



FIJI ELECTRICITY AUTHORITY TENDER

TENDER NO: MR 247/2017

**DESIGN AND CONSTRUCT CIVIL WORKS FOR DEUBA SUBSTATION
1 X 50 TONNE 33kV/11kV TRANSFORMER PAD, FIRE WALL, OIL
SEPERATOR PIT and Road WORKS**

TENDER NO: MR 247/2016

**DESIGN AND CONSTRUCT CIVIL WORKS FOR DEUBA SUBSTATION 1 X 35 TONNE 33kV/11kV
TRANSFORMER PAD, FIRE WALLOIL SEPERATOR and ROAD WORKS**

The Fiji Electricity Authority invites reputable contractors to tender for the Design and Construct Civil works to be carried out for the transformer pad works at Deuba Substation 33kV/11kV transformer yard. The tender shall be on the basis of a lump sum contract based on firm prices.

FEA is seeking those contractors who shall be able to ensure all civil works shall be complete by the February Month, 2018. Construction and installation of the bund walls, fire wall, oil Separator Pit, Road Works, and other miscellaneous work as specified by the employer's representative shall take place following installation and commissioning of the new transformers.

It is Mandatory to submit Sealed Tenders to the following location:

The Secretary – Tender Committee,
Fiji Electricity Authority Head Office,
2 Marlow Street,
Suva

The Tenders Should be Marked with the Following Details:

**“TENDER NO: MR 247/2017 – “DESIGN AND CONSTRUCT CIVIL WORKS FOR DEUBA SUBSTATION 1 X 50 TONNE
33kV/11kV TRANSFORMER PAD, OIL SEPERATOR and ROAD WORKS”**

COMPANY NAME AND ADDRESS

Further Information about this tender can be obtained from:

Tuvitu Delairewa
General Manager Commercial
2 Marlow Street, Suva, Fiji.
Email: TDe lairewa@fea.com.fj
Phone: 679 3224 185

A Mandatory Site visit will be held on **Thursday, 28th September, 2017 commencing at 10.00am**

The deadline for submission of Tenders shall be 1600hrs on **Wednesday 18th October 2017, Fiji Standard Time.**

1. SCOPE OF WORKS

This section covers the civil scope of work required to be carried for preparation of the transformer bay prior to installation of the new 5/6.25MVA 33/11kV Transformer at the Fiji Electricity Authority's Deuba Substation. The proposed area for extension:

- A transformer pad currently exists at the location. This pad is to be removed and new pad to built on top of it to support the required weight.

The civil work scopes of this tender shall be to remove the existing transformer pad and build a new pad at this location with bund wall and oil separator pit. Design details of the new transformer is as listed in the table below:

TRANSFORMER ELECTRICAL SPECIFICATIONS	
RATING	5/6.25 MVA
TOTAL TRANSFORMER MASS	33,000 kg
OIL VOLUME	6,000 lit

1.1 GENERAL DESCRIPTION

1.1.1 DEUBA SUBSTATION TRANSFORMER PAD

The transformer pad works shall consist of the following main items:

- Removal of existing pad to a required level so that a new pad can be safely built on the same location
- Construction of 1 X transformer pad suited for 50 Tonne of Load
- Construction of transformer bund bases and wall 800mm high x 200mm thick wall
- Construction of fire walls – 6,000mm high and 200mm thick as per drawings
- Installation of oil/water drainage system and oil separator pits as per NFA, USA standards
- Installation of high voltage cable conduits for 11kV and 33kV cables, each circuit shall be 150mm X 6 conduits from Pad to the cable trench.
- 35m concrete 30MPA Standard road works as per drawings – compacted to 98%, 500mm crushed metal (40mm)
- Installation of 8 x 150 Watts Phillips LED lights with 8m high street light pole
- Earth GRID 150mm squared with flat bar 100mm X 6mm

1.1.2 ELECTRICITY, WATER, GAS AND OTHER SERVICES

The Contractor shall at his expense, provide all electricity, water, gas and other services necessary to execute and complete the Works on site. Prevailing tariff and service connection procedure shall be applicable.

1.1.3 STANDARDS

All civil works shall be carried out in conformity with Fiji Building Code or the British Standard Institution. All electrical works shall be carried out in conformity to the IEC Standards in general. British or Australian standards may be applied where necessary. Any national or international standard may be used if such standards are not less exacting than corresponding standards IEC, BSI or Fiji Building Code. In all instances, a copy of the relevant standard adopted shall be forwarded to the Engineer.

1.2 GENERAL WORK SCOPE

1.2.1 PRELIMINARY WORKS:

- a) Site Survey
- b) Geotechnical Study - as per Section 2 Technical Specifications.

1.2.2 SITE CLEARING:

- a) Removal existing transformer pad to allow for new pad construction on top.

1.2.3 EXCAVATION:

- a) Cutting and filling earth
 - Formation levels shall be as approved by the Employer's Representative.
- b) Surface chipping
 - Area covered by earth mat.

1.2.4 CABLE CONDUITS LAYING:

- a) As per drawings

1.2.5 FOUNDATIONS:

Concrete Bund base and wall together with fire walls for transformers complete with excavation, backfilling, form works, demolishing of existing pad, concrete works and reinforcement bars.

- 1 Nos. 33kV /11 kV Power Transformers (5/6.25MVA)
- 1 No. Oil/Water containment and drainage system. Outlet to be as per Environmental Management Plan.

1.2.6 LIGHTNING PROTECTION SYSTEM:

- As per section 2 Technical Specification 1 X 17m

1.2.7 WATER DRAINAGE SYSTEM:

- a) Surface water drainage system
 - Internal surface water drainage system shall be directed as per the Environmental Management Plan.

1.2.8 CONSTRUCTION & MAINTENANCE OF ROADS:

- a) Approach Road
- b) Structures for approach road
- c) Access road and structures

1.2.9 SURGE ARRESTER, cable termination and CABLE STRUCTURES

1. Replace existing 33kV Surge Arrester and associated steel structures and electrical accessories and earthing with ABB Sweden complete with counter reading.
2. Replace existing 33kV cable and associated steel structures and electrical accessories and earthing with ABB Sweden complete with counter reading
3. Install new 33kV 300mm XLPE from Nexun NZ cable from Transformer to cable structure and terminate both ends with ABB/NKT Cable terminations

4. Dig, lay and Install new 11kV 300mm XLPE from Nexun NZ cable from Transformer to 11kV circuit breaker at the switch room and terminate both ends with ABB/NKT Cable terminations

1.2.10 MISCELLANEOUS WORKS

- Any work other than that listed above

2. TECHNICAL SPECIFICATIONS

2.2 GEOTECHNICAL STUDY - A detailed geotechnical study is to be conducted on the identified site to determine feasibility for the construction of two transformer pads, their respective bund walls, fire walls, casting of HV cable trenches, laying of earth mat and laying of multicore HV/LV cable conduits as shown on layout drawing.

- 2.2.1 The study shall be undertaken by a qualified geotechnical engineer. The said engineer will be tasked with the responsibility of undertaking the geotechnical investigations and providing the necessary geotechnical design parameters that will be used for foundation design and construction.
- 2.2.2 Samples shall be taken from a minimum of four (4) borings to determine soil bearing capacities. These shall be tested to determine the physical and chemical characteristics of various strata and of the ground water. A safe bearing capacity shall be determined for the purpose of foundation design.
- 2.2.3 A report of the investigation and study carried out shall be submitted. This will serve to clearly inform of the current suitability of the on-site materials for construction of the new transformer yard accounting for a total designed load of 80 Tons per transformer. The study will clearly advise on the site's ability to hold up without fail the combined installation load on the green patch and issue recommendations on type of foundation design.
- 2.2.4 The report must also serve to clearly inform the employer of any remedial works that will need to be undertaken so as to ensure the suitability of the site to hold up the transformer yard extension for the new transformers without fail for its projected 60 years' of service life. Detailed excavation work specifications and drawings for all remedial works shall be submitted together with the report.
- 2.2.5 The employer's written approval is to be given prior to commencing of any remedial earth works.
- 2.2.6 The safe bearing capacity of the sub-strata may be modified at the final design stage when the full site survey and investigation have been completed and the final layout, structural details etc. agreed. No variation in contract price will be made due to any variation in the bearing capacity leading to modification of foundation design at the final design stage. Special attention shall be paid to the ground water table and chemical composition of the ground water and soil in the substation area.
- 2.2.7 The following shall be considered as a minimum requirement, assuming uniform conditions over the Site. This shall be extended if significant inconsistencies arise.
 - a) Depth of boreholes shall be continued up to bedrock if it does not meet the hard stratum of N- value more than 50.
 - b) Borehole records shall describe and indicate level of all soils encountered and indicate the natural water table level. Rock core records shall specify total core recovery, solid core recovery and quality of the rock cored.
 - c) Where applicable, samples of soil shall be obtained from all soil strata or at 2 meters intervals in a single stratum and tested to determine physical and chemical properties, particularly with respect to

substances, which would react with concrete or other materials to be used for the foundation works.

