RURAL ELECTRIFICATION FUND

BIDDING DOCUMENT

for the
Supply and delivery of various transformers

Tender Closing Date: 08 April 2022 , Time:1000hrs

Tender Number: REF/Inter/02/03/2022

Date of tender advert: 11 March 2022

RURAL ELECTRIFICATION FUND

DECLARATION BY THE ACCOUNTING OFFICER IN TERMS OF SECTION 19(2)(C) OF THE PUBLIC PROCUREMENT AND DISPOSAL OF PUBLIC ASSETS REGULATIONS,2018.

TENDER NUMBER: REF/INTER/02/03/2022

TENDER DESCRIPTION-SUPPLY AND DELIVERY OF CONDUCTOR CABLES

DECLARATION

The procurement for the tendered goods/items is based on neutral and fair technical requirements and bidder qualifications.

Signed

.....
J.V MASHAMBA
CHIEF EXECUTIVE OFFICER

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Part 1: Bidding Procedures

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PART 1: BIDDING PROCEDURES

References:

References to the Act are to the Public Procurement and Disposal of Public Assets Act [*Chapter22:23*] and references to the Regulations are to the Public Procurement and Disposal of Public Assets (General) Regulations (Statutory Instrument No. 5 of 2018). The terms and requirements in the Act and Regulations govern the submission of Bids and should be read by all Bidders. The evaluation of this tender shall be guided by requirements of the Act.

Table of tender requirements

	11KV				**19.1 Kv**					**33KV**			
SIZE	**10kVA**	**25Kva**	**50kVA**	**100kVA**	**16 Kva**	**32 kVA**	**64 kVA**	**475 kVA**	**Auto**	**15kVA**	**25 kVA**	**50kVA**	**100kVA**
TENDER QTY	**10**	**65**	**55**	**8**	**8**	**11**	**1**	**2**	**2**	**4**	**3**	**23**	**8**
LOT No	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**

Preparation of Bids

You are requested to bid for the supply of the goods specified in the Statement of Requirements below, by completing and returning the following documentation:

1. the Bid Submission Sheet in this Part;
2. the Statement of Requirements in Part 2;
3. a copy of every document necessary to demonstrate eligibility in terms of section 28 (1) of the Regulations;
4. Supplier Registration number showing that you are registered with the Procurement Regulatory Authority of Zimbabwe(PRAZ);
5. A bid security or bid securing declaration in the format specified in this Part;
6. A copy of:
    - *Company profile*
    - *Certificate of incorporation/proof of company registration in the country of origin*
    - *Tax clearance certificate/proof of tax compliance*
    - *CR 14(Proof of company ownership)*
    - *ISO certificate for the manufacturer*
    - *Letter of agency from the manufacturer(for non-manufacturers)*
    - *Two Reference letters*

The tender is subject to review in terms of Section 54 of the Act,therefore bidders shall be required to pay the following fees in terms of Part IV of S.I 219 of 2020:

- Equivalent of ZW$30,000.00 for local bidders and USD$400.00 for foreign bidders . Bidders must attach proof of compliance on the bid documents without fail.

You are advised to carefully read the complete Bidding Document, as well as the General Conditions of Contract which are available on the Authority's website, before preparing your Bid. Part 3: Contract is provided not for completion at this stage but to enable Bidders to note the Contract terms they will enter into if their Bid is successful.

The standard forms in this document may be retyped for completion but the Bidder is responsible for their accurate reproduction. All pages of the Bid should be clearly marked with the Procurement Reference Number above and the Bidder's name and any reference number.

Lots and Packages

The tender is divided into lots. Bidders may bid for one or all the Lots

Number of bids allowed

No Bidder may submit more than one bid, either individually or as a joint venture partner in another Bid, except as a subcontractor. Where the procurement is divided into lots and packages, only one Bid can be submitted. A conflict of interest will be deemed to arise if bids are received from more than one Bidder owned, directly or indirectly, by the same person.

Clarification

All queries regarding the tender shall be forwarded by the bidder in writing on duly signed company letterhead and emailed on the following three(3) email addresses : kchinembiri@rea.co.zw; tshumba@rea.co.zw and buyer1@rea.co.zw , not less than five(5) working days from the closing date of the tender. Ensure the quiry is emailed to ALL the three email addresses without fail. Clarifications/Responses pertaining to the queries received shall uploaded on REF website address www.rea.co.zw on the notice board page. It shall be the responsibility of bidders to continuously check the website for such clarifications/quiry responses.

