

**SUPPLY & INSTALLATION  
of the  
ELECTRICAL SERVICES  
for the  
LTA KARAVI WEIGHBRIDGE STATION  
at  
KARAVI, BA, FIJI ISLANDS**

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**ELECTRICAL SERVICES  
LTA KARAVI WEIGHBRIDGE STATION  
KARAVI, BA, FIJI ISLANDS**

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## **SECTION 1 GENERAL CONDITIONS OF CONTRACT**

General Conditions of Contract shall be the Conditions of Contract for LTA Karavi Weighbridge Station at Karavi, Ba, Fiji islands and any other Amendments and Revisions up to date of issue, provided by the Principal Consultant – Irwin Alsop Pacific Ltd.

## **SECTION 2 SPECIAL CONDITIONS OF CONTRACT**

Special Conditions of Contract shall be the Conditions of Contract for LTA Karavi Weighbridge Station at Karavi, Ba, Fiji islands and any other Amendments and Revisions up to date of issue, provided by the Principal Consultant – Irwin Alsop Pacific Ltd.

## **SECTION 3 PRELIMINARY AND GENERAL**

Conditions of Contract shall be the Conditions of Contract for LTA Karavi Weighbridge Station at Karavi, Ba, Fiji islands and any other Amendments and Revisions up to date of issue, provided by the Principal Consultant – Irwin Alsop Pacific Ltd.

## SECTION 4 GENERAL

### 4.1 SCOPE OF WORK

The scope of works comprises the supply, installation, testing, commissioning, maintenance and defects liability services of materials, labour and equipment for the complete Electrical Services installation for LTA Karavi Weighbridge Station Karavi, Ba, Fiji islands.

This shall include all necessary work required to implement the intent and meaning of this Specification and associated drawings.

Whether or not the words “supply and install” appear in this Specification or on the drawings, unless clearly excluded, all items of equipment for the complete installation are required and shall be supplied and installed.

#### Extent of Work

The work shall include but will not be limited to the following main items:-

- a) Supply and installation of un-metered consumer mains cables (and conduits), from the existing EFL pole to the main switch board.
- b) Supply and installation of generator mains cabling, control cabling (and support systems), and associated accessories.
- c) Supply and installation of the main switch board.
- d) Supply and installation of a power factor correction unit, transient voltage suppressor, associated accessories and cabling in the main switch board.
- e) Supply and installation of sub-mains cables (including cable support systems)
- f) Supply and installation of distribution boards.
- g) Supply and installation of luminaires, associated accessories and final sub-circuit cabling (including cable support systems).
- h) Supply and installation of socket outlets, associated accessories and final sub-circuit cabling (including cable support systems).
- i) Supply and installation of cable pits, conduits, catenary wires and cable ladders for the Extra Low Voltage Services and Telecommunications Services.
- j) Supply and installation of the earthing system.
- k) Supply and installation of cabling, isolators and associated accessories for electrical motors.

#### Additional Work

Provisions of the following additional services:-

- a) Coordination with Energy Fiji Limited.
- b) As Installed drawings and Installation Manuals.
- c) Testing, commissioning, warranty and preventative maintenance of the complete electrical installation.

### 4.2 COMPLIANCE WITH REGULATIONS

The work carried out by the Electrical Sub-Contractor shall comply in all respects with this Specification and:

- a) The Building Regulations applying to the project.
- b) Current issue of relevant Australian and New Zealand Standards.
- c) Energy Fiji Limited
- d) Ministry of Labour OHS Regulations
- e) Any other regulations that apply directly or indirectly to such installations in the location

### 4.3 DRAWINGS

The scope of works is shown on the Electrical Services drawings E01 to E08 inclusive which should be read

in conjunction with this Specification. Refer to the Electrical and Architectural drawings for the exact positions of fixtures, fittings, plant equipment, sundry appliances and structural elements. Confirm dimensions on site before commencing work.

The following drawings shall form part of the Contract:

E01	SCHEDULE OF DRAWINGS, LEGEND, GENERAL NOTES, ABBREVIATIONS & LOCALITY PLAN
E02	ELECTRICAL DETAILS & SCHEDULE OF LUMINAIRES
E03	PROPOSED SITE PLAN LIGHTING & POWER RETICULATION LAYOUTS
E04	PROPOSED FLOOR PLAN LIGHTING LAYOUTS
E05	PROPOSED FLOOR PLAN POWER LAYOUTS
E06	SECURITY BOOTH / WAITING BURE / GENERATOR ROOM / SIDE ELEVATION LIGHTING & POWER LAYOUTS
E07	MAIN SINGLE LINE DIAGRAM & SCHEDULE OF CABLING
E08	PROPOSED SINGLE LINE DIAGRAM

#### 4.4 SAMPLES

The Electrical Sub-Contractor will be required to submit for approval by the Engineer, samples of luminaires, switches, socket outlets, cover plates and other fittings and materials to be used in the works.

#### 4.5 SHOP DRAWINGS

Provide for approval Shop Drawings of the connections, construction details and schematics for the Electrical Services. Confirm all dimensions on site.

Supply shop drawings in SI Metric to completely detail the works as follows:

ITEM	INFORMATION REQUIRED	SETS
Distribution Boards	Construction and Layout Details	3

Submission to the Building Services Engineer in the first instance shall be made not less than two (2) weeks prior to approval in principle is required.

At the completion of the project, update all drawings to indicate as installed details.

All drawings are required to be provided in electronic (AutoCAD 2014 version or approved equivalent) and paper copy format (3 sets).

#### 4.6 APPROVAL CERTIFICATE

Provide the Engineer with a copy of the signed and stamped Energy Fiji Limited Completion Certificate prior to the commencement of the Defects Liability Period.

#### 4.7 AUTHORITIES AND FEES

Make application to the Energy Fiji Limited for permits to carry out the work and pay all fees and charges in respect of the work involved.

#### 4.8 CONSUMER DEPOSIT

The Consumer Deposit shall be paid by the Principal.

## **SECTION 5 EARTHING**

### **5.1 GENERAL**

Supply and install the complete earthing system for the installation including electrode(s), cabling, clamps, test-links and all associated accessories and equipment in accordance with *AS/NZS 3000 Wiring Rule*.

### **5.2 MAIN EARTHING SYSTEM**

The existing main earthing shall be replaced by a new system. The new main earthing system shall consist of driven electrode(s) connected to an earth terminal bar in the main switchboards by means of stranded copper PVC insulated earthing cable. Confirm final position of electrodes before installation.

The system of electrode(s), clamps and earthing cable shall provide an earth resistance at the main switchboard as required by the Energy Fiji Limited.

The earth electrode shall be Eritech Stainless Steel Ground Rod SSER complete with CC12F coupler and EHL12FC2G cabling or approved equivalent.

The earth electrode shall be connected using approved clamps to the earthing conductor. The connections shall be made in a boxes. The connection box shall be ERICO Earth Rod Inspection Box PIT-03 or approved equivalent.

### **5.3 DISTRIBUTION BOARDS**

All distribution boards shall be earthed by means of earthing conductors provided with each sub-mains cabling.

Distribution boards shall be fitted with double screw tunnel type earth bars.

### **5.4 CABLING, ACCESSORIES APPLIANCES**

Floodlights, luminaires, socket outlets and fixed wiring to appliances shall be earthed by means of the earth conductor, which forms part of the respective circuit cabling.

A separate earthing conductor shall be used for each circuit.

Earthing conductors shall be run back to the earth bar within the distribution boards / control panels from where the supply originated.

## **SECTION 6 SUPPLY AND METERING**

### **6.1 SUPPLY**

The point of supply will be the Energy Fiji Limited aerial mains cabling.

The supply system will be at 415/240 volt 3 phase 4 wire 50Hz to be reuse.

### **6.2 METERING**

#### **6.2.1 GENERAL**

Meter panels, links, and associated wiring to the Energy Fiji Limited's kilowatt hour meters shall be supplied and installed by the Electrical Sub-Contractor.

Arrange for the installation of the Energy Fiji Limited's meters, current transformers etc.

#### **6.2.2 METER PANELS**

Meter panels shall be of dimensions nominated, predrilled and located to the Energy Fiji Limited's requirements.

## **SECTION 7 DISTRIBUTION BOARDS**

### **7.1 GENERAL**

Supply and install the distribution boards required for the installation.

The distribution boards shall comprise all switchgear, control and protection devices and power sources.

The exact extent of equipment required on the main switchboard and distribution boards shall be taken from the schematic diagram(s) and from the Specification.

Elevations of the main switchboard and distribution boards where shown on the drawings are indicative only for tendering purposes.

### **7.2 PERFORMANCE**

The main switchboard and distribution boards shall comply with *AS/NZS 61439* and *AS1939* and shall be built by a specialist switchboards manufacturer.

### **7.3 MAIN SWITCHBOARD**

The main switchboard shall be bottom entry and top/bottom exit, front connected free standing of totally enclosed metalclad construction.

The fault interrupting capacity of the main switchboard shall be 30kA

### **7.4 DISTRIBUTION BOARDS**

Distribution boards shall be bottom entry, front connected of totally enclosed metalclad construction with hinged escutcheon plates.

### **7.5 CONSTRUCTION**

The distribution boards unless otherwise detailed, shall be of sheet steel construction forming a rigid frame cubicle enclosure.

All distribution boards shall be of metal construction and lockable.

Sheet and structural members shall be of commercial quality drawn bright mild steel machine bent and folded, flat, smooth and free from warps, twists or other distortions. The minimum thickness of sheet steel shall be 1.6mm.

All floor mounted distribution boards shall be provided with galvanized steel frame bases of minimum height of 75mm.

The assembled distribution boards shall be constructed to prevent the entry of vermin.

Ventilation openings shall be provided. These shall be louvred and fitted with brass flywire mesh behind each louver.

Cable zones shall have cable trays, ducts and supports arranged for access to and removal of any cable without disturbing adjacent cables.

Escutcheon panels for the distribution boards shall have separate cut-outs for each individual circuit breaker.

Spare spaces provided for miniature circuit breakers shall be covered using purpose made plastic inserts.

Distribution boards shall be fitted with doors and flush locks keyed to CL1001 keys.



Cable entry provisions shall be via removable gland plates or pre-punched conduit knockouts.

Bolts and machine screws shall be zinc or cadmium plated complete with hexagon nuts and washers with excess threaded sections cut and filed. Nuts, bolts and machine screws exposed to view shall be chrome plated.

## 7.6 BUSBARS

The busbar configuration shall match incoming conductors and phase rotation shall be uniform.

Busbars shall be of high conductivity hard drawn copper with continuous current ratings as detailed.

Busbars for distribution boards shall be rectangular sections stamped in one piece.

*All busbars shall be insulated with phase coloured thermoplastic insulation.*

Busbar sections for current transformer mounting shall be readily removable.

## 7.7 CABLES

Cables and wiring shall be run horizontally or vertically neatly loomed and continuously clipped or enclosed in PVC wiring ducts.

Cables entering the main switchboards and distribution boards shall be clamped in approved IP68 cable glands. All cables shall be installed so that no stresses are placed on any termination.

## 7.8 PAINTING AND FINISHING

After fabrication the distribution boards shall be painted.

The inner equipment chassis shall be finished in gloss white enamel. The exterior colour shall be confirmed by the Engineer prior to manufacture.

## 7.9 LABELS

The Electrical Sub-Contractor shall supply and install on the existing Main Switchboard and distribution boards suitably engraved labels of Traffolyte type having white letters, or figures, of appropriate size on a black background. These labels shall be securely fixed to the panels or other equipment as required, by escutcheon pins or self-tapping screws.

The following labels shall be provided:

- a) Zone labels
- b) Switch labels
- c) Equipment labels
- d) Fuse labels
- e) Other, as specified

The Electrical Sub-Contractor shall provide typed circuit schedules and mount on the inside of the door of the respective distribution board. The schedules shall show the circuit number, area serviced and outlet or equipment location and identification.

## 7.10 WORKS PROGRESS

The Engineer shall be advised five working days in advance of manufacture reaching the following stages:

- a) After all busbar work and fitment of equipment is completed.
- b) Before painting of the distribution boards.
- c) When the distribution boards are completed but before being transported to site.

## SECTION 8 SWITCHGEAR– INSTRUMENTATION, PROTECTION AND CONTROLS

### 8.1 GENERAL

Supply and install all switchgear, controls, protection and instrumentation for the complete system including all power sources. The power sources shall be capable of continuous operation at the rated values detailed which are nett values after any applicable derating have been applied relative to the mounting or enclosure of equipment.

### 8.2 MOULDED CASE AND MINIATURE CIRCUIT BREAKERS

Moulded case circuit breakers shall comply with AS2184.

Miniature circuit breakers shall comply with AS3111.  
Circuit breakers shall be mounted on a purpose made chassis.

Single pole circuit breakers shall be interchangeable with multi pole circuit breakers. Duplex MCBs shall not be used unless specified.

Circuit breakers shall have instantaneous short circuit and inverse-time over-current tripping characteristics and shall also have positive identification of breaker status “ON”, “OFF” and “CENTRE TRIP”, positions.

Miniature circuit breakers shall have a minimum fault interrupting capacity of 6kA. Evidence that a particular make of circuit breaker complies with the above requirements shall be submitted prior to installation.

Circuit breakers shall be supplied by one of *the following* manufacturers:

- a) Cutler Hammer (Eaton)
- b) Schneider Electric
- c) Terasaki (NHP)
- d) Legrand

**Alternatives will not be accepted.**

All circuit breakers for the protection of socket outlet and lighting circuits shall be of the single pole residual current breaker overcurrent protection device (RCBO) type.

### 8.2 CONTROL SWITCHES

Switches shall be type tested to be mechanically capable of a minimum of one (1) million operations and shall be derated where applicable to provide an electrical life expectancy of one (1) million operations.

Selector switches shall be cam operated rotary type switches.

Auto/manual/lock-out switches, and test switches shall be key operated with similar locks and supplied with four (4) keys.

Ammeter selector switches shall have phase to phase and an “OFF” position.

Voltmeter selector switches shall have phase to phase and phase to neutral selection and an “OFF” position.

Control switches shall be *KRAUS* and *NAIMER* manufacture or other approved equivalent.

## SECTION 9 RETICULATION AND DISTRIBUTION SYSTEMS

### 9.1 GENERAL

Supply, install, connect and terminate all required cabling and supply and install all cable support systems to complete the electrical reticulation and distribution system for the works.

### 9.2 CONSUMER MAINS CABLING

The Electrical Sub-Contractor shall supply and install the consumer mains cabling including cable support systems as detailed on the drawings.

### 9.3 SUBMAINS CABLING

The Electrical Sub-Contractor shall supply and install all sub-mains cabling including cable support system as detailed on the drawings.

### 9.4 SUB-CIRCUIT CABLING

All cables shall be sized as stated on the drawing(s), however, where not shown the following minimum sizes shall be used:

- |                                  |              |
|----------------------------------|--------------|
| a) Luminaire Circuits            | 1.5sq. mm CU |
| b) 10 amp Socket Outlet Circuits | 2.5sq. mm CU |
| c) 15 amp Socket Outlet Circuits | 4.0sq. mm CU |

### 9.5 CABLES

#### 9.5.1 MATERIALS

##### 9.5.1.1 GENERAL

Cables shall be of approved manufacture and shall comply with the appropriate Australian Standards. All cables shall have high conductivity plain annealed copper conductors and shall be of the multi-stranded type. Cables shall be delivered to site in the original package.

##### 9.5.1.2 PVC INSULATED AND PVC SHEATHED CABLES (PVC/PVC)

PVC insulated and PVC sheathed cables shall be 0.6/1kV and V.75 rating unless otherwise specified.

##### 9.5.1.3 XLPE INSULATED AND PVC SHEATHED CABLES (XLPE/PVC)

XLPE insulated and PVC sheathed cables shall be 0.6/1kV and X-90 rating unless otherwise specified.

#### 9.5.2 COLOUR CODING

##### 9.5.2.1 GENERAL

Cables shall be colour coded as indicated in *AS/NZS 3000* Wiring Rules.

### 9.6 CABLING – INSTALLATION METHODS

#### 9.6.1 GENERAL

All cables shall be installed in a workmanlike manner parallel to walls, floors and ceilings, as applicable. Cables shall be concealed except where nominated otherwise. Cables shall not be imbedded in plaster, concrete, mortar or other finishes unless they are in conduit. Bending radii shall not be less than the manufacturer's recommendation and in any case shall be not less than six times the overall cable diameter.

All cables shall be installed giving due consideration to the derating requirements of *Australian Standard*

### AS3008.1 Electrical Installations – Selection of Cables.

Compression lugs or ferrules shall be designed for the type of cable and shall be installed in accordance with the manufacturer's recommendations using the approved compression tool and die.

#### 9.6.2 CABLING IN FALSE CEILING SPACE

Where metallic support systems are not utilized, cables shall be supported at intervals not exceeding 1200mm using catenary wires fixed to the building structure. Cables shall be neatly grouped together and at no point shall they be fixed to ceiling support systems, rest on the top side of the false ceiling, luminaires or other heat producing equipment.

#### 9.6.3 CABLES IN CONDUITS

Conduits shall be completely assembled and built in before drawing in cables. Do not use inspection fittings for drawing in cables. Kinked or damaged cables shall be replaced.

#### 9.6.4 CABLES ON TRAYS

Cables shall be fixed neatly in the tray in a single layer or trefoil formation for three phase circuits and shall be installed parallel with the tray edge and to avoid unnecessary crossovers. Cables shall be fixed at intervals not exceeding 1200mm by means of approved fastenings of non-corrosive materials.

### 9.7 CABLE RETICULATION SYSTEMS

#### 9.7.1 CONDUITS AND FITTINGS

##### 9.7.1.1 MATERIAL

Conduits and fittings shall comply with *AS/NZS 2053*. Minimum size of conduits shall be 25mm.

##### 9.7.1.2 INSTALLATION – GENERAL

All surface conduits shall be installed in a workmanlike manner parallel to walls, floors and ceilings as applicable, but all conduits cast into concrete pours shall be installed to the most suitable direct route. Approval shall be obtained before using oval conduit. Bends shall be made where possible with easy sweeps. Bends of 90° shall be made with a radius of not less than two times the external diameter of the conduit. Conduit saddles shall be spaced a maximum of 1000mm apart. Where conduits terminate at free ends a coupling and bush shall be attached. Conduit take-offs shall be rigidly fastened with lock-nuts to each side and conduits ends shall be bushed.

##### 9.7.1.3 INSTALLATION – IN SITU CONCRETE

Conduits greater than 32mm diameter shall not be cast into structural concrete without the approval of the Engineer.

##### 9.7.1.4 INSTALLATION – EXTERNAL USE

All exposed external conduits shall be heavy duty rigid PVC type. Where exposed to the weather or dampness, junction boxes shall be provided with covers fitted with neoprene gasket. Conduits shall be mounted on PVC saddle spacers to maintain a spacing of not less than 12mm from surfaces concerned. All conduits and conduit fittings installed in direct sunlight shall be painted with a light coloured water-based acrylic paint. Confirm the colour of the paint with the Engineer.

#### 9.7.2 CABLE TRAYS

##### 9.7.2.1 MATERIAL

Cable trays shall be selected from the *Unistrut UT3* range. Bends of one piece manufacturer shall be provided equal in strength to the original section at all points. Butted straight ends will not be accepted. Trays shall not be less than 1.0mm thick wide.

### **9.7.2.2 INSTALLATION**

Trays shall be installed in workmanlike manner parallel to walls, floors and ceilings as applicable. Trays shall be fully supported over their entire width by suitable metal brackets. The brackets shall be equally spaced at not more than 900mm centres to prevent sagging in horizontal lengths of tray. Installation methods, weight of cables and requirements for subsequent maintenance procedures shall be taken into account when designing supports and brackets. Trays shall not be mounted directly onto a flat surface. The minimum mounting dimension of any cable tray from a wall or ceiling shall be 12mm.

### **9.7.3 SKIRTING DUCTS (NOT APPLICABLE)**

## **9.8 UNDERGROUND CONDUITS (ENCLOSURES FOR UNDERGROUND CABLING)**

### **9.8.1 MATERIAL**

Conduits shall be heavy duty electrical orange type and comply with AS/NZS 2053.

### **9.8.2 INSTALLATION**

All underground reticulation routes shall be marked out and approved before commencing excavation. Trenches shall be located to permit changes of direction in easy stages eliminating strain on cable or conduits. Accurate records of underground reticulation routes shall be kept for later inclusion in the As Installed Drawings. Conduits shall be laid evenly in an orderly fashion.

The Electrical Sub-Contractor shall give the Engineer three (3) working days' notice prior to backfilling to allow inspection of all conduits laid in trenches. Wherever possible all underground conduits that connect to a cable pit shall be graded to drain to the pit. Unless otherwise specified, backfill with general filling, with no stones retained on a 25mm sieve occurring within 150mm of the service. Where service excavations occur in topsoil areas, complete backfilling with topsoil, reinstate existing surface and assets disturbed or removed as a result of the excavation or trenching, to the approval of the Architect.

### **9.8.3 UNDERGROUND PVC MARKER SHEETING**

Orange PVC marker sheeting with indelible lettering giving warning of electric cables below shall be supplied and located across the width and along the entire length of the excavation at depths detailed in AS/NSZ 3000.

## **9.9 JOINTING AND TERMINATIONS**

### **9.9.1 GENERAL**

No joints will be permitted except at outlet and luminaire positions.

#### **9.9.1.1 PVC INSULATED AND SHEATHED CABLES**

Copper cables 6sq.mm and above shall be terminated to bolts or studs, using soldered or compression type lugs. Compression lugs or ferrules shall be designed for the type of cable and shall be installed in accordance with the manufacturer's recommendations using the approved compression tool and die.

Protective sheath covering on all PVC insulated and sheathed cables shall be maintained between outlet boxes, conduits or equipment enclosures.

#### **9.9.1.2 CABLE JOINT AND TERMINATION BOXES**

Cable boxes of the correct size and voltage rating for the cables to be jointed therein shall be provided.

Joints and terminations shall be provided for the particular type of cable being installed.

At terminations, the cable cores shall be extended with PVC cable tails of equal cross sectional area. Joints shall be made with solid barrier crimp links and shall be insulated with heat shrink sleeves or

encapsulated within a selected proprietary insulating setting compound.

### **9.9.2 SEALING OF PENETRATIONS**

The Electrical Sub-Contractor shall supply and install *HILTI CP611A* or equal approved intumescent firestop mastic for all penetrations (including sleeves) through walls, ceiling slabs, beams etc. for all cabling.

## SECTION 10 ACCESSORIES, OUTLETS AND APPLIANCES

### 10.1 GENERAL

Supply and install all accessories, outlets, appliances and appliance connections complete with required fixings and fastenings.

### 10.2 ACCESSORIES AND OUTLETS

#### 10.2.1 GENERAL

Accessory flush plates shall be of high impact polycarbonate construction. Colour of accessories shall be selected by the Engineer at a later date. Confirm colour of accessories before ordering. Mounting heights nominated are to the centre of the equipment. Accessories located on hollow block walls or in-situ concrete walls shall be recessed in standard metal wall boxes. Accessories located on lightweight stud walls or de-mountable partitions shall be mounted directly on the paneling using proprietary fixing brackets.

#### 10.2.2 SWITCHES

Switches shall be of the rocker type suitable for fluorescent lighting loads and shall be flush wall mounted generally. Switches shall be vertically mounted. Multi switch positions shall be ganged under one cover plate. Switches in ganged boxes shall be arranged similar in plan to the lighting points controlled. Unless otherwise specified all light switches shall be mounted at 1300 above finished floor level. All switch modules shall be of the front-loading type. Alternative methods may be used to prevent the modules from being pushed into the wall boxes.

Switches shall be 15amp capacity except where higher ratings are specified.

Approved manufacturer and range:

- a) PDL 600 Series Range
- b) Clipsal 2000 Series Range
- c) Legrand Excel Range

#### 10.2.3 SOCKET OUTLETS

Socket outlets shall be of the same manufacture as the switches.

Outlets shall generally be of the combination rocker switch/socket type flush wall mounted. Outlets shall be horizontally mounted. All switch modules shall be of the front-loading type. Alternative methods shall be used to prevent the modules from being pushed into the wall boxes. Double outlets shall be under one flush plate. Weather protected socket outlets shall be selected from the range. Outlets with rating greater than 10A 240V shall be supplied with matching plugs.

The Electrical Sub-Contractor shall allow to relocate socket outlets 2000mm in any direction from the positions shown on the drawings at no additional cost to the Contract. Confirm final positions of socket outlets on site before carrying out installation works.

Approved manufacturer and range:

- a) PDL 600 Series Range
- b) Clipsal 2000 Series Range
- c) Legrand Excel Range

## **SECTION 11 LUMINAIRES**

### **11.1 GENERAL**

The Electrical Sub-Contractor shall supply and install luminaires (including floodlights) where indicated on the drawings. Luminaires shall be installed in an approved manner and be complete with lamps/tubes, discharge lamps and accessories necessary for their proper functioning.

All fixings for luminaires shall be corrosion resistant.

The quantities of each type of luminaire shall be determined from the drawings as identified by the letter symbol signifying type.

All luminaires shall comply with *AS/NZS 60598*.

### **11.2 INSTALLATION**

#### **11.2.1 GENERAL**

Confirm final positions of luminaires on site before carrying out installation works.

All screws, batten, roses, noggins, trims, packing etc. for the proper fixing of luminaires shall be provided by the Electrical Sub-Contractor as part of the works.

All luminaires shall be effectively earthed.

### **11.3 LUMINAIRES**

Luminaires shall be manufactured to the following requirements:

- a) All luminaires shall be power factor corrected to 0.85
- b) Treated to minimize the effects of corrosion.
- c) Rated average life of 40,000 hours
- d) Reliable operation between -20 °C to 45 °C ambient temperature

### **11.4 TUBES / LAMPS**

All tubes and lamps shall be of LED type and shall be warm light in colour. Approved manufacturers are:

- a) Osram
- b) Philips
- c) Sylvania



## **SECTION 12 TELECOMMUNICATIONS SERVICES**

### **12.1 GENERAL**

The Electrical Sub-Contractor shall supply and install cable trays and conduits detailed on the drawings, for the Telecommunications Services.

All conduits shall be RONTEL Corporation green type and installed with pull tape.

**SECTION 13 LIGHTNING PROTECTION SYSTEM (NOT APPLICABLE)****SECTION 14 AUTOMATIC POWER FACTOR CORRECTION UNITS****14.1 GENERAL**

Supply and install one three stage automatic 20kVAr power factor correction unit as indicated on the drawings.

The power factor correction unit shall comprise all switchgear, control and protection devices and power sources.

**14.2 PERFORMANCE AND FAULT CAPACITY**

The power factor correction unit enclosures shall comply with AS/NZS61439 and shall be built by specialist switchboard manufacturers.

The fault interrupting capacity of the power factor correction unit shall be 30kA.

**14.3 OPERATION OF THE UNITS**

The power factor correction units shall automatically monitor the power factor of the electrical loads and adjust to maintain a power factor greater than 0.85.

**14.4 CONSTRUCTION**

The construction of the unit shall be similar to that of the main switchboard.

## **SECTION 15 TESTING AND COMMISSIONING**

### **15.1 GENERAL**

The installation shall be tested and commissioned to the satisfaction of the Engineer and Energy Fiji Limited prior to the acceptance of the installation and the commencement of the Defects Liability Period.

The tests shall comprise a thorough inspection of the complete installation and the operational and performance tests specified or necessary to confirm compliance with the specification.

All tests detailed in *AS/NZS 3000* and required by Energy Fiji Limited shall be carried out by the Electrical Sub-Contractor.

All necessary testing and commissioning shall be carefully preplanned and scheduled in order that it is fully coordinated with other relevant trades and shall be carried out in a safe and efficient manner with a minimum of inconvenience to all concerned.

All equipment or materials found to be faulty during testing shall either be replaced or repaired free of charge.

Should a trial or test be deemed unsatisfactory by the Engineer it shall be repeated at no further charge after necessary rectification, until such time as a satisfactory result is obtained.

### **15.2 TESTS**

The Engineer shall be given three (3) working days' notice of any proposed test and shall be given the opportunity to attend all such tests.

### **15.3 COMMISSIONING**

Carry out all commissioning tests necessary to put the systems into commercial use and to approval before Practical Completion is granted. Each item of equipment individually and each complete system as a whole shall be checked and adjusted to achieve satisfactory performance.

### **15.4 TESTS AND INSTRUMENTS**

All instruments, appliances and test loads shall be provided for the duration of the tests as necessary to complete the test procedures specified.

