure that bunching and consequent overheating does not occur. Maintain space factors in accordance with the requirements of NZECP28. All cables shall be protected from damage.

Power cables shall be installed with a separation from data/voice cables in accordance with AS/NZS 3080:2003 – Telecommunication Installations.

Cable runs shall be made without joints. Cables shall not be jointed except with specific prior review by the engineer. Where joints are permitted they must be accessible and in proprietary junction boxes, or made with proprietary jointing kits to the approval of the engineer.

3.5.1 INSTRUMENT CABLES

Sensor, instrument control loop and indication cables shall be screened industrial grade instrument cable unless otherwise specified.

Instrument cables shall be run separated from power cables by a minimum spacing of 1000 mm. Where possible instrument cables shall follow a separate route from, and shall not be run parallel to large power cables or motor cables.

Cable screens shall be earthed at one end of the cable only. Where screened cable circuits include an intermediate junction point the screens of the respective cables shall be bonded between the two sides of the junction.

Where instrument cables enter panels and equipment, sealing glands shall be provided which effectively seal and clamp the cable sheath.

Conductor terminations shall be made using correctly sized crimp lugs or pins.
Cores that form pairs in a cable shall be connected so that their correct pair relationship is maintained.

3.5.2 COMMUNICATION CABLES

Communication cables shall be industrial grade screened twisted pair data cable unless otherwise specified.
Cable characteristics shall be suitable for the transmission rate and format to be used. Advise the Engineer of the proposed cable type before proceeding with procurement.

Communication cable shall be run separated from power cables by a minimum spacing of 300 mm. Where possible communication cables shall follow a separate route from, and shall not be run parallel to large power cables or motor cables.

Communication cable terminations and connectors shall match connectors fitted to equipment and shall be arranged to suit that equipment. Terminations shall be made in accordance with any manufacturer's recommendations and with the recommended presses and tools to suit the connector type.

Where communication cables enter panels, sealing glands shall be provided which effectively seal and

clamp the cable sheath.

3.5.3 FIRE RESISTANT CABLES

Fire resistant cabling shall be copper conductor and fire rated for 1 hour in accordance with AS/NZS 3013.

Cabling shall be flame retardant, self-extinguishing, low smoke, and Halogen free.

Fire resistant cabling shall be installed in accordance with the manufacturer's recommendations.

Fire resistant cabling shall be fixed with stainless steel cable ties. All termination shall be by crimping.

Fire resistant cabling shall have a voltage rating exceeding .6/1KV and shall be suitable for a 50 Hz mains system.

Where the jointing of fire resistant cabling is approved by the Engineer cabling shall be jointed using proprietary fire rated junction boxes and cable glands or by in line joints. Jointing techniques and materials shall be in accordance with the manufacturer's recommendations. The fire resistance of the jointed cable shall be not less than the fire resistance of an un-jointed cable.

3.5.4 CABLE SUPPORT SYSTEMS

3.5.4.1 GENERAL

Cable support systems shall be run level, straight and parallel with building lines to produce a tidy installation. Joints and accessories shall fit closely and shall be correctly matched.
Provide all necessary hangers and brackets. Fixings shall be adequate for the items being fixed. The installation shall be in accordance with the manufacturer's written recommendations. Supports and fixings shall comply with NZS 4219.

Care shall be taken to avoid bimetallic corrosion at fixings and joints. Fixings and fastenings shall be of a material appropriate to the parts being fixed, the loads imposed and the locations involved. Bolts, screws, nuts, washers and other fixing components shall be zinc, chromium or cadmium plated.

Avoid sharp edges which may damage cables. Cut ends and cut-outs in cable support systems shall be neat and square. Cut edges shall be protected against corrosion.

Cable support systems shall be complete with matching proprietary bonds, ties, reducers, expansion joints and jointing accessories which shall be employed as appropriate at junctions, changes of level, changes of direction, and changes of size. Metallic cable support systems shall be bonded to earth and shall be electrically continuous using, where necessary, earth continuity straps between sections.

3.5.4.2 CABLE LADDER

Cable ladder shall be constructed of heavy duty, class C electro-galvanised to AS 1789 for interior and hot dipped galvanised for external installation or as specified.

3.5.4.3 CABLE TRAY

Cable ladder shall be constructed of heavy duty, class C electro-galvanised to AS 1789 for interior and hot dipped galvanised for external installation of rolled edge tray or as specified.

3.5.4.4 CABLE TRUNKING

Cable trunking shall be of the type and finish shown on the Drawings. Where not otherwise stated, cable trunking shall be of minimum thickness 1 mm sheet steel painted orange (BS 4800 colour No. 06E51).

Vertical cable in trunking shall be fitted with insulated cable supports to support cables at maximum 2.5 metre intervals.

3.5.4.5 SKIRTING DUCT

Skirting duct shall be compartment, extruded aluminium with paint finish as detailed on the drawings with champher front. Overall duct dimension shall be 150 mm x 50 mm or as specified.

3.5.4.6 CONDUIT

Conduit shall be galvanised steel screwed to AS/NZS 2053 or high impact PVC to AS/NZS 2053 or as specified.

The minimum size of conduit shall be 20 mm. Unless otherwise specified, conduit shall be one size larger than required by regulation for the number of conductors to be drawn in.

Conduit shall be delivered to Site in manufacturers standard lengths each with a coupling on one end and thread protection on the other.

Conduit for any circuit shall be erected complete before any cable is drawn in.

Conduits which penetrate walls or floors of fire resisting construction shall be treated in the following or equivalent approved manner. Seal all PVC conduit penetrations with firestop collars. Seal all steel conduit penetrations with PYROSAFE SVT universal bulkhead system and pack any gaps with FYREFYBA ceramic fibre. For small penetrations with gaps less than 10mm seal with fire resistant foaming sealant.

3.5.4.7 CATENARY WIRES

Catenary wires shall be galvanised steel, insulated of 2.5 mm diameter minimum, securely fixed to the building structure at each end and supported at intermediate points as required. Catenary wires shall support cables clear of all structures, services and other equipment. Provide turnbuckles of suitable size to permit future adjustment.

Separate catenary wires shall be employed for mains voltage electrical services and for telecommunication, signalling, or data cables. Maintain a minimum distance of 50 mm between catenaries, or 150 mm between mains and other catenary wires.

3.6 UNDERGROUND CABLING

3.6.1 GENERAL

Underground cable installation shall include all necessary clearing, saw cutting, excavating, disposal of spoils, temporary supports, bailing, pumping and the provision of bedding material, cable laying, protection, backfilling, marker tape and reinstatement of the cable route.

Prior to the commencement of excavation, the contractor shall mark the locations of all existing services along the proposed cable route. Any existing facilities which become damaged during the course of the work shall be repaired and reinstated to the original condition to the Engineer's satisfaction.

3.6.2 INSTALLATION

Cables shall be installed utilising the manufacturer's recommended installation methods, and pulling tensions. The contractor shall obtain a copy of these recommendations prior to cable installation and have a copy on site during installation.

The manufacturers minimum bending radius shall be observed for the cable installation.
Underground cable joints shall be avoided wherever possible. Where unavoidable, underground cable joints shall be permitted only with the specific prior review by the Engineer.

All exposed ends of underground cables shall be capped and sealed until properly terminated, to prevent the ingress of moisture.

A loop or slack section of cable shall be left at each side of a road or traffic way to allow for settlement of the road without stretching the cable.

Backfilling material shall be free of stones, debris, rubbish, etc., and shall be placed, and thoroughly compacted in 200 mm (loose) layers. Make good the surface to match the original adjacent.

Allowance shall be made for the de-rating effect of the soil and ducting in calculating cable size.

3.6.3 Cable Ducts

Long radius sweeps or bends shall be used for all changes of direction. Elbows will not be accepted.

Duct joints shall be glued to prevent water ingress into the duct system, using adhesives recommended by the duct manufacturer.

A draw-in tape/wire shall be provided in all ducts to facilitate cable installation.

Ducts shall be provided with suitably sized end caps to prevent the ingress of soil prior to cable installation.

Ducts shall be cleaned of rocks/debris before cable installation to prevent damage to cables.

Cable lubricant shall be utilised during cable installation.

A draw-in tape/wire shall be left in the duct after completion of cable installation.

Ducts shall be sealed with a suitable material after cable installation to prevent soil ingress.

3.6.4 Cable Pits

Cable pits shall be installed at locations shown on the drawing. They shall be square or rectangular as indicated.

Cable duct entries shall be sealed to prevent the ingress of water.

3.6.5 Thrusting/Directional Drilling

The use of thrusting or directional drilling techniques shall be permitted under concrete and tar sealed areas.

In these circumstances, the Contractor shall install a rigid heavy duty PVC pipe with a minimum diameter of 3 x the cable diameter (for multicore cables), or 4 x the single core cable diameter (for single core cables laid in trefoil).

The ducting shall be utilised to enclose the required cabling system.

3.7 CABLE TERMINATIONS

3.7.1 Cable Glands

Armoured cable terminations shall be fitted with appropriate metal cable glands which shall grip the cable securely, seal on the outer sheath of the cable and be complete with matching locknuts. They shall include provision for securely bonding the cable armour to earth.

PVC/PVC, XLPE/PVC and NS cable terminations shall be fitted with suitable sealing glands. These shall grip the cable securely and seal on the cable sheath.

3.7.2 Cable Terminations

All terminations shall comply with manufacturer's written recommendations. Connections shall be made with electroplated bolts, nuts and locknuts.

Cable terminations shall be made with correctly sized crimp or compression lugs, fitted according to manufacturer's instructions and using proprietary crimping tools or presses with correctly sized dies. Terminals and cable terminations shall not be under mechanical stress. Terminations shall not support the weight of cables.

Terminations between copper and aluminium conductors shall be made using only proprietary bimetallic lugs or links.

Care shall be taken to ensure sufficient room is allowed in equipment to permit cable terminations, including those to be made by others.

3.8 LUMINAIRES

Provide and install luminaires as shown on the Drawings. All luminaires shall be complete with lamps.

Fluorescent and discharge luminaires shall be power factor corrected to at least .95 lagging. Fluorescent luminaires shall be switch start type.

High bay luminaires shall be suspended from purlins or from additional members provided for the purpose, and shall be provided with U-bolt or shackle type suspension points. Open hooks shall not form any part of the suspension arrangement.

Low voltage luminaires shall be supplied complete with one luminaire per transformer or as specified.

Exterior luminaires shall be controlled via a photocell and time clock with override switch at the distribution board.

Emergency lighting shall be installed in accordance with the Building Regulations and AS/NZS 2293. It generally shall be non-maintained type except for the stairways where it shall be maintained type.

Emergency lighting shall operate in areas if the normal lighting fails in those areas. Therefore, normal lighting circuits from a DB shall be sensed on the load side of the protection with a phase failure relay which shall activate the emergency lighting.

A 0-2 hour adjustable mechanical timer shall be installed in the phase failure relay circuit for test purposes which resets after the timed-out duration.

3.9 LIGHTING CONTROL SYSTEM

3.9.1 Manual

Generally light switches shall be mounted at a height of 1150 mm. Light switches shall be of the white polycarbonate flush mounted. Mounting shall be in flush boxes or white polycarbonate mounting blocks as applicable to the positions shown on the Drawings.

Unless otherwise specified, switches shall be within 200 mm of the door frame on the handle side and shall be mounted square and level. Confirm all door swings before installing conduits or cables for light switches. Pushbutton panels at lift lobbies shall be within 400 mm of the lobby opening.

Adjacent switches on different phases shall be housed in separate or approved partitioned boxes clearly marked to indicate the presence of 400 volts.

Where up to six switches are grouped together, ganged switch plates having the exact number of switch positions required shall be used.

Where six or more switches are grouped together, six-gang switch plates shall be used. Blank off, with proprietary blanking inserts, those switch positions not used.

All weatherproof light switches shall be of the surface mounted type to IP56 minimum as BS 5490.

3.9.2 Semi-Automatic

Photo electric switches shall be positioned where shade or extraneous light shall not adversely affect its operation. The unit shall be positioned to be protected from the most adverse weather conditions.

Photo electric switches shall be positioned internally under a skylight.

Circuits shall be switched by a time clock mounted on the D.B. with a manual override facility.

Circuits shall be switched by time delay switches.

Exterior lighting shall be controlled by a P.E. switch for turning on and a settable time switch for turning off.

Passive Infra-red (P.I.R.) detectors shall not be positioned where they can receive the sun directly into the sensor.

Controls shall be mounted in such a position to avoid vandalism and deterioration due to environmental effects e.g. ice, and landing or nesting birds.

Cupboard door switches shall be double insulated or suitably earthed. They shall be rated for 5 amps for loads up to 4 amps.

3.10 SOCKET OUTLETS AND FIXED OUTLETS

3.10.1 Socket Outlets

Unless expressly noted otherwise, outlets shall be mounted at a height of 300 mm above finished floor level or 200 mm above benches, or 1400 mm above finished floor level in plant rooms and the like.

Socket outlets, unless otherwise specified, shall be shuttered, switched 3 pin 10A polycarbonate, flush mounted with removable cover plates. Outlets and cover plates shall be available in a range of colours.

Outlets in medical areas shall be coloured in accordance with AS/NZS 3003 to identify circuits which are UPS (blue), essential (red) or non-essential (white).

Cleaners outlets shall be coloured (beige) and labelled in accordance with AS/NZS 3003.

All outlets protected by an RCD located within the same room but not integral shall be labelled to identify the RCD protecting it and complete with integral “power available” indication.

All socket outlets shall be labelled to identify the circuit number, phase and distribution board from which they are supplied. Labels shall generally be concealed behind cover plates. Indelible ink pen (felt tip) is an acceptable means of labelling.
Mounting shall be directly to walls or in flush boxes or polycarbonate mounting blocks as applicable to the positions shown on the Drawings. Where perimeter trunking is installed, socket outlets shall be mounted in the top section.

Weatherproof socket outlets shall be to IP56 minimum.

3.10.2 Fixed Outlets

Fixed outlets shall be installed for such items as hot water cylinders, auto doors, roller shutter doors etc, and be mounted adjacent to the equipment adjacent to the equipment they supply as shown on the Drawings.

Single phase fixed outlets shall be polycarbonate and complete with an isolator. Provide, install and connect all cabling and flexes from fixed outlets to the various items.

Fixed outlets for three phase connection or fixed outlets in plant rooms etc shall be of an approved polycarbonate surface mounted type. They shall be complete with an isolator.

3.10.3 Outlet Boxes

In timber-framed walls, switch and socket outlet boxes shall fixed to dwangs, noggings or studs to provide necessary support.

Where boxes are in blockwork or in concrete, a galvanised type shall be used. All conduits shall be terminated with sockets and male bushes and the boxes completely sealed to prevent the ingress of cement slurry. Boxes shall be securely fixed to prevent movement during concreting. As soon as possible after concreting, examine such boxes, clean out and protect against corrosion.

In fire rated walls all outlet boxes shall be metal, one-hour fire rated, lined with intumescent material (e.g. Firepro B361).

Confirm location of all outlets with the Architect prior to installation.

3.10.4.5 Commercial Kitchens

Not applicable for this project.

4.0 EARTHING

The earthing system shall comply fully with SAA Wiring Rules and with any additional local power authority requirements.

All equipment that is directly or indirectly in proximity to live cables shall be earthed. All metallic components of equipment such as panels, casings, enclosures shall be earthed.

All exposed metals such as switchboards, enclosures, equipment, pipe work, conduits, cable trays, catenaries, accessories that may become live through an electrical fault, shall be bonded to earth by means of secure clamps, cables and/or electrodes.

All switchboards shall be earthed using the earth of the sub-mains cables or in the case of the main

switchboard, be connected to the main earth rod. The hinged panels of switchboards shall be electrically bonded to the main chassis.

Proprietary earth/neutral bars shall be provided for all switchboards and distribution boards.

All equipment including socket outlets and exposed metal parts of light fittings shall be provided with earth connections.

The testing of the insulation and earthing system shall be carried out as per AS 3000/SAA Wiring Rules and local power authority requirements. Insulation resistance to earth shall be tested ("MEGGA" Test) and these readings shall meet the prescribed regulations.

5.0 ELECTRICITY SUPPLY, METERING & DISTRIBUTION

Not applicable for this project.

6.0 STANDBY RATED / STANDBY GENERATION SERVICES

Not applicable for this project.

7.0 SCHEDULE OF EQUIPMENT, UNIT RATES & PRICES

Where a selection of equipment and plant has been made by the Engineer, the tender shall be completed on that selection. Where plant and/or equipment have not been selected by the Engineer, and a performance specification given instead, the Tenderer shall complete and submit a Schedule of Performance of Specified Equipment.

Include current descriptive trade literature complete with performance information, curves, etc. Note that trade literature will be considered to supplement the description of equipment in the tender documents but if it is inconsistent with the specified requirements in any way, tenderers shall draw attention to such inconsistencies in their tender. Otherwise the Contract will require the performance specified in the tender documents to be met.

Where trade literature includes models or options that are not part of the tender, clarify which sections are relevant. The use of such terms as "or equal approved" where equipment has been nominated by the Engineer does not allow Contractors to nominate alternatives after the tender stage. Alternative plant and equipment may be offered for approval. Any alternatives shall be listed on a schedule and shall be submitted with the tender.

If an alternative plant schedule is not returned with the tender, the Contractor will be deemed to be installing

the equipment selected by the Engineer without variance.

No plant or equipment on this list may be ordered until approval from the Engineer has been received in writing. Where any plant offered as an alternative does not fully comply with the Tender Documents, this shall be stated and reference shall be made to the relevant specification clause or drawings.

Any proposed changes to sizes, or performance of equipment or control systems shall be similarly described.

7.0.1 Tender Price Schedule for Electrical Services

The schedule of prices and equipment is attached as a separate document from this specification. The contractor is required to fill in the schedule and submit with the tender form. The contractor shall take note that this is a strict requirement of this specification. Contractors failing to follow the above instruction will not be considered for this project.

The contractor shall provide detail breakdown of all equipment supplied in the attached equipment schedule.

The prices to be set out in this schedule are to provide a breakdown of the tender sum and shall be inclusive of all incidentals in accordance with the specifications and drawings. This is a comprehensive supply and installation contract and the tenderer shall take all responsibility for all items required to complete the Contract Works in accordance with the Contract Documents

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8.0 TENDER FORM

NAME OF COMPANY TENDERING I/We _____

ADDRESS OF COMPANY TENDERING Of _____

Do hereby agree to supply, construct, install, test, commission and maintain during the warranty period and carry out the whole of the works as specified in this specification and its associated engineering drawings.

We hereby confirm that our tender is fully compliant with all requirements of this specification, drawings, engineering standards and relevant regulatory authority regulations.

For the fixed, lump sum price, inclusive of all duties, fees and taxes in Fiji dollars

Amount in words_____

_____

Amount in F$ _____

Authorised Signatories _____

Name of Signatories _____

Dated this _____day of _____, year _____.