If a prospective tenderer sends a query less than the stated days above, the query may not be responded. Any neglect, delay or failure on the part of the Tenderer to obtain additional information on the above or any other matters, which the tenderer considers necessary, shall not relieve him/her from responsibility as a Tenderer. Only bidders facing challenges in receiving responses to their quiries may call the Procurement Administrator on 0719 409 691.

Pre-bid meeting

No pre-bid meeting shall be held in this tender.

Validity of Bids

The minimum period for which the Bidder's bid must remain valid is ninety (90) days from the deadline for the submission of bids.

Submission of Bids

Bids must be submitted in writing in a sealed envelope to the address below, no later than the date and time of the deadline below. It is the Bidder's responsibility to ensure that they receive a receipt confirming submission of their bid that has correct details of the Bidder and the number of the Bid.

The Bidder must mark the envelope with the Bidder's name and address and the Procurement Reference Number.

Bidders must submit three bid documents. The bidder must clearly mark the original copy "ORIGINAL.".Two other copies must be clearly marked "COPY." In the event of any discrepancy between the original and the copies, the original will prevail.

Late bids will be rejected. The Procuring Entity reserves the right to extend the bid submission deadline but will notify all potential bidders who have collected the bidding documents of the amended bid submission deadline.

Submission address:	**Chief Executive Officer** **Rural Electrification Fund** **Megawatt House** **44 Samora Machel Avenue** **Harare**
Means of acceptance:	Tenders must be enclosed in sealed envelopes and endorsed on the outside with the advertised tender number , the description and closing date. The bids shall be dropped in the tender box located at the above stated address by the closing date and time personally or by post. Upon bid submission, bidders must obtain a bid submission receipt as proof of bid acceptance. Bidders are free to witness the opening of the tenders on the named closing date and time.

Bid opening

Bidders and their representatives may witness the opening of bids, which will take place at the submission address immediately following the deadline.

Withdrawal, amendment or modification of Bids

A Bidder may withdraw, substitute, or modify its Bid after it has been submitted by sending a written notice, duly signed by an authorized representative. However, no Bid may be withdrawn, substituted, or modified in the interval between the deadline for submission of Bids and the expiration of the period of Bid validity specified by the Bidder or any extension of that period.

Bid Prices and Discounts

The prices and discounts quoted by the Bidder in the Bid Submission Form and in the Price Schedules must conform to the requirements specified below.

Prices must be quoted as specified in the Price Schedule included in Part 2 Statement of Requirements. In quoting prices, the Bidder is free to use transportation through carriers registered in any eligible country and similarly may obtain insurance services from any eligible country. Prices quoted must include the following costs and components:

(i) the price must be quoted DDP(2020) that is inclusive of freight costs,insurance costs(risk),import duties and taxes till delivery.

Payment of tender fees

All foreign bidders are expected to pay for any fees or the bid bond in the currency of their bids while local bidders shall pay in local currency only.

Bid Security

Every bidder is required to include bid security as follows:

Bid Bond/Security

The Bid bond for this tender shall be RTGS$150,000.00.00(local bidders) and payable using the following options (S.I 5 of 2018 section 26).Please note that foreign bidders must provide the bid bond of equivalent value in the currency of their bid.

Option 1

A certified bank cheque; or

Option 2

A bank guarantee; or

Option 3

A cash deposit to Procurement Regulatory Authority of Zimbabwe (PRAZ)

NB: If Option 3 is chosen please note that the Tenderer must pay a non-refundable Bid Bond/Bid security establishment fee equivalent to ZW$30,000.00(local bidders) and USD350.00 (Foreign bidders) to the Procurement Regulatory Authority of Zimbabwe in line with S.I. 299 of 2021 PART V item 4.

Any bid not accompanied by a Bid Security or Bid Securing Declaration, where this is a requirement of bidding, will be rejected by the Procuring Entity as non-responsive.

The Bid Security or Bid- Securing Declaration of a Joint Venture (JV) must be in the name of the JV that submits the Bid. If the JV has not been legally constituted at the time of bidding, the Bid Security or Bid-Securing Declaration must be in the names of all intended partners.

Contract Administration Fees

The winning bidder(s) shall be required to pay applicable contract administration fees to PRAZ in terms of part VI of Statutory Instrument (S.I) 299 of 2021 before contract signature. Bidders must study and understand the fees structure provided in S.I 299 of 2021.

Administration fees payable by bidders for bids subject to review (SPOC fees)

The tender is subject to review in terms of Section 54 of the Act,therefore bidders shall be required to pay the following fees in terms of Part IV of S.I 299 of 2021:

- Equivalent of ZW$30,000.00 for local bidders and USD$400.00 for foreign bidders . Bidders must attach proof of compliance on the bid documents without fail.

Evaluation of Bids

Bids will be evaluated using the following methodology:

1. Preliminary examination to confirm that all documents required have been provided, to confirm the eligibility of Bidders in terms of section 28 (1) of the Regulations and to confirm that the Bid is administratively compliant in terms of section 28 (2) of the Regulations.
2. Technical evaluation to determine substantial responsiveness to the specifications in the Statement of Requirements;
3. Financial evaluation and comparison to determine the evaluated price of bids and to determine the lowest evaluated bid.

Bids shall be fully evaluated for all the stages and bids failing on any stage shall be rejected.

Review by the Special Procurement Oversight Committee

Section 54 of the Act provides for review by the Special Procurement Oversight Committee for certain especially sensitive or especially valuable contracts. The tender is subject to review therefore three identical copies of the bid document are required and that, where the copies are not identical, the contents of the bid marked original will alone be considered.

Evaluation criteria

The Procuring Entity's evaluation of a Bid will take into account, in addition to the Bid Price, the following criteria and methodologies.

(a) Compliance to technical specifications-Bidders must fully comply with the technical specifications provided in this tender. **Bidders who hold the transformers ex stock are exempted from completing the technical guarantee schedule only if they attach proof of quality inspection certificates issued by Zesa Enterprises(ZENT). The exemption shall apply only to the transformers held in stock.**

(b) Price and pricing format-Bidders should submit their bid prices with the following format. Failure to follow the format below may lead to disqualification of the bid:

Lot No	Description of transformer	Qty	Unit Price Excluding VAT ZWS$	Total 14.5% VAT ZW$	Total Including VAT ZW$
1	Transformers	Xx			
2	Transformers	Xx			
3	Transformers	xx			
4	Transformers	xx			

❖ Bidders are free to quote for one or more lots

- Payment shall be strictly in local currency only.
- The bid price should **clearly and separately** show the unit price and the total price of the to be supplied.
- The ZW$ prices shall be used for purposes of tender evaluation.
- Bidders MUST state clearly whether they charge VAT or not.

(c) Should REF receive bids in different currencies , the currency of evaluation will be the local currency(ZW$) . NOTE: Local bidders must quote in local currency only .See pricing format provided. However foreign bidders are required to convert their bids into local currency using the RBZ exchange rate (mid-rate) obtaining on 16 March 2022. See http://www.rbz.co.zw/.

Where foreign bids are not converted into local currency REF shall convert the bids into local currency for purposes of tender evaluation using the RBZ exchange rate obtaining on the 16 March 2022 as above. However REF may reject bids quoted in foreign currency without conversion into local currency. REF reserves the right to amend the tender quantity during evaluation in line with budgetary provisions and or other considerations.

(d) **Delivery schedule**: Successful bidder(s) shall be required to deliver the transformers five(5) days from the date of contract signing or from the date a purchase order is issued, whichever comes first. The delivery address for the tender shall be:

- REF Central Stores No.22A James Martin Road, Lochinvar Harare Zimbabwe. REF reserves the right to reject the right to reject any deliveries or products that do not meet the technical specifications provided in this tender.

(e) **Payment terms-Bidders must state the preferred payment terms**

However REF shall pay the winning bidder whether it's a local bidder or foreign bidder in local currency(ZW$) only:

- Prepayment -REF favors payment after delivery, however where a bidder require pre-delivery payment they must state ability to secure a bank guarantee from a registered commercial bank acceptable to REF equal to the amount to be advanced. The bank guarantee must be provided within two weeks of contract signing.

NOTE: Foreign bidders must provide a bank guarantee confirmed by any local commercial banks or provide a bank guarantee issued by any local banks.

(f) Bidders must state whether the transformers are imported or are locally manufactured without fail. State the country of origin without fail.

(g) Bidders should provide their local bank account details without fail.

(h) Delivery term shall be Delivered Duty Paid**(DDP)(**2020),Harare Central Stores-That is Inclusive of freight costs, transit insurance (risk),all import duties and costs until delivery at REF Central Stores No.22A James Martin Road, Lochinvar Harare Zimbabwe.-Bidders MUST state that the delivery term shall be **DDP(2020) Central Stores No.22A James Martin Road, Lochinvar Harare Zimbabwe.**

(i) The transformers shall be tested by Zesa Enterprises Engineers before they are received by REF Central Stores at the supplier's cost. REF reserves the right to reject goods that do not meet the required tender specifications.

(j) Bidders must be registered with the Procurement Regulatory Authority of Zimbabwe(PRAZ)- Bidders must attach proof of registration with PRAZ on the list for supply of electricals/hardware. However foreign bidders shall only be required to register with PRAZ if awarded the tender and before contract signature.

(k) Letter of agency-non-manufacturers must attach a letter of agency from the manufacturer with the bid documents without fail.

(L) Product brochure- Bidders are required to attach a product brochure for the transformers tendered without fail.

(m) Valid ISO certificate of the manufacturer of the transformers must be provided- Bidders must attach proof without fail.

(n) Foreign bidders must clearly state in their bids that they have checked that the transformers tendered "fall" or "do not fall" under the Consignment Based Conformity Assessment (CBCA) programme as required by the Government of Zimbabwe. If the goods tendered "fall" under the CBCA programme, bidders must further state that all costs associated with this requirement will be to the supplier's account. Bidders who hold the transformers ex-stock do not need to comply with this requirement.

(o) Delivery period. The winning bidder(s) shall be required to deliver the transformers within a period five(5) days the date of contract signing or the date a purchase order is issued whichever comes first. Bidders must state their capacity to deliver within a period of five(5) days as required.

(p) Reference letters-Bidders must attach at least two reference letters from companies where the bidder has supplied transformers over the past two years. Reference letters referring to supplies done more than two years old will not be acceptable.

(q) Bidders must state a warranty period of 12 months for the supplied items.

(r) Bid bond compliance-Bidders must attach proof of bid bod compliance as per Part one of this bidding document without fail.

(s) Compliance with Administration fees payable by bidders for bids subject to review (SPOC fees)-Bidders must attach proof of payment for SPOC administration fees as per

part one of this bidding document.

(t) Bid validity of a minimum of 90 days is required and must be clearly stated.

(u) The Bidders must submit the bid with a duly filled in and signed Declaration On Non-Engagement in Corrupt or Fraudulent Practices Form Annexure 2.

(v) The bidder must submit with the bid a duly filled in and signed attached Form of Tender Annexure 3.

(w) Attach the bid submission form attached on page 13 of this document. Bids without the bid submission form may be rejected.

Eligibility and Qualification Criteria

Bidders are required to meet the criteria in section 28 of the Act to be eligible to participate in public procurement and to be qualified for the proposed contract. To be eligible, Bidders must:

1. have the legal capacity to enter into a contract;
2. not be insolvent, in receivership, bankrupt or being wound up, not have had business activities suspended and not be the subject of legal proceedings for any of these circumstances;
3. not have a conflict of interest in relation to this procurement requirement;
4. not been debarred from participation in public procurement under section 72 (6) of the Act and section 74(1) (c), (d) or (e) of the Regulations or declared ineligible under section 99 of the Act;
5. have the nationality of an eligible country as specified in the Special Conditions of Contract; and

Participation in this bidding procedure is open to *both Zimbabwean and foreign bidders*.

Origin of Goods

All goods and related services must have as their country of origin an eligible country, as specified in the Special Conditions of Contract.

Technical Criteria

The Technical Specifications Sheet details the minimum specification of the goods required. The goods offered must meet this specification, but no credit will be given for exceeding the specification.

Award of Tender Criteria

Tender shall be awarded to the lowest priced bidder to specification who hold the tendered items **ex-stock.** Where the winning bidder holds less-than the tender quantity, REF may award the tender for one lot to different bidders who hold the transformers ex-stock until the tender quantity is fulfilled. Bidders who hold the transformers ex-stock must state that they hold the goods ex stock without fail and the quantity held in stock.

Bidders who hold the transformers ex-stock MUST attach ZENT quