MR 261/2017

DESIGN, MANUFACTURE, TESTING AND SUPPLY OF TWO (2) 11/0.415kV, 2,000kVA GROUND MOUNTED DISTRIBUTION TRANSFORMERS

FIJI ELECTRICITY AUTHORITY

REVISION HISTORY & DOCUMENT CONTROL

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TABLE OF CONTENTS

1 INTRODUCTION AND SCOPE OF WORK

Fiji Electricity Authority ("FEA") is responsible for generation, transmission and distribution of electricity in Viti Levu, Vanua Levu, Ovalau and Tavueni in Fiji. By the end of 2016, the FEA had 174,530 customers. This included residential, commercial and institutional customers. By the end of 2016, it had an installed capacity of 605,961 kVA of distribution transformers in its various distribution networks.

FEA is seeking tender bids from reputable transformer manufacturers and suppliers for design, manufacture, testing and supply of two (2) 11/0.415kV, 2,000kVA ground-mounted distribution transformers to be installed in an existing kiosk substation.

This tender specification outlines the instruction to bidders, design and performance criteria for the ground-mounted distribution transformers.

The transformers shall comply to the current version of AS 60076 Power transformers – all parts and amendments as current, AS 2374 Power transformers – all parts and amendments as current, and as detailed in this specification.

2 INSTRUCTIONS TO BIDDERS

2.1 Eligible Bidders

This invitation is open to all Bidders who have sound Financial Background, and have previous experience in design, manufacture and supply of such transformers.

Bidders shall provide such evidence of their continued eligibility satisfactory to FEA as FEA shall reasonably request. Bidders who are not manufacturer of such transformers shall provide evidence of agency.

Bidders shall not be under a declaration of ineligibility for corrupt or fraudulent practice.

2.2 Eligible Materials, Equipment and Services

The materials, equipment, and services to be supplied under the Contract shall have their origin from reputable companies as specified by FEA and from various countries and all expenditures made under the Contract will be limited to such materials, equipment, and services. Upon request, bidders may be required to provide evidence of the origin of materials, equipment, and services.

For purposes of this Contract, "services" means the works and all project-related services including design services.

For purposes of this Contract, “origin" means the place where the materials and equipment are mined, grown, produced or manufactured, and from which the services are provided. Materials and equipment are produced when, through manufacturing, processing or substantial or major assembling of components, a commercial recognized product results that is substantially different in basic characteristics or in purpose or utility from its components.

The materials, equipment and services to be supplied under the Contract shall not infringe or violate any industrial property or intellectual property rights or claim of any third party.

2.3 One Bid Per Bidder

Each bidder shall submit only one bid. A bidder who submits or participates in more than one bid will cause all those bids to be rejected.

2.4 Cost of Bidding

The bidder shall bear all costs associated with the preparation and submission of its bid and FEA will in no case be responsible or liable for those costs.

2.5 Site Visits

No site visits are required for this project.

2.6 Contents of Bidding Documents

The bidder is expected to examine carefully the contents of this Bidding document. Failure to comply with the requirements of bid submission will be at the bidder's own risk. Bids which are not substantially responsive to the requirements of the bidding documents will be rejected.

2.7 Clarification of Bidding Documents

A prospective bidder requiring any clarification of the bidding documents may notify FEA in writing by fax (hereinafter the term “fax" is deemed to include electronic transmission such as facsimile, cable and telex), or email addressed to:

Tuvitu Delairewa
General Manager Corporate Services
2 Marlow Street, Suva, FIJI.
Phone: 679 3224 185
Facsimile: 679 331 1882
Email: TuvituD@fea.com.fj

FEA will respond to any request for clarification which it receives earlier than 10 days prior to the deadline for submission of bids.

2.8 Amendment of Bidding Document

At any time prior to the deadline for submission of bids, FEA may, for any reason, whether at its own initiative or in response to a clarification requested by a prospective bidder, modify the bidding documents by issuing addenda.

2.9 Language of Bid

The bid, and all correspondence and documents related to the bid, exchanged between the bidder and the FEA shall be written in the English language.

2.10 Bid Prices

Unless specified otherwise, Bidders shall quote for the entire facilities on a “single responsibility" basis such that the total bid price covers all the Supplier’s obligations mentioned in or to be reasonably inferred from the bidding documents in respect of the design, manufacture, including procurement and subcontracting (if any), testing and delivery.

Bidders shall give a breakdown of the prices in the manner and detail called for in this bidding document, or any issued addenda.

Bids shall be given on CIF basis. The point of delivery shall be FEA’s Kinoya Depot in Suva. The term CIF shall be governed by the rules prescribed in the current edition of Incoterms, published by the International Chamber of Commerce, Paris.

2.11 Bid Currencies

Prices shall be quoted in a single currency only.

2.12 Bid Validity

Bids shall remain valid for a period of **180 days** from the date of Deadline for Submission of Bids specified in Sub-Clause 2.15.

2.13 Format and Signing of Bids

The bidder shall prepare one original and four (4) copies of the technical and financial proposals, clearly marking each one as: "ORIGINAL-TECHNICAL & PRICE PROPOSAL", "COPY NO. I - TECHNICAL & PRICE PROPOSAL", etc. as appropriate. In the event of discrepancy between the original and any copy, the original shall prevail.

The original and all copies of the bid shall be typed or written in indelible ink (in the case of copies, Photostats are also acceptable) and shall be signed by a person or persons duly authorized to sign on behalf of the bidder. All pages of the bid where entries or amendments have been made shall be initialed by the person or persons signing the bid.

The bidder shall provide one electronic copy of the Technical and Financial proposals on FEA's electronic tender hosting website, https://www.tenderlink.com/fea.