### **15.5 TEST RESULTS**

All test procedures used and results obtained for both works and site tests shall be submitted in the form of a written Test Report.

Records shall be kept of test results and two (2) copies shall be submitted to the Engineer at the completion of the work. Approval of the format required for the test results shall be obtained prior to the submission.

### **15.6 NOTICES**

All tests required by the Energy Fiji Limited shall be completed in accordance with directions given by them.

Copies of all approval notices including the "Final Acceptance" notice shall be submitted prior to the claim for final payment.

### **15.7 EARTHING**

The earthing systems shall be tested by the Electrical Sub-Contractor in the presence of the Engineer to the requirements of Energy Fiji Limited.

## **SECTION 16 AS INSTALLED DRAWINGS & INSTALLATION MANUALS**

### **16.1 GENERAL**

The Electrical Sub-Contractor shall supply at Practical Completion As Installed drawings and Installation Manuals for the project.

### **16.2 AS INSTALLED DRAWINGS**

The drawings shall be marked up progressively and tabled, for approval, at each site meeting.

As installed drawings correctly brought up to date to present true and accurate representation of the actual installation and to a scale of not less than 1:100 shall be provided at Practical Completion.

The following shall be included in these drawings:

- a) Layouts of main switchboard and distribution boards.
- b) Layouts of the floodlight poles.
- c) Complete layouts showing locations of cable ducts and cast in conduits, junction boxes, distribution boards, socket outlets, luminaires and accessories.
- d) Complete electrical schematics and line diagrams including fault ratings, sizes, settings and types of protection apparatus and cable sizes.

Upon submission and approval the following issue of As Installed Drawings shall be made:

3 Complete sets of prints, bound as sets

An accompanying typed list of all drawings shall be provided, with both full drawing number and title.

All drawings are required to be provided in electronic FILE (AutoCAD 2014 version or approved equivalent).

### **16.3 INSTALLATION MANUALS**

Three copies of the Installation Manual shall be provided to the Project Manager at Practical Completion.

A full description of the various systems involved and instructions covering every action necessary for the efficient operation and maintenance of the installation shall be included. The manual shall be bound neatly in a blue vinyl hardback folder with stamped gold lettering on the front cover, in a format to be confirmed by the Engineer.

In addition, the words, "Installation Manual", the services, and the job name, shall be stamped in gold lettering along the spine of the folder.

All aspects of the style and quality of the Manual, including folders and contents shall be to approval. The general format to be followed shall be:-

## **SECTION 1 INDEX**

All sub-divisions of each section including lists of drawings, equipment and similar shall be indexed for quick reference.

## **SECTION 2 GENERAL DESCRIPTION OF ELECTRICAL SERVICES**

Each individual system shall be included as a sub-section as appropriate. Full details of any system which requires regular maintenance shall be included. The function of each system or sub-system shall be described.

**SECTION 3 AS INSTALLED DRAWINGS**

A complete set of As Installed Drawings shall be included in the Installation Manual.

**SECTION 4 EQUIPMENT**

All major items of equipment supplied and installed by the Electrical Sub-Contractor shall be listed complete with manufacturer's name, model, and/or Type No., Serial No., size, and design ratings in sub-divided sections as for Section 2 above (i.e. all relevant data necessary for re-ordering or replacing).

**SECTION 5 INSTALLATION MAINTENANCE & OPERATING INSTRUCTIONS**

Manufacturer's installation, maintenance and operating instruction for each system shall be included and sub-divided as for Section 2. A comprehensive maintenance schedule to be followed throughout the warranty period shall be included along with copies of all data relating to commissioning and testing.

**SECTION 6 PLANT OPERATING INSTRUCTIONS**

A complete description and correct sequence of all actions necessary to start up and operate each system shall be provided and sub-divided as for Section 2. Full operation on such items as normal and abnormal dial readings and protection equipment settings shall be included. Information on the immediate action to be taken in the event of hazardous conditions arising shall be provided concluding with the following sentence in large lettering.

FOR SERVICE - CALL TELEPHONE NO.: \_\_\_\_\_

With appropriate telephone number provided.

**SECTION 7 PERFORMANCE TEST RESULTS**

Space for inclusion of all performance test results shall be provided and sub-divided as for Section 2.

All results of progressive tests during the installation works shall be included.

## **SECTION 17 MAINTENANCE AND SERVICING**

### **17.1 MAINTENANCE**

Routine maintenance and servicing shall be carried out for a period of twelve months from date of Practical Completion to the end of the Defects Liability Period.

Routine maintenance shall be carried out on a monthly basis and emergency service shall be carried out on a 24 hour call out basis.

Maintenance procedures shall be as appropriate to ensure the safe and proper operation of all systems and shall be in accordance with current standard requirements of the Building Act and Regulations having jurisdiction, relevant Australian and New Zealand Standards, Local Authority Regulations and the schedule provided in the Installation Manual as outlined in Section "Testing and Commissioning" of this Specification.

Routine maintenance shall be deemed to be the regular maintenance of equipment and shall include not less than:

- a) Checking and replacement of faulty lamps/tubes and accessories every month.
- b) Checking the operation of all electrical switchgear every three (3) months.
- c) Checking the operation, setting and calibration of all controls every three (3) months.
- d) Checking the emergency and exit lighting systems every three (3) months.
- e) Checking and where necessary tightening loose connections at the main switchboard and distribution boards immediately prior to the completion of the Defects Liability Period.

### **17.2 BALANCING OF LOADS**

Balance the loads as evenly as practicable at Practical Completion. Recheck and where necessary, rebalance the loads prior to the completion of the Defects Liability Period.

### **17.2 RECTIFICATION OF DEFECTS**

All defects shall be promptly rectified. Retention moneys or Bank Guarantee will not be released until all outstanding defects notified during the Maintenance and Defects Liability Period has been rectified and completion of such work subsequently advised in writing to the approving Authority.

### **17.3 SERVICE LOG BOOK**

Provide a log book bound in an approved hard cover folder and containing sufficient pages to record all operational maintenance during the defects liability period. Provide a fixed holder in an approved location for the log book.

Record in the log book all maintenance work performed. Each log sheet shall be signed by the Serviceman responsible and shall include the date and description of work carried out.

All log sheets must be countersigned by the Principal's representative.

The front cover of the log book shall be labelled with the name of the project and shall clearly note that each sheet must be countersigned.

Inform the Maintenance staff and supplier's Serviceman on the correct use of the log book.

### **17.4 DEFECTS LIABILITY**

The Defects Liability Period shall be 52 weeks from the date of Practical Completion.

During the Defects Liability Period the Electrical sub-contractor should be responsible for the provision of all labour, materials and other costs associated with the removal of defective components, bad workmanship and the installation, adjusting and testing of replacements and to carry out such work within

a reasonable time.

Equipment replaced or repaired during the warranty period shall be provided with a warranty of 52 weeks commencing from the date of replacement or repair. Warranty maintenance for the replaced or repaired equipment shall be limited to the 52 weeks from date of Practical Completion.

### **17.5 CERTIFICATION**

At the end of the Defects Liability period, make a final service visit and upon satisfactory completion of the above procedures certify in writing that the installation is operating correctly.

# APPENDICES



**APPENDIX I TENDER FORM (To be completed and submitted with Tender)**

**ELECTRICAL SERVICES TENDER  
KARAVI WEIGHBRIDGE STATION  
KARAVI, BA, FIJI**

We, the undersigned having examined the Drawings and Specification hereby offer to execute and complete the whole of the Works required to be done, as shown on the said Drawings and described by or referred to in the Specification and for the Fixed Lump Sum of:

.....  
..... (FJ \$.....)

Which includes all Contingency, Provisional and P C Sums and is a Fixed Lump Sum without provision for fluctuations in the cost of labour and materials.

AS WITNESS OUR HANDS THIS ..... day of ..... 2019

SIGNATURE OF TENDERER .....

OFFICE STAMP .....

ADDRESS .....

WITNESS [SIGNATURE AND BLOCK CAPITALS] .....

ADDRESS1 .....

OCCUPATION .....

DATE .....

We confirm that our time for completion is .....calendar weeks.  
The Tender shall be open for acceptance for a period of sixty (60) days.  
The Principal does not bind himself to accept the lowest or any tender.  
The documents must not be altered in any way. Any special observation should be made in a separate letter attached to this Tender. Please return documents with Tender.  
The Tender is to be enclosed in a sealed envelope and must arrive at the nominated office as per the details in the "Tender Invitation Letter".

Name of Tenderer \_\_\_\_\_

Signature \_\_\_\_\_ Date \_\_\_\_\_

**APPENDIX II SUMMARY OF TENDER (To be completed and submitted with Tender)****PRINCIPAL** : LAND TRANSPORT AUTHORITY**SHEET 1 of 1 SHEET****PROJECT** : KARAVI WEIGHBRIDGE STATION  
KARAVI, BA, FIJI**PROJECT NO:** 7835**SPECIFICATION:** ELECTRICAL SERVICES**DATE:** JUNE 2019

ITEM	DESCRIPTION	PRICE (VEP)
a)	Preliminary and General	\$
b)	Supply and installation of un-metered consumer mains cables (and conduits), from the existing EFL pole to the main switch board.	\$
c)	Supply and installation of generator mains cabling, control cabling (and support systems), and associated accessories.	\$
d)	Supply and installation of the main switch board.	\$
e)	Supply and installation of a power factor correction unit, transient voltage suppressor, associated accessories and cabling in the main switch board.	\$
f)	Supply and installation of sub-mains cables (including cable support systems)	\$
g)	Supply and installation of distribution boards	\$
h)	Supply and installation of luminaires, associated accessories and final sub-circuit cabling (including cable support systems).	\$
i)	Supply and installation of socket outlets, associated accessories and final sub-circuit cabling (including cable support systems).	\$
j)	Supply and installation of cable pits, conduits, catenary wires and cable ladders for the Extra Low Voltage Services and Telecommunications Services.	\$
k)	Supply and installation of the earthing system.	\$
l)	Supply and installation of cabling, isolators and associated accessories for electrical motors.	\$
m)	Supply of Shop Drawings	\$
n)	Testing and commissioning	\$
o)	Supply of As Installed Drawings	\$
p)	Supply of Installation Manuals	\$
q)	Twelve (12) months Maintenance	\$
r)	Contingency Sum	\$ 15,000.00
	<b>TOTAL TENDER PRICE (VAT Exclusive)</b>	<b>\$ (VEP)</b>
	<b>VAT @ 9%</b>	<b>\$</b>
	<b>TOTAL TENDER PRICE (VAT Inclusive)</b>	<b>\$ (VIP)</b>

**APPENDIX III SCHEDULE OF TECHNICAL DATA (To be completed and submitted with Tender)**

**PRINCIPAL** : LAND TRANSPORT AUTHORITY

**SHEET 1 of 4 SHEETS**

**PROJECT** : KARAVI WEIGHBRIDGE STATION  
KARAVI, BA, FIJI

**PROJECT NO:** 7835

**SPECIFICATION:** ELECTRICAL SERVICES

**DATE:** JUNE 2019

**NAME OF TENDERER:**.....

Two loose copies of this Schedule are supplied with this Specification.

One copy shall be completed, signed by the Tenderer and returned with his tender.  
The other copy is for the Tenderer's retention.

A Tender shall be regarded as not complying with this Specification if the information required by this Schedule of Technical Data is not supplied with the Tender.

Tenders are to be based on equipment etc., as specified.

Alternatives may be submitted, but must be clearly described to receive consideration.  
For each alternative, an alternative tender price must be submitted.

	<b>NAME OF PROPOSED SUB-CONTRACTOR / SUPPLIER</b>	<b>SUB-CONTRACT EQUIPMENT</b>
1	.....	.....
2	.....	.....
3	.....	.....
4	.....	.....
5	.....	.....
6	.....	.....

	<b>COMPARABLE WORK CARRIED OUT BY THE TENDERER AND APPROXIMATE VALUE</b>	
1	.....	\$.....
2	.....	\$.....
3	.....	\$.....
4	.....	\$.....
5	.....	\$.....
6	.....	\$.....

Name of Tenderer \_\_\_\_\_

Signature \_\_\_\_\_ Date \_\_\_\_\_

**APPENDIX III SCHEDULE OF TECHNICAL DATA (To be completed and submitted with Tender)**

**PRINCIPAL** : LAND TRANSPORT AUTHORITY

**SHEET 2 of 4 SHEETS**

**PROJECT** : KARAVI WEIGHBRIDGE STATION  
KARAVI, BA, FIJI

**PROJECT NO:** 7835

**SPECIFICATION:** ELECTRICAL SERVICES

**DATE:** JUNE 2019

**1. MAIN DISTRIBUTIONBOARD**

Manufacturer .....

**2. DISTRIBUTION BOARDS**

Manufacturer .....

Model No .....

**3. CIRCUIT BREAKERS**

Manufacturer .....

Type .....

**4. SOCKET OUTLETS**

Double 10A Outlet Weather-Proof (IP65) .....

Single 15A Outlet Weather-Proof (IP65) .....

**SINGLE / THREE PHASE WEATHER-PROOF (IP65) ISOLATORS**

Manufacturer .....

Model No .....

**5. CABLES**

CONSUMER MAINS / SUBMAINS CABLING

Manufacturer .....

Type .....

FINAL SUB-CIRCUIT CABLING

Manufacturer .....

Type .....

**APPENDIX III SCHEDULE OF TECHNICAL DATA (To be completed and submitted with Tender)**

**PRINCIPAL** : LAND TRANSPORT AUTHORITY

**SHEET 3 of 4 SHEETS**

**PROJECT** : KARAVI WEIGHBRIDGE STATION  
KARAVI, BA, FIJI

**PROJECT NO:** 7835

**SPECIFICATION:** ELECTRICAL SERVICES

**DATE:** JUNE 2019

**6. LUMINAIRES**

TYPE A

Manufacturer .....

Model No .....

TYPE B

Manufacturer .....

Model No .....

TYPE C

Manufacturer .....

Model No .....

TYPE D

Manufacturer .....

Model No .....

TYPE E

Manufacturer .....

Model No .....

TYPE F

Manufacturer .....

Model No .....

**APPENDIX III SCHEDULE OF TECHNICAL DATA (To be completed and submitted with Tender)**

**PRINCIPAL** : LAND TRANSPORT AUTHORITY

**SHEET 4 of 4 SHEETS**

**PROJECT** : KARAVI WEIGHBRIDGE STATION  
KARAVI, BA, FIJI

**PROJECT NO:** 7835

**SPECIFICATION:** ELECTRICAL SERVICES

**DATE:** JUNE 2019

**6. LUMINAIRES**

TYPE G

Manufacturer .....

Model No .....

TYPE EM

Manufacturer .....

Model No .....

TYPE EX

Manufacturer .....

Model No .....

Name of Tenderer \_\_\_\_\_

Signature \_\_\_\_\_ Date \_\_\_\_\_

**APPENDIX IV SCHEDULE OF RATES (To be completed and submitted with Tender)****PRINCIPAL** : LAND TRANSPORT AUTHORITY**SHEET 1 of 1 SHEET****PROJECT** : KARAVI WEIGHBRIDGE STATION  
KARAVI, BA, FIJI**PROJECT NO:** 7835**SPECIFICATION:** ELECTRICAL SERVICES**DATE:** JUNE 2019

The following Schedule of Rates shall be used as a basis to value variations (either additions or deletions) and progress claims for this Contract.

Rates shall include all overheads (including on and off site supervisory staff, allowance etc.) profit and VAT.

Rates for equipment and materials are that delivered to site, without installation. (Unless otherwise stated)

ITEM	DESCRIPTION	UNIT	PRICE (VAT)
1	Licensed Electrician	Per hour	\$.....
2	Technician	Per hour	\$.....
3	Unskilled Labour	Per hour	\$.....
4	a) Socket Outlets – Double 10A Outlet Weather-Proof (IP65)		\$.....
	b) Socket Outlets – 15amp Outlet Weather-Proof (IP65)		\$.....
	c) Socket Outlets – 32A Three phase Weather-Proof (IP65)		\$.....
	d) 20A SINGLE PHASE Weather-proof (IP65) Explosion-proof Isolator		\$.....
	e) 20A THREE PHASE Weather-proof (IP65) Explosion-proof Isolator		\$.....
	f) 20A SINGLE PHASE Weather-proof (IP65) Isolator		\$.....
	g) 20A THREE PHASE Weather-proof (IP65) Isolator		\$.....
5	a) Circuit Breaker – 10A Single Pole RCBO		\$.....
	b) Circuit Breaker – 16A Single Pole RCBO		\$.....
	c) Circuit Breaker – 20A Single Pole RCBO		\$.....
	d) Circuit Breaker – 20A Triple Pole		\$.....
	e) Circuit Breaker – 32A Triple Pole		\$.....
6	Type A		\$.....
	Type B		\$.....
	Type C		\$.....
	Type D		\$.....
	Type E		\$.....
	Type F		\$.....
	Type G		\$.....
	Type EM		\$.....
	Type EX		\$.....
	<u>On Cost Percentage Mark-Ups</u>		
7	Labour		.....%
8	Material		.....%
9	Plant		.....%

Name of Tenderer \_\_\_\_\_

Signature \_\_\_\_\_ Date \_\_\_\_\_