- d) Where applicable, in situ soil tests shall be completed for all soil strata or at 2 meter intervals in a single stratum. Standard Penetration test in non-cohesive soils, field vane tests in sensitive cohesive soils.
- e) Ground water samples shall be obtained from each bore-hole and tested in accordance with approved practice.
- f) Electrical resistivity of the soil shall be verified on four samples, in accordance with approved practice (IEEE 80-2004 : IEEE Guide for Safety in AC Substation Grounding).

2.3 REMOVING OF EXISTING MASONRY/CONCRETE - Unwanted foundations shall be demolished or up-rooted. The Contractor shall clear all areas required for the work. All unwanted materials, debris, etc. shall be removed from the employer's premises.

2.4 EXCAVATION OF CABLE TRENCH - The exact location of each trench shall be agreed at the site with the Employer's Representative before the installation work begins. Permits for excavation shall be obtained from the Employer's Representative.

2.4.1 Trenches shall be kept as straight and shall be excavated to approved formations and dimensions. Trenches shall have vertical sides and shall be close timbered and strutted where necessary to prevent subsidence.

2.4.2 The depth of excavated trenches for the installation of HV cables and MV cables shall be according to the Employer's Standards of 1500mm and 1500mm wide. The Employer's Representative shall make these standards available to the Contractor upon his request.

2.4.3 The Contractor shall use no power excavation tools for excavation within outdoor transformer yard. The contractor shall take all precautions to avoid damaging any other power cables along the cable route.

2.4.4 All excavation, cable laying and back filling shall be carried out only under the direct supervision of a responsible officer and only in the presence of a representative of the Employer's

2.5 DE-WATERING - All excavation works are to be kept dry and clean to ensure work is not affected or interfered with by water entering the excavations. The Bidder is to allow in his Tender for the costs of pumping, de-watering or other methods of dealing with the water during and after excavation. No concrete, masonry, brickwork or other materials shall be placed or built until the surfaces are properly drained.

2.6 CONTROL & POWER CABLE CONDUIT and CABLE LADDERS - The Contractor is responsible for all civil works required for building in cable conduits and Trench with covers. Cable entries into buildings shall be through conduits.

2.6.1 Power cable which passes under roads, hard standing areas or where they would otherwise be at risk shall be laid in approved ducts. 6 sets for each circuit shall be installed and the whole surrounded in a minimum of 150 mm C10 concrete.

2.6.2 33kV, 11kV and control cable conduits shall be encased in concrete casings with minimum thickness of 150mm and at depths of 1200mm and 600mm respectively on entry to the substation.

2.6.3 Dig and lay 33kV cable from transformer to 33kV circuit breaker. Reinstatate trench and crush metal with weed control mat.

- 2.6.4 Dig and lay 11kV cable from transformer to 11kV Circuit breaker. Reinststate trench and crush metal with weed control mat.
- 2.6.5 2 x earthing conduits for the transformer shall be encased in concrete casings with minimum thickness of 100mm.
- 2.6.6 Fibre conduits shall be encased in concrete casings with minimum thickness of 50mm.
- 2.6.7 AC and DC conduits shall be encased in concrete casings with minimum thickness of 50mm separately.
- 2.6.8 Cable entries into buildings shall be sealed with approved using suitable materials ROXREC to prevent entry of any water, dust, vermin, etc. Cable entry to the control building shall be provided for future requirements.
- 2.6.9 All cable ducts shall be laid in straight lines and regular gradients between cable pits, as directed. All ducts shall be kept clear from earth, debris and other obstructions during and after being laid.
- 2.6.10 Conduit stubs protruding from transformer pads shall extend upwards by 50mm from the top of bund wall so as to inhibit ingress of oil/water should oil/water held in the bund fill up to maximum holding capacity.
- 2.6.11 Cable ducts shall be of Polyvinyl Chloride (PVC) type material approved by the Employer's Representative and obtained from an approved manufacturer.
- 2.6.12 Each cable conduit shall be housed with galvanized draw wires of sufficient strength and size to pull cables that shall run within the conduits. The galvanized draw wires shall run the full length of the conduits.
- 2.7 **OIL CONTAINMENT/DRAINAGE SYSTEM** – The bund shall be equipped with an approved oil/water sump and an approved oil/water drainage system. These shall be designed to address three (3) main risks: 1) Catastrophic failure causing prolonged fire. 2) Catastrophic failure causing large amounts of oil spreading off site. 3) Minimise oil pollution during normal operation. This is as stipulated in the Ausgrid NS189 standard for Oil Containment for Major Substations.
 - 2.7.1 The bund base of each transformer shall be designed to have a 1% slope directing all oil/water towards the designated oil/water sump.
 - 2.7.2 The sumps shall have an approved non-slip surface applied onto the inside walls and base.
 - 2.7.3 The Ausgrid NS189 standard details two (2) drainage systems that can be installed for transformer bunds. These are the Closed Drainage PPS System and the Gravity Drainage System with Oil Containment Tank. The selection of the oil containment system that is most feasible for the transformer bunds shall be made by the Contractor as according to Ausgrid NS189 standard. The design of which shall be submitted for employer's approval prior to any construction and installation works.
 - 2.7.4 As detailed in Ausgrid NS189, the selection criteria for the oil containment system shall be based on a Life Cycle Cost (LCC) analysis together with an assessment of site constraints, site risks, environmental aspects and impacts upon project schedule.
 - 2.7.5 The Contractor shall ensure that the breakout of any fire will be contained within the bund and not transferrable under any circumstance to the oil/water separators or oil tanks to be installed as per the design to be submitted for approval.
 - 2.7.6 The oil containment system shall allow for effective discharging of storm water in the event of heavy rainfall or spraying down of the transformers in the event of a fire.
 - 2.7.7 The oil containment shall be 130% of the total oil volume of the transformer oil (5,500L)

2.8 **TRANSFORMER PADS** - transformer pads shall be designed to accept a total transformer weight of 30 ton. This is to account for future upgrades to higher rated and larger transformers.

2.8.1 The pads shall be constructed to dimensions 5000 x 3000 mm (LxW). The transformer pad shall extend upwards from the bund base by a maximum 300mm. The Contractor shall ensure that the pad dimensions are sufficient to cover the transformer base footprint and all cable conduit stub-ups

2.8.2 The Contractor shall ensure that the transformer pad surface is levelled to a maximum deviation of $\pm 2\text{mm}$. The Contractor's engineer shall satisfy himself with the levelling of the two transformer pads.

2.9 **TRANSFORMER FOUNDATION** - The transformer foundations are to be designed to accept all normal applied dead and imposed loadings without causing any significant settlement. In addition, foundations shall be designed to accommodate any additional imposed loadings during installation and removal of the transformer. This shall be constructed with a minimum 150mm base thickness and an approved steel reinforcement layout.

2.10 **FILLING & REINSTATEMENT** - If it is required to fill the land, the Contractor shall get approval for the filling material and method of construction before the commencement of work.

2.10.1 Filling for trenches, excavations and levelling of the site shall be deposited in layers not exceeding 300 mm of un compacted thickness, each layer watered when necessary and well rammed or otherwise compacted to within 98% of the maximum dry density obtained by the use of a Proctor Standard Compaction Test.

2.10.2 Any fill material used within 500 mm of concrete structures cement bound materials shall have a soluble sulphate content not exceeding 2.5g per litre when tested in accordance with BS 1377, special precautions shall be taken to protect the concrete or cement bound materials to the approval of the Employer's Representative.

2.10.3 Where excavations whether in rock or other material, are made to a greater depth than detailed, the intervening space shall be brought up to the proper level in plain concrete at the Contractor's expense.

2.10.4 Any formation encountered in the excavations which is not sufficiently strong to carry the loads which will be imposed on it, shall be excavated to an adequate load bearing stratum and replaced with mass concrete.

2.10.5 Unless otherwise described, directed or permitted, imported filling shall consist of pervious naturally occurring material, free from mud, silt, clay, peat, vegetable or injurious matter and water soluble salts harmful to copper and other metals. Filling shall be imported only from approved areas.

2.11 **STABILITY OF FILL AND EMBANKMENT** - The Contractor shall be responsible for the stability of embankments, which formed either by cutting or filling, and precautions taken to protect the earthworks from deterioration under adverse weather conditions. Wherever applicable the recommendations contained in the following codes of practice shall be followed in calculations, detailing and performance of the earthworks and drainage. **Earthworks - British Standard Code of Practice BS 6031-1981.**

2.11.1 Should any slips occur in the excavations, banks or filling during the execution of the Works or during the period of maintenance from any cause whatsoever, the Contractor shall execute the necessary remedial work in such manner, and with such materials as approved by the employer's representative, at the Contractor's expense.

2.12 **READY MIXED CONCRETE** – 30MPA Ready-mixed concrete shall be provided as defined in BS 5328, which batched off the Site, may be used only with the agreement of the Employer's Representative and comply with all requirements of the Contract.

The concrete shall be carried in purpose made agitators operating continuously, or truck mixers. The concrete shall be compacted and in its final position within 2 hours of the introduction of cement to the aggregates, unless a

longer time is agreed by the Employer's Representative. The time of such introduction shall be recorded on the delivery note together with the weight of the constituents of each mix.

- 2.12.1 When truck-mixed concrete is used, water shall be added under supervision, either at the Site or at the central batching plant, as agreed by the Employer's Representative but in no circumstances shall water be added in transit.
- 2.12.2 Unless otherwise agreed by the Employer's Representative, truck mixer units and their mixing and discharge performance shall comply with the requirements of BS 5328 part 3.
- 2.13 **BUND WALL** - Commencement of wall construction shall be done following the installation of the transformers. Each transformer bund base shall be surrounded by a low enclosing bund wall designed to a maximum 800mm height which shall account for 130% of the total oil storage capacity of each transformer. An approved non-slip surface shall be applied to the inside bund walls and bases by the Contractor. The Contractor shall ensure that all bunds are designed as according to AS 1940-2004. The bund walls shall be designed for all expected imposed loadings with provision for vertical extension of EI 240 (4 hours) rated fire resistance fire wall.
- 2.14 **STONE CHIPPING AND ACCESS ROAD** - Stone chipping used for substation surfacing are to be clean hard crushed stone graded to 40mm (minimum depth 300mm). The formation in areas where stone chipping are to be used shall be well compacted to the approval of the Employer's Representative, and treated with an approved total weed killer, used in accordance with the manufacturer's instructions.
- 2.14.1 The layout drawing shows the area to be compacted with stone chipping for the transformer yard access road. The said area shall be compacted to allow for all expected imposed loadings.
- 2.14.2 35m 6m X 150mm depth (16mm rod @ 200ctc) concrete road required for the driveway as per drawings. The contractor to ensure make two existing drainage below the roads are properly done.
- 2.15 **CHAIN LINK FENCE AND GATE** - Chain link fences shall be constructed of galvanised steel wire, and shall be of such manufacture that when any one segment is cut, remaining segments within the pattern retain their rigidity. The bottom of the fence shall be fixed down with staples to a continuous concrete sill in accordance with BS 1722, Part 10.
- 2.15.1 Steel wire for mesh and line wire shall comply with grade A of BS 4102. The galvanized coating on steel wires of mesh and line wires shall be comply with requirements of BS 443.
- 2.15.2 All mesh shall be of galvanised steel wire of 3.15 mm diameter with a length of side not exceeding 50 mm. Line wires shall be of galvanised steel wire of the same gauge to adequately support the mesh rigidly. Line wire shall be provided at the top and bottom of the mesh and at two evenly spaced intermediate levels.
- 2.15.3 The line wires shall be strained tightly by eyebolt strainers or winders at each straining post and secured to intermediate posts of stirrup wires passed through holes in the posts. The top wire shall be doubled, Mesh and line wires shall comply with BS 4102.
- 2.15.4 Chain link mesh shall be strained between straining posts by means of stretcher bars and tied to line wires in accordance with Clause 3.5 of BS 1722, Part 10.
- 2.15.5 Galvanized post 50mm "C" grade 6.5mm thickens at every 2.4m intervals
- 2.15.6 Straining posts and struts shall be of Galvanised steel to the same standard as above. The posts shall be set in concrete in the ground. The posts shall have cranked tops set at 45 to the posts, to which shall be attached three strands of galvanised barbed wire to BS 4102. All post tops shall be fitted with PVC capping's to suit.

- 2.15.7 All posts at intervals shall be welded with 60 x 50 x 5mm thick earth lugs for provision of connection to the Earth Grid. Lugs shall be drilled with a 13mm diameter hole that shall be 25mm from the edge of 60mm free end.
- 2.15.8 Barbed wires shall be strained between straining posts with eyebolts and fixed to intermediate posts with stirrup wires. Droppers shall be fitted at the centre of each Bay of the fence to prevent the wires being bunched together. Intermediate posts shall be provided at centres not exceeding 3 meters. Corner posts and struts shall be provided at all ends, corners, changes in direction, adjacent to gateposts and at intervals not exceeding 35 meters. All fence fittings shall be galvanised.
- 2.15.9 The existing gate shall be relocated to a new location and fitted as specified by the employer's representative.
- 2.16 **CRUSH METAL** – The contractor must reinstate all crush metal that are to be removed for construction works or have been contaminated with soil and other material due to construction activity. 200mm of depth crushed metal (screened 40mm – 3000ohmm) to be applied on weed control mats. All materials to be supplied by contractor and to be approved by FEA Engineer before application. Attached drawings shows area of crush metal works required.
- 2.17 **MISCELLANEOUS WORK** - Shall be carried out according to the relevant clause of this specification.

3. EARTHING SYSTEMS

3.1 GENERAL

- 3.1.1 The earthing of all equipment and the provision of earthing systems, electrodes and connections shall be in accordance with the recommendations in the "Guide for safety in Substation Grounding" IEEE No. 80 and the requirements of this Chapter.
- 3.1.2 Steelworks and supporting structures shall be bonded and earthed to the substation earthing system. Earth connections shall be made approximately 250 mm above the top of the finished foundation level. Connections shall be made also to the earth terminals of each transformer.
- ~~3.1.3~~ Except where the earth connection is bonded to the steelwork, insulated clamps shall be provided for supporting the earthing connection to high level equipment and the earth screen
- 3.1.4 Trench earthing copper 100mm X 6mm flat bar route length – 50m and 25 insulator holders.

3.2 EXTENT OF WORK

- ~~3.2.1~~ The Contract includes the Complete design of the substation earthing system including, connections of Plant supplied under this Contract to the main earthing system and all Site Tests as specified in this specification. The contract includes the trenching and laying of any earth conductor that will have to be relocated due to the construction of the transformer pad. Trench to be back filled with black soil and fully reinstated. The contractor to submit step and touch potential of from a recognized software.
- 3.2.2 The main earth system shall be installed prior to the construction of the transformer and equipment foundations.
- 3.2.3 The Contractor will be required to prepare installation drawings and schedules of material to be provided. These drawings and schedules shall be submitted to the Employer's Representative for approval together with calculations of step, touch and mesh potentials.
- 3.2.4 Once the contractor has installed the earth wire, the Employer's Representative shall approve the position at which the connections are made and the number of connections. The employers representative will connect the new earth wire to the existing grid. Earth conductor will be provided by the employer.

3.3 DESIGN OF EARTHING SYSTEMS

- 3.3.1 The grounding system shall be designed according to the guideline given in ANSI/IEEE Standard 80.
- 3.3.2 The site shall be provided with earth grid of buried conductors designed for an earth fault current specified 40kA for duration of 3 second, keeping the step and touch voltages within the limits as recommended in the guide ANSI/IEEE std. 80.
- 3.3.3 The design of earth grid over the area occupied by the new transformer yard and associated apparatus shall be based on a maximum grid spacing of 17m x 15m.
- 3.3.4 The Contractor shall carry out Site tests of the ground resistivity not later than one month after the award of the Contract and his final design of the earthing system shall be submitted and approved prior to foundation excavation works.
- 3.3.5 Earthing points shall be provided by the Contractor such that the combined resistance of the earth grid and earthing points does not exceed 1 ohm, however combined resistance shall be considered for acceptance provided that the conditions recommended above are satisfied. It is the Contractor's responsibility to provide design calculations.

3.4 CONSTRUCTION OF EARTH GRIDS

- 3.4.1 The earth grids shall be of hard drawn high conductivity copper conductor 200mm², and shall be installed at minimum depth of 600mm approved by the Employer's Representative below the ground level. After the construction of footings and foundations the area shall be backfilled. Cadweld shall be used where two earth conductors are to be joined.
- 3.4.2 Connections for the transformer neutrals shall be provided using 50X5mm copper bar.

3.5 EARTHING POINTS - The number of earthing points shall be verified by Site earth resistivity tests after the letting of the Contract.

- 3.5.1 Each will consist of at least 15mm diameter copper rod electrodes, driven into undisturbed soil. Each electrode will be complete with approved non-ferrous clamps for the connection of earthing conductors and with a hardened steel tip and cap driving by means of a power hammer.
- 3.5.2 Test link chambers and covers for each earthing point are to be provided and the Contractor for the approval of the Employer's Representative shall submit a drawing showing the proposed arrangement.

3.6 CONNECTION OF EARTHING POINTS AND SYSTEM NEUTRALS

- 3.6.1 The electrodes of an earthing point shall be connected to the test link and there shall be duplicate conductors from each test link to the earth grid.
- 3.6.2 Any neutral points for high voltage systems within the substation will have duplicate connections to earth grid.
- 3.6.3 Conductors interconnecting the electrodes to a test link and between the test links and the earth grid will have a cross-sectional area of not less than 150 sq. mm. There will be at least two connections from each steel support etc. to the earth grid. Duplicate connections may be in the form of rings.
- 3.6.4 Earthing conductors will be of soft annealed high conductivity copper stranded in accordance with Table 4 in BS.6346. Earthing conductors will normally be buried directly in the ground but where necessary they may be cleated to walls, fixed to cable racks or laid in the cable trenches as convenient.

3.7 EARTHING EQUIPMENT

- 3.7.1 The frames of all electrical apparatus and the bases of all structural steelwork shall be connected by branches running to a group of equipment. All earth terminals and neutral current transformers shall be connected to the earth grid.
- 3.7.2 Earthing of new 33kV/11 kV transformer yard shall be properly performed with copper strip 100mmX6mm and 150mms bare copper, which enable connection to the equipment installed in and linked to main grid with more than two wires.

3.8 JOINTING AND BONDING

- 3.8.1 Connections to plant and equipment shall be made using the earthing terminals specified in the Contract. Where a strip has to be drilled to fit an earth terminal the hole shall not be greater than half the width of the strip.
- 3.8.2 Joints in earthing strip shall employ chemical welding or high compression joints.
- 3.8.3 The main FEA Grid and the Transformer Grid shall be connected in at least 4 point

4. INSPECTION AND TESTS

- 4.1 The Authority's Engineer representative shall have the right to inspect the works and to confirm conformity to the contract specifications.
- 4.2 Should any inspected works fail to conform to the specifications, the Authority may reject them and the Contractor shall make all alterations necessary to meet the specification requirements.
- 4.3 Nothing in this clause shall in any way release the Contractor from any other obligations under this contract.

5. SITE CONDITIONS

- 5.1 The site is located at the 33kV/11 Deuba Substation in Deuba. The Contractor shall be deemed to have visited the site of the works to satisfy him/her as to the accuracy of all information supplied to the Tenderers and to the feasibility of construction of the works.
- 5.2 The proposed location is in a Substation equipped with therefore all necessary Safety Gear must be worn by the Contractor's Staff at all times.
- 5.3 The Contractor may only enter the site upon provision of access by an Authorized FEA representative. The Contractor is not to execute any work without direct supervision from the FEA representative. The times for work are 8am to 4.30pm Monday to Thursday, and 8am to 4pm on Fridays.

6 SETTING OUT

- 6.1 All tenderers shall inspect and examine the site, its surroundings, and shall satisfy himself before submitting his tender, as to the form and nature of the site, the nature and type of existing work, the quantities and natures of the work and materials necessary for the completion of the Works and the means of access to the site, the accommodation he may require, the availability, conditions and rates of pay of labour and in general shall himself obtain all necessary information as to risks, contingencies and other circumstances which may influence or affect his tender.

- 6.2 The Contractor shall be responsible for the correct detailed setting out of the Works as indicated in the Tender Documents and shall, at his own cost, amend any errors during the progress of the Works arising from inaccurate setting out.
- 6.3 If a tenderer has any doubt as to the meaning of any portion of the Works, he shall when submitting his tender, include a statement of the interpretation upon which he relies and upon which his tender has been prepared and submitted.

6. MATERIALS, WORKMANSHIP AND PLANT

- 6.1 Materials in all trades shall be new and the best of their kinds specified and necessary complying with relevant standards (Fiji, Australia, New Zealand or USA) where applicable and subject to approval or rejection by the Engineer.
- 6.2 The Contractor shall at all times ensure that adequate protection is provided to finished work and materials to be used in the construction of the work. Where necessary, make good any damage to property.
- 6.3 The Contractor shall provide all workmen, both skilled and unskilled, plant, equipment and materials necessary for the expeditious completion of the work.

7. OCCUPATIONAL HEALTH AND SAFETY

- 7.1 The Contractor shall comply with the Health and Safety at Work Act, 1996 and regulations and Amendments thereto and the Fiji Electricity Authority HSE Policy.

8. GENERAL FOREMAN

- 8.1 The Contractor shall appoint a competent General Foreman who shall be constantly on the works during the progress of the same, to whom instructions may be given by the Engineer.
- 8.2 The Engineer may require the Contractor to dismiss the General Foreman or other person shall he be incompetent or shall misconduct himself or for any other good reason to be assigned by the Engineer to the Contractor.

9. MAINTENANCE AND DEFECTS

- 9.1 Period of maintenance shall be 1 year (12) calendar months after practical completion of works. All defects during this period shall be made good by the Contractor, at his cost.

10. CLEANING UP

- 10.1 On completion, remove all surplus materials from site and leave site in a clean and tidy condition.
- 10.2 The Contractor shall remove and cart away all rubbish and trade debris as it accumulates during the progress of the works.

11. PROGRAM

- 11.1 Within seven (7) days of acceptance of his tender, the Contractor shall submit to the Authority, for approval a Program showing the order in which he proposes to carry out the works. The contractor shall ensure all civil and earth grid works shall be complete by the 20th February, 2018. Construction and installation of the bund walls and other miscellaneous work as specified by the employer's representative shall take place following installation and commissioning of the two new transformers.

12. INSURANCE

The Contractor is to effect the following insurance policies:

12.1 Contractor's All Risk Insurance - \$500,000

12.2 Public Liability Insurance - \$500,000

12.3 Workmen's Compensation - \$250,000

13. PRICE AND PAYMENT

13.1 The Contract Price is to be on a Lump Sum basis. The tenderer is to submit a breakdown of the various components of the project.

13.2 The Contractor's request for payment shall be made to the Authority in writing, accompanied by invoice(s) describing, as appropriate, and services performed, together with other documents as may be required by the Authority. Payments shall be made promptly by the Authority, within thirty days of submission of an invoice/claim by the Contractor.

13.3 The Contractor is eligible for payment after completion of the Contract. No partial payments will be made.

14. VALIDITY

14.1 The Tendered Price is to remain valid for a period of 120 days after the closing date of the tender.

15. PRICE SCHEDULE

No.			TOTAL PRICE (VIP)
1	<u>Option 1</u> One new Transformer Pads, bund wall, Road, oil separator pit, drainage and Security Lights and earth grid		

16. DRAWINGS AND ATTACHMENTS

Submission of Tender

Two (2) hard copies of the tender bids in sealed envelope shall be deposited in the tender box located at the Supply Chain Office at the FEA Head Office, 2 Marlow Street, Suva, Fiji.

Courier charges for delivery of Tender Document must be paid by the bidders.

This tender closes at **4:00 p.m. (16.00hrs Fiji time)** on **Wednesday 18th October, 2017**

Each tender shall be sealed in an envelope with:

The envelope bearing only the following marking:

MR 247/2016

Construction of Rural Electrification Project – Line Extension from Balekinaga to Navesau, Wainibuka
(Stage 2) – Scheme: RA09-13B

The Secretary, Tender Committee
Fiji Electricity Authority
Supply Chain Office
Private Mail Bag, Suva

It must also indicate the name and address of the tenderer on the reverse of the envelope.

All late tenders, unmarked Envelopes and envelopes without bidder's name and address on the reverse on the envelope will be returned to the Tenderers unopened. (Bids via e-mail or fax will not be considered).

The bidders must ensure that their bid is inclusive of all Taxes payable under Fiji Income Tax Act and must have the most current Tax Compliance Certificate.

For further information or clarification please contact our Supply Chain Office on phone **(+679) 3224360** or **(+679) 9991587**.

Bidders are requested to submit a:

- **Valid Tax Compliance Certificate**
- **FNPF Compliance Certificate**