The bid shall contain no alterations, omissions or additions, except those to comply with instructions issued by FEA, or as necessary to correct errors made by the bidder, in which case such corrections shall be initialed by the person or persons signing the bid.

2.14 Sealing and Marking of Bids

The bidder shall seal the original copy of the technical proposal and the original copy of the price proposal and each copy of the technical proposal and each copy of the price proposal in separate envelopes clearly marking each one as: "ORIGINAL-TECHNICAL & PRICE PROPOSAL", "COPY NO. I -TECHNICAL & PRICE PROPOSAL", etc. as appropriate.

The bidder shall seal the original bids and each copy of the bids in an inner and an outer envelope, duly marking the envelopes as "ORIGINAL", "COPY No. 1", etc.

The inner and outer envelopes shall

a) be addressed to FEA at the following address:

Tuvitu Delairewa
General Manager Corporate Services
2 Marlow Street, Suva, FIJI.
Phone: 679 3224 185
Facsimile: 679 331 1882
Email: TuvituD@fea.com.fj

And

b) bear the following identification:

- Bid for: Design, Manufacture, Testing and Supply of Two (2) 11/0.415kV, 2,000kVA Ground-mounted Distribution Transformers

- Bid Tender Number: MR 261/2017
- DO NOT OPEN BEFORE: 1600hrs on 18/10/2017

In addition to the identification required, the inner envelope shall indicate the name and address of the bidder to enable the bid to be returned unopened in case it is declared "late" pursuant to Deadline for Submission of Bids.

If the outer envelope is not sealed and marked as above, FEA will assume no responsibility for the misplacement or premature opening of the bid.

2.15 Deadline for Submission of Bids

Bids must be received by FEA at the address specified above no later than 1600 hours (Fiji Time) 18/10/2017.

FEA may, at its discretion, extend the deadline for submission of bids by issuing an addendum, in which case all rights and obligations of FEA and the bidders previously subject to the original deadline will thereafter be subject to the deadlines extended.

2.16 Late Bids

Any bid received by FEA after the deadline for submission of bids prescribed above will be rejected and returned unopened to the bidder.

2.17 Modification and Withdrawal of Bids

The bidder may modify or withdraw its bid after bid submission, provided that written notice of the modification or withdrawal is received by FEA prior to the deadline for submission of bids.

The bidder's modification or withdrawal notice shall be prepared, sealed, marked and delivered in accordance with Sealing and Marking of Bids, with the outer and inner envelopes additionally marked "MODIFICATION" or "WITHDRAWAL", as appropriate. A withdrawal notice may also be sent by fax but must be followed by a signed confirmation copy.

No bid may be modified by the bidder after the deadline for submission of bids.

2.18 Rejection of One or All Bids

FEA reserves the right to accept or reject any bid, and to annul the bidding process and reject all bids, at any time prior to award of Contract, without thereby incurring any liability to the affected bidder or bidders or any obligation to inform the affected bidder or bidders of the grounds for the rejection.

2.19 Process to be Confidential

Information relating to the examination, clarification, evaluation and comparison of bids and recommendations for the award of a contract shall not be disclosed to bidders or any other persons not officially concerned with such process.

Any effort by a bidder to influence FEA's processing of bids or award decisions may result in the rejection of the bidder's bid.

Lowest bid will not necessarily be accepted as successful bid.

2.20 Clarification of Bids

To assist in the examination, evaluation and comparison of bids, FEA may, at its discretion, ask any bidder for clarification of its bid. The request for clarification and the response shall be in writing or by fax, but no change in the price or substance of the bid shall be sought, offered or permitted except as required to confirm the correction of arithmetic errors discovered by FEA in the evaluation of the bids.

3 GENERAL CONDITIONS OF CONTRACT

The General Conditions of Contract shall be based upon AS 4910 – 2002 General Conditions of Contract for Supply of Equipment Without Installation.

The Conditions of Contract comprises two parts:

1. Part 1 – General Conditions; and
2. Part 2 – Conditions of Particular Application

4 CONDITIONS OF PARTICULAR APPLICATION

FEA will advise at contract stage.

5 REFERENCES

5.1 Applicable Standards

Transformers shall be designed, manufactured and tested in accordance with the following Australian Standards and all amendments issued prior to the date of closing of tenders except where varied by this Specifications.

AS 1100	Drawing Practice Scales – Part 7
AS 1194	Winding Wires Parts 1 – 4
AS 1265	Bushings for Alternating Voltages Above 1 000 V
AS 1319	Safety Signs for the Occupational Environment
AS/NZS 1580	Paints and Related Materials – Methods of Test
AS 1627	Metal Finishing – Preparation and Pretreatment of Surfaces
AS 1650	Galvanized Coatings
AS 1767	Insulating Oil for Transformer and Switchgear
AS 1824	Insulation Co-Ordination
AS 1931	High Voltage Testing Techniques – Part 1
AS 2067	Substations and High Voltage Installations Exceeding 1kV AC
AS 2129	Flanges for Pipes, Valves and Fittings
AS 2312	Guide to Protection of Iron and Steel Against Exterior Atmospheric Corrosion
AS 2374	Power Transformers – Part 1 to 3, 5, 6 and 7
AS 2700	Colour Standards for General Purpose
AS 2768	Electrical Insulating Materials
AS 3000	Electrical installations (known as the Australian/New Zealand Wiring Rules)
AS/NZS 3750	Paints for Steel Structures
AS 4398	Insulators – Ceramic or Glass – Station Post for Indoor and Outdoor Use – Voltages greater than 1 000V a.c.
AS 4436	Guide for the selection of insulators in respect of polluted conditions
AS 4680	Hot-dip galvanized (zinc) coatings on fabricated ferrous articles
AS 60076	Power transformers (including all parts and normative references as current)
AS/NZS 60137	Insulated bushings for alternating voltages above 1000 V
AS 60214	Tap-changers (including all parts and normative references as current)
AS 60270	High voltage testing techniques – Partial discharge measurements
AS 62271.200	High-voltage switchgear and controlgear - A.C. metal-enclosed switchgear and controlgear for rated voltages above 1 kV and up to and including 52 kV
AS 62271.301	High voltage switchgear and controlgear – Dimensional standardization of terminals
AS/NZS 9001	Quality Systems Model for Quality Assurance in Design, Development, Production, Installation and Servicing
IEC 61619	Insulating liquids - Contamination by polychlorinated biphenyls (PCBs) - Method of determination by capillary column gas chromatography

Should inconsistencies be defined between Standards and this Specifications, this Specification will take precedence. However, significant inconsistencies shall be referred to FEA for resolution.

5.2 Applicable Laws

The Bidder warrants (without limiting any other warranties or conditions implied by law) that all Goods have been produced, sold and delivered to FEA in compliance with all applicable laws (including all workplace health and safety and electrical safety legislations and codes of conduct).

6 SERVICE CONDITIONS

6.1 Environmental Conditions

The transformers shall be designed to withstand the following service conditions of:

Atmosphere	:	Saliferous, corrosive and dusty
Ambient temperature	:	Peak : 40^{o}C
	:	24 Hour Average: 30^{o}C
	:	Annual Average: 22^{o}C
	:	Minimum: 10^{o}C
Relative Humidity (Average)	:	85%
Rainfall	:	Annual Average: 1900 mm
Wind Speed	:	Sustained : 55 m/s
	:	Gusts : 70 – 110 m/s
Isokeraunic Level	:	60 Thunder days per year
Seismic	:	To a maximum of 7 on the open-ended Richter Scale

Note: Fiji is situated in a region where cyclones are experienced frequently. All plant and equipment shall be designed and constructed to withstand these extreme conditions. All plant and equipment shall be rust proof, vermin proof and weather proof and designed to be suitable for a damp, tropical climate, which may be experienced simultaneously.

6.2 System Conditions

The rated frequency of FEA's power system is 50 Hz. Each unit shall be suitable for use on its respective system position.

	System Voltages	
Particulars	230V/415V	11kV
Nominal System Voltage	230V (p-n), 415V (p-p)	11kV
Highest (Equivalent) System Voltage:	244V (p-n), 440V (p-p)	12kV
Number of phases:	1 or 3	3
Impulse Withstand voltage (peak):	AC 10kV rms	95kV (peak)
Power frequency withstand voltage:		28kV

The equipment must be rated to withstand:

- 31.5kA for 1second for 415V
- 25kA for 3second for 11kV

7 DESIGN AND PERFORMANCE CRITERIA FOR TRANSFORMERS

7.1 General

Generally, all design and construction of the items and their components and parts must be Fit for Purpose and Fit for Duty, including for Normal Cyclic and Emergency Cyclic Duty as described in this specification and applicable documents to prevent distortion or damage under service conditions and during handling and transport.

The transformers will be suitably stiffened and braced to prevent distortion or damage under service conditions or during handling and transport.

All sharp points on transformer exterior will be removed to prevent injury.

All bolts nuts and washers (fasteners, studs, lifting lugs etc.) will be to Australian Metric Standards and be stainless steel Grade 316 or 304. Compatibility, with regard to corrosion prevention, between the fasteners will be observed. To prevent binding, different grade stainless steel nuts and bolts will be used together with anti-seizing lubricant on all bolt threads.

The transformers shall be designed such that the total weight is less than 6,000kg, and the height, width or length does not exceed 2metres.

7.2 Loadings

The transformer shall be loaded in service in accordance with the following:

Normal cyclic	1.5pu
Long-time Emergency Cyclic	1.8pu
Short-time Emergency	2.0pu

The overloads are in accordance with AS 2374, Part 7 and apply to well ventilated situations. Any limitations to loading above ‘normal cyclic’, as per Clause 1.5 of AS 2374, Part 7, shall be stated in the tender.

7.3 Oil Preservation System – Type

Sealed tank type construction will be used; however, the transformers will not be pressurized or incorporate gases other than air. Diaphragm sealing is not acceptable.

7.4 Tanks and Lids

All surfaces will be designed to prevent the accumulation of water.

All seams will be electrically welded and oil tight.

On the external areas of the tank, welding of horizontal and vertical joints will be on both sides of the joint. Welding in all cases will be continuous.

All metal work will be electrically bonded to the tank to permit earthing by FEA. If a part cannot be adequately bonded it will be constructed from a suitable insulating material instead of metal.

The tanks will be so designed that with a top oil temperature of 105°C, the oil level in the tank will be below the tank lid flange. The lid of the transformer will be capable of being removed without having to take off other components first (eg. cable box) and will be capable of supporting up to 100 kg of a person's weight without permanent deformation.

The tank will incorporate all mounting studs necessary for the fitment of an LV cable box. It will also incorporate two mounting lugs sufficiently above ground level for attachment of the LV cable support bracket.

7.5 Joints and Gaskets

All joints will be oil tight. All gaskets/seals will be designed to last the intended life of the transformer. Joints in gaskets will not occur at bolt holes.

7.6 Core and Windings

All transformers will have electrically separate high and low voltage windings connected to comply with vector group Dyn11 as relevant to the items as stated in Attachment 1, of AS 60076.

The core and winding assembly will be supported by the main tank and not by the cover.

Means will be provided at both the top and bottom of the core and coil assembly for locating the transformer core centrally in the tank and securing it in position to prevent movement, particularly during transport.

The core and all metalwork will be electrically bonded to the tank. The bonding will be brought to one point only.

The insulation between the core and the frame will have a resistance no lower than 50 MΩ after assembly, and will withstand 2.5 kV for one minute. The core and frame will then be electrically connected together at one point only.

7.7 Tappings

The transformer shall be capable of off-circuit tap changing by means of an externally operated switch. The tapping switch shall have a permanent overload capacity of 50 percent. The tapping switch shall be located near the top of the transformer for ease of access and to readily facilitate untanking of the transformer.

Tapping shall be provided on high voltage winding. The principal tapping shall correspond to rated voltage. The tapping range for each applicable rating shall be as detailed in Appendix A with step voltages of 2.5 percent.

The tapping selector switch shall be capable of being locked into each of the positions. The locking arrangement shall be such that it is not possible to lock the switch between taps. The tap switch shall be provided with the same number of positions as tapings. However, if a tap selector switch with more positions (via extra undefined positions) is used, it shall be provided with stop pins (or similar) to

prevent tap rotation into non-tap positions. Stop pins shall be of the permanently fixed type, i.e. bolts, etc. shall not be used.

Each tapping selector switch position shall be identified by a number clearly and indelibly stamped or cast onto either the switch operating handle or the transformer tank.

Tap position No. 1 shall correspond to full winding in circuit.

The tap position selector switch shall be manufactured in such a way that it may be coupled with its operating handle only in the correct manner, not 180° out of adjustment. This shall be done so no inadvertent open or short circuit can occur due to incorrect assembly following out of tank repair/inspection.

A sealing gland shall be provided on the tapping selector switch operating shaft where it passes through the transformer tank or prevent any breathing or leaking along the shaft.

The tapping switch shall be mounted on the side of the transformer where the neutral bushing is positioned.

7.8 Impedance Voltage

The impedance voltage at rated current on principal tapping shall be specified in submission by Bidder as per Appendix A of this document.

7.9 Cooling

The method of cooling each transformer shall be ONAN.

7.10 Insulating Oil

Each transformer shall be supplied with standard mineral insulating oil that meets the requirements of AS 1767 and be proven to be non-corrosive by Method B of ASTM D1275-06 Standard Test Method for Corrosive Sulphur in Electrical Insulating Oils and, IEC 62535 Ed. 1.0: Insulating liquids – Test method for detection of potentially corrosive sulphur in used and unused insulating oil.

The oil shall be new, supplied direct from the oil refinery and its bulk delivery shall be certified to contain less than 1 ppm of PCBs. The supplier shall follow approved quality procedures to ensure that the oil cannot be contaminated while under their control. The Bidder shall supply full identification, specifications and test results for any and each oil offered.

The quality of any offered insulating oil at the time of filling (i.e. on release from supplier) is such as to have a moisture content of at least <20 ppm and a Breakdown Voltage of >50kV.

The cold oil level shall be above the radiator inlet point (if radiators fitted).

7.11 Drying out and Oil Filling before Delivery

The transformers shall be thoroughly dried out at the manufacturer's works and shall be delivered filled with oil to the correct level and ready for service. All transformers shall be vacuum filled. The degree of vacuum applied to the production units shall be identical to that applied to the units that are type tested. The moisture content of the oil shall be less than 25 ppm at time of filling.

7.12 Bushings and Terminals

7.12.1 General

All bushings will comply with AS/NZS 60137, AS 4436 and the Service and Environmental Conditions as specified in this technical specification. All porcelain components will be glazed and fully vitrified.

All terminal palms will be arranged vertically and comply with AS 62271.301. They will be copper with their contact.

7.12.2 LV Bushings

The LV bushings will be mounted horizontally on the side of the transformer opposite the HV cable box.

The part of each LV bushing within the tank will be completely covered with oil when the transformer is old (with an outside temperature of 15°C), and will be readily accessible with the tank cover removed.

The distance between centre lines of the LV bushings will not be less than 200 mm. The taut string metal to metal clearances of the bushing terminals will be not less than 100 mm, phase to phase, and 60 mm phase to earth.

The neutral connection to the star point on the secondary winding will be brought out of the tank unearthed and insulated in the same manner as the phase terminals.

7.12.3 Marking of Terminals

The terminals will be marked in accordance with AS 2374. The use of adhesives to attach marking plates will not be accepted.

7.13 HV Cable Box

7.13.1 Compliance to AS 62271

The cable box will be designed to conform with the internal arc withstand requirements of AS 62271.200 : High-voltage switchgear and controlgear - A.C. metal-enclosed switchgear and controlgear for rated voltages above 1 kV and up to and including 52 kV, Annex A, A.2 Types of accessibility, Accessibility Type A, A.6 Acceptance criteria, Criterion No. 1 to Criterion No. 5 inclusive, for an IAC classification test current.

7.13.2 General Requirements for HV Cable Boxes

The access cover of the cable box shall be capable of being removed/installed by two persons without mechanical aids. A brushed aluminium cover fitted with suitable lifting handles is preferred by FEA. As a minimum, the top edge of the access cover shall have a return to ensure the ingress of moisture through the gasket is prevented. It is preferred that both side edges also include a return.

The minimum clearances between exposed live parts shall generally be in accordance with the requirements if AS 2067 for the required impulse withstand voltages of 200 kVp. When determining minimum clearances, due consideration shall be taken of the flexible cable connections. Where manufacturers use clearances that are less than those shown in AS 2067, type test results are to be provided by the Supplier indicating that the clearances selected are capable of meeting the above test voltages.

The design of the cable box shall be such that the cable termination connections can be left bare without the need for further insulation. The provision of easily removable phase barriers is acceptable.

Lightning impulse withstand voltage tests shall be carried out with the cable lugs suitable for the applicable cable fitted within the box (to remain fitted to transformer during test including cover) to prove compliance with the specified impulse withstand voltage level.

The cable box shall be completely weather and vermin proof and shall be adequately ventilated to eliminate the possibility of build-up of moisture internally.

The cable box shall be fitted with a removable gland plate made of aluminium, brass, or other corrosive-resistant material to the FEA's satisfaction, bolted to the underside of the cable box to allow the cables to be laid into and removed from the box without the need to thread the cables through the entry holes. This feature provides ease of jointing and facilitates the changing of transformers.

An earth bar for cable sheath earths, insulated from the transformer steelwork, shall be provided in the cable box. The earth bar shall have sufficient holes provided to allow for individual connection of each cable sheath. Provision shall be made for external connection to the earth grid.

The minimum distance from the gland plate to ground level shall be 460 mm.

The cable box front cover shall be fastened using galvanised bolts, nuts and washers.

The cable openings shall be located directly below the corresponding phase cable connection points.

7.13.3 LV Cable Box

FEA requires an air insulated cable box as standard for the LV bushings utilizing the mounting studs described in these specifications.

The cable box will maintain the clearances given in these specifications and have a detachable un-drilled gland plate made of aluminium, brass, stainless steel or other non-corrosive material that is not subject to inductive heating and fit for purpose, to FEA's satisfaction.

The cable box shall be supplied compete will all necessary accessories, supports and flexible connections suitable for termination of single or multiple 300mm2 Copper or Aluminium cables as required. Additionally a 'unistrut' or equivalent type cable support bracket to accommodate up to 4 x 300mm2 cables per phases and 2 x 300mm2 cables for the neutral shall be provided. The bracket shall be suitable for attachment to the mounting lugs provided on the tank and shall be clear of the transformer cooling fins (if any are installed).

All necessary nuts, bolts, etc for the mounting of the bracket shall be provided. The bracket design and attachment shall be to the FEA's satisfaction.

Detail drawings of the cable boxes offered, including a list of accessories such as supports and flexible connections (expansion joints), shall be submitted with the Tender.

The LV extension palms/ flexible connectors (expansion joints)/ cable support boards must suit installation on all the Bidder's kVA ratings listed above.

7.14 Sound Level

The design and construction of the transformer shall be such that the sound level of the transformer, measured in accordance with the AS 2374.6, shall be no greater than the applicable 'reduced limit' as per Appendix AA of AS 2374.6.

7.15 Radio and Television interference

The design and construction of each transformer shall be such that it will not cause unacceptable radio or television interference.

7.16 Fittings

The transformers shall be supplied with fittings as detailed below:

7.16.1 Rating/Terminal Marking Plate

The rating plate will be made from stainless steel (or non-ferrous metal) and be clearly marked, the lettering etched or otherwise formed in relief and colored black (except for values which vary from nameplate to nameplate) such that the lettering is in sharp contrast with the background.

The rating/Terminal Marking Plate shall be in accordance with Clause 7 and Appendix ZC of AS 2374, Part 1, and shall include a Voltage Vector Diagram. In addition it shall state:

- That the transformer is 'sealed'
- Temperature rises (even though normal values apply)
- Type of insulating oil (even though it is mineral oil)
- Impedance on principal tap only.

All quantities on the rating/terminal marking plate shall be stated in metric units.

The FEA item stock code and Corrosion Protection Category shall be shown on the plate or the separate tag permanently attached in close proximity to rating/terminal marking plate.

The rating/terminal marking plate shall be located on the side of the transformer near the tapping switch in a position that can be easily read when the transformer is in service.

7.16.2 Lifting and Transport Facilities

Lifting lugs shall be provided with a minimum hole diameter of 32 mm for:

a. Lifting the transformer when filled with oil and ready for service, and,
b. Holding down the transformer during transport.

The transformer tank walls shall be strengthened to allow the above. The lugs shall be positioned so that:

a. They are suitable for connection to lifting beams;
b. They are suitable for attaching slings, each 1 m in length. The slings may be shortened such that transformers will require the holes in the lifting lugs to be spaced not more than 1.2 m that transformers will require the holes in the lifting lugs to be spaced not more than 1.2 m apart. The maximum enclosed angle of the slings would be 120^{o} during any lifting procedure.
c. Any beams or slings attached during lifting or transporting shall not foul any part of the transformer and when suspended by them the transformer shall hang by acting through the center of gravity, with a maximum angle of tilt of 2.5 degrees from the plane of the mounting brackets.

The base of each transformer shall be raised above ground level by a suitable supporting structure so that protective coating of the main transformer tank cannot be damaged during reasonable storage or transport.

All heavy parts of the transformer, including the core/coil assembly, which must be removed for inspection or repair shall be fitted with lifting facilities suitable for use with slings and shackles.

7.16.3 Earthing Terminal

A stainless steel flag of at least 50 x 40 x 5 mm with an M14 hole will be provided near the bottom of the tank (as close as practicable to vertically below the secondary neutral terminal) in an easily accessible position. The earth flag will be welded directly to the tank.

An M12 x 40 mm Grade 304 stainless steel bolt and stainless steel nut, locknut and two flat washers will be supplied fitted to the flag.

7.16.4 Oil Level Indicator

Oil level indication shall be provided on the inside of the transformer tank (visible from the filler cap for rectangular tank units). The indication inside the tank shall take form of horizontal 50 mm long stenciled mark in contrasting colour. This indication shall include safety margin, permitting inaccuracy in mounting.

No external indicator is required.

7.16.5 Thermometer Pocket

Transformer shall not be fitted with a thermometer pocket.

7.16.6 Oil Draining

An oil drain valve is required for transformer. The valve will be positioned so that all sludge and thick oil can be drained from the bottom of the tank and that clear access is provided to operate the valve.

7.16.7 Filler Cap

Rectangular tank transformers with multiple lid shall be fitted with a filler cap (or plug) on the lid as near as possible to one corner of the cover, such that if moisture did enter it would drop to the bottom of the tank.

Gaskets or thread sealing may be used to prevent water drops being inhaled into the transformer.

7.16.8 Tank Markings

The transformer capacity and FEA's stock code number shall be stenciled in black numerals onto the tank where it can be easily seen from the ground with the transformer mounted on a pole. Each numeral shall be 75 mm high and have a body width of not less than 12 mm.

7.17 Spark Gaps

No HV spark gaps are required.

7.18 Protective Coating

FEA requires all internal and external surfaces to be protected against corrosion and be hot dipped galvanized.

The external corrosion protection for all items shall suit Long Term Corrosion Protection in Atmospheric Classifications of “Mild”, “Moderate” and “Tropical” per clause 2.2 of AS 2312.

The Bidder shall guarantee protective coating system for a minimum period of five (5) years from commissioning against corrosion which would require repair/replacement of the transformer. In such case, the normal warranty provision shall apply, with all associated costs to be borne by the manufacturer. Warranty provisions would only apply if the transformers are installed in the appropriate environment.

Warranty claims would cover any transformer requiring replacement due to corrosion as well as the repair of rusty tanks in situ to prevent the premature need to replace units. Repairs in situ would normally be performed by FEA. Providing one week notice is given to Bidder to investigate, all labour and material costs (but excluding consequential costs) would be passed from FEA to the Bidder on a recoverable basis.

The successful Bidder shall provide details on the method of protective coating repair to allow FEA to carry out touch-up (before commissioning) and field maintenance.

The surface coating inside the transformer tank shall not react with unpassivated transformer mineral oil (including additives if applicable).

7.19 Transformer Losses

Guaranteed load and no-load loss figures are to be specified in the Schedules.

Load losses are to be corrected to a reference temperature of 75deg C.

7.19.1 Guaranteed Losses

In evaluating the tenders, FEA will capitalize the guaranteed losses and so determine the economic advantages of the transformers offered. Capitalization of losses will be based on the guaranteed losses at the required power rating for each item as stated in the Schedules. Load losses will be those specified on the principal tapping. For this contract, the following values will be used for the purpose of making a fair economic comparison.

Transformer Rating	F (Capitalized No-load loss)/ kW	C (Capitalized Load-loss)/kW
100kVA and above	$6,300	$1,800

F and C are the $/kW capitalization figures for the no-load and load-losses respectively.

A unit with total losses over 10 percent or individual no load and load losses over 15 percent in excess of a guaranteed figure may not be shipped to FEA without written permission and only by special arrangement.

7.20 Minimum Power Efficiency

All transformers must meet or exceed the minimum power efficiency levels specified in Table 1 of AS 2374.1.2-2003 Minimum Energy Performance Standard. Transformers with efficiencies not meeting or improving performance upon these Minimum Energy Performance Standards are unacceptable.

7.21 Wheels

Transformers will be fitted with wheels that enable them to be moved forwards, backwards and sideways. Jacking points will be provided to facilitate changing the direction of the wheels. The wheelbase and wheel height will be such that the transformer may be rolled from one level surface to a higher surface without any portion of the transformer fouling. Towing holes will be located on the frame such that it is possible to connect a cable to winch the transformer along.

8 TESTING

8.1 Type Tests on Transformers

A copy of the type test certificates shall be provided, free of charge, to FEA. If a specific item was not tested in the past, the tests shall be performed on units purchased at the Supplier's expenses. Where units are offered of a similar deign to those previously tested, FEA may consider (in accordance with AS 2374, Part 1, Para 3.11.2) to accepting previous type set reports. The Bidder shall state if such tests, that would qualify for consideration exist. The Bidder may be requested during the tender evaluation period to substantiate that claim with written engineering evaluation. Such evaluation shall provide all relevant details permitting FEA to establish validity of existing type tests.

Should FEA require any test(s) to be repeated despite the earlier certificate being available for an identical or similar unit, the cost of such test will be borne by FEA.

Any modification, resulting from a type test failure or change of design instigated by the Supplier or change of design to comply with the specification, which could affect the result of earlier type tests, shall require a repeat of such earlier type test. Any repeat type tests to provide compliance with the Standard's requirements shall be to the Supplier's cost.

The insulation of the HV winding shall be capable of withstanding impulse voltage testing including chopped waves in accordance with AS 2374, Part 3, Clauses 13 and 14.

The lightening impulse withstand voltage and power frequency withstand voltage of the HV windings and connected parts shall be specified in the Specification Requirement.

Extrapolations of temperature rise for guaranteed load and no-load losses shall be incorporated in the test report to verify conformance. During the test, sealing around thermometers, etc. shall be adequate to ensure the units are sealed during the test. Also, tap switch operation shall be free, i.e. not over tightened during the test. Internal pressures shall be measured and recorded.

Bidders are required to conduct an overload temperature rise type test on the same unit which underwent the temperature rise type test to verify that the maximum hot spot winding temperature of 140º C is not exceeded when the ambient is 25º C for an overload condition of 1.5 times the normal rated load on any tapping for up to 2 hours after continuous operation at 0.6 times the normal rated load. Internal pressure shall be measured and recorded. The result of this test shall be incorporated in the test reports for temperature rise. Bidders shall state in the schedule the guaranteed top oil/winding temperature rise for this condition.

Oil leaks during temperature rise tests would constitute failure of the test.

A short-circuit test in accordance with AS 2374, Part 5 shall be carried out on the transformers. Should a unit fail test, subsequent tests to provide compliance with the standard's requirements shall be to the supplier's costs. At the conclusion of tests to FEA's account, FEA reserves the right to attend the out of tank inspection at the testing premises.

8.2 Routine Tests on Transformers

The following tests, as specified in AS 2374, shall be carried out:

AS2374	Clause No.

1. Measurement of winding resistance	Part 1 – Clause 10.2
2. Ratio and phase relationship checks	Part 1 – Clause 10.3
3. Impedance voltage, short circuit impedance and load losses	Part 1 – Clause 10.4
4. No load loss and currents	Part 1 – Clause 10.5
5. Induced over-voltage withstand	Part 3 – Clause 12
6. Separate-source voltage withstand	Part 3 – Clause 11
7. Insulation resistance	Part 3 – Clause 16

8.3 Witnessing of Tests

The Bidder shall also make allowance for witnessing of routine tests by one FEA engineer. The Supplier shall give FEA not less than four (4) weeks' notice of when each and every type test will be carried out.

8.4 Test Certificates

One certified copy of all test results shall be supplied to FEA. Electronic copies shall also be submitted.

All test certificates shall include the manufacturer's serial number. On allocation, the corresponding FEA transformer number or stock code, the order number, contract number, item number, specification number and guaranteed losses must be added to the certificate, or attachment to the test report.

Test reports must not be more than five (5) years old from the closing date of the tender.

9 RELIABILITY

9.1 Service Life

Bidders are required to comment on the reliability of the equipment and the performance of the materials offered for a service life of 35 years under the specified system and environmental conditions.

9.2 Spare Parts and Maintenance

The supplier shall supply a list of recommended spare parts, special tools and appliances required for the whole of life operation and maintenance of the transformer installation. The list, together with prices, shall be indicated in the appropriate schedule. The supplier must also provide details (if required) of the recommended maintenance and the frequency at which it must be carried out. Details of the manufacturers repair capability and options shall be provided

9.3 Evidence in Support of Reliability

The supplier shall indicate and provide updates to FEA the mean time between failures (MTBF) of the transformer and its components including the recommended maintenance regime and maintenance tasks and intervals. This regime shall be based on the mean time between failure (MTBF) and the critical failure modes identified by the failure mode, effects and criticality analysis (FMECA) of the equipment. Details substantiating the FMECA analysis shall be included in the offer.

Such comments will include evidence in support of the reliability and performance claimed including information on Failure Mode and Effect Analysis.

10 ENVIRONMENTAL CONSIDERATIONS

Bidders are required to comment on the environmental soundness of the design and material used in the manufacture of the items offered. In particular, comments should address such issues as recyclability and disposal at end of service life.

Bidders are required to provide with the tender, EMF levels at transformer normal (balanced) maximum load. Such EMF levels are required at a point midway along each side, and diagonally out from each corner, at a distance of 1m above and beyond the base.

11 PACKAGING AND MARKING

The packaging of items by the Bidder must ensure that they are capable of being delivered undamaged giving due consideration to the quantity, distance of transportation and the preferred method of handling at each location.

The Bidder shall take all necessary precautions to ensure safe handling of all transformers and associated accessories supplied.

12 QUALITY REQUIREMENTS

12.1 Quality System

Bidders are required to submit evidence that the design, manufacture and testing of the transformers are in accordance with AS/NZS 9001.

Documentary evidence shall be provided concerning the level of Quality System Certification associated with the supplier and or manufacturer. This documentation shall include the Capability Statement associated with the Quality System Certification.

13 PRODUCT WARRANTY PERIOD

The Bidder is required to provide the warranty period as part of the proposal. A minimum warranty period of twenty-four (24) months from time of dispatch from factory shall be provided.

14 INFORMATION TO BE SUPPLIED BY THE BIDDER

14.1 Documentation to be Supplied with the Tender

To enable FEA to fully evaluate the transformers offered, (in addition to the completed Specification Requirement and Guaranteed Performance schedules) the Bidder will submit the following information with their tender:

- List showing similar equipment supplied to or on order for other utilities in Australia or New Zealand or the Oceania region
- Typical arrangement drawings and full details of the dimensions of the transformer
- Type test certificates for the transformers offered, or transformers of similar design and rating (if available).
- Typical loading curves (for loading transformers in accordance with AS 2374, Part7)
- Short circuit test details for equipment of similar design and rating.
- Sample inspection and test plans for the transformers
- Typical installation and maintenance manuals for all components
- Full details of the protective coatings offered
- End of service life disposal method
- Calculations for MEPS efficiencies
- Detailed procedure for receiving, handling, lifting and storage
- A list of all departures of the tender from this specification
- Evidence of quality management systems
- Evidence of Health, Safety and Environmental plans
- Evidence of financial ability to provide the level of service and support
- Origin of materials used in manufacture of the transformer and switchgears

Bidders may be asked to provide additional information during tender assessment period or following award of contract.

14.2 Training

Training material in the form of drawings, instructions and/or audio visuals shall be provided for all the items offered and accepted by FEA.

This material shall include but is not limited to the following topics:

- Handling
- Storage
- Installation
- Maintenance program
- Environmental performance
- Electrical performance
- Mechanical performance
- disposal

Tender Submission - Instruction to bidders

It is mandatory for Bidders to upload a copy of their bid in the TENDER LINK Electronic Tender Box no later than 4:00pm, on Wednesday 18th October 2017

To register your interest and tender a response, view 'Current Tenders' at: https://www.tenderlink.com/fea

For further information contact The Secretary Tender Committee, by e-mail TDelairewa@fea.com.fj

In addition, hard copies of the tender, one original and one copy must be deposited in the tender box located at the FEA Head Office, 2 Marlow Street, Suva, Fiji no later than 4:00pm, on Wednesday 18th October 2017 - Addressed as

Tender – MR 261/2017 Design, Manufacture, Testing and Supply of Two (2) 11/0.415kV, 2,000kVA Ground Mounted distribution transformers
The Secretary Tender Committee
Fiji Electricity Authority
Head Office
Suva
Fiji

- Hard copies of the Tender bid will also be accepted after the closing date and time provided a soft copy is uploaded in the e-Tender Box and it is dispatched before the closing date and time.

Tenders received after 4:00pm on the closing date of Wednesday 18th October, 2017

- will not be considered.
- Lowest bid will not necessarily be accepted as successful bid
- It is the responsibility of the bidder to pay courier chargers and all other cost associated with the delivery of the hard copy of the Tender submission including any Duties/Taxes. Hard copies of the Tender submission via Post Box will not be considered.
- Local Bidders are requested to submit a:

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

APPENDIX A: SPECIFICATION REQUIREMENT – TRANSFORMER

This table is to be filled for each item offered.

Ref.	Particulars	Units	
1	Transformer Description		11/0.415kV, G/M distribution transformer
2	Rated Power	kVA	2,000
3	Number of Phases		
4 4.1 4.2	Rated Voltages: HV winding: LV winding:	 V V	
5	Winding inter-connection vector group symbol		Dyn11
6	Impedance voltage at rated current on principal tapping		
7	Tap Changer Type		
8	% Tap Change		
9	No load Loss	kW	
10	Load Loss @ 75 Deg C	kW	
11	Power Frequency Insulation Level (HV/LV)	kV rms	
12	Impulse Withstand Voltage (1.2/50 micro-sec)	kVp	
13	Insulation Class		
14 14.1 14.2	Winding Conductor Type High Voltage: Low Voltage:		
15	Magnetizing Current (% of full load)		
16	Sound Power Level	dB (A)	56
17	Volume of Insulation Oil	liters	
18	Maximum Total Mass	kg	
19 19.1 19.2	Temperature rise limits Winding Top Oil	 Deg C Deg C	 65 60
20	Tappings		6 HV winding taps, rated, -7.5%, -5%, -2.5%, 0, +2.5%, +5%
21	Country of Manufacture of complete transformer		
22	Lifting & Transport Facilities Clearly marked with permanent label or stencil? Fully rated?	 Yes/No Yes/No	
23	Protective Coating Are full details of protective	 Yes/No	

	coating included with the tender documents? Time to first maintenance	Years	
24	Maximum Dimensions: Width (including Base) Length Height (including base) maximum, interchangeability requirements have changed	 mm mm mm	
25	Guard provided over transformer radiators	Yes/No	
26	All bolts (Fasteners, Studs, etc.) nuts and washers 316/304 grade stainless steel?	Yes/No	
27	Tamper proof bolts used for all unenclosed components accessibility to the public?	Yes/No	
28	Serviceable life expectancy	Years	
29	Inspection free interval	Years	
30	Maintenance free interval	Years	

APPENDIX B: GUARANTEED PERFORMANCE - TRANSFORMER

The following is to be filled for each unit tendered for by the Bidder.

Ref	Particulars	Units	
1 1.1 1.2	Losses on Principal tap at 75℃ Load: No Load	 W W	
2 2.1 2.2	Temperature Rise limits during overload conditions Top Oil: Winding (by resistance)	 ℃ ℃	
3 3.1 3.2	Minimum insulation resistance at 20 ℃ (1 kV test after 1 minute) for HV winding: LV winding:	 Mega Ohms	
4	Continuous permissible overvoltage at any tap	%	
5	Power efficiency at 50% load	%	
6	Rated power at 40deg C ambient temperature	kVA	
7	Positive sequence impedance as vector coordinates: (Rectangular form: Z(Ω)=R(Ω)+jX(Ω))		
8	Zero sequence impedance as vector coordinates: (Rectangular form: Z(Ω)=R(Ω)+jX(Ω))		
	Oil Preservation System - Type		
6 6.1 6.2`	Rated Voltage Primary Voltage Secondary Voltage (No Load)	 V V	
7	Method of cooling		
8	Suitable for loading in accordance with AS 2374, Part 7.	Yes/No	
9	Normal loading curves supplied with Tender (corrected for maximum ambient temperature)	Yes/No	
10	Maximum ambient temperature	℃	
11	Tappings: 7 HV winding tappings, rated +10% to -5% of rated voltage, 2.5% steps, off-circuit	Yes/No	
12 12.1 12.2 12.3	Insulation Level: HV winding impulse voltage withstand Power frequency voltage withstand of HV winding Power frequency voltage withstand of LV winding	 KV peak KV rms KV rms	
13 13.1 13.2	HV Terminals Cast epoxy pad type capable of accepting a Holec 502-0024 termination kit (or similar)? HV terminal height above base	 Yes/No mm	
14 14.1 14.2	Clearance in air (minimum) LV Phase-Phase LV Phase- to-earth (and neutrals)	 mm mm	
15 15.1 15.2 15.3 15.4 15.5	Insulating Oil Does it comply with AS 1767 and non-corrosive? Type Brand of oil used Method of Filling PCB in oil detection limit	 Yes/No - - - ppm	

16 16.1 16.2 16.3	Material Thickness Tank sides/floor Lid Fins	 mm mm mm	
17	Maximum deflection of side walls	mm	

APPENDIX E: DEPARTURE FROM SPECIFICATIONS

The Bidder shall nominate the Clause or relevant section of the tender specification and describe the departure.

Tender Specification Reference[i]	**Departure**

[i] Where possible, the Tender shall refer to the specific clause of the tender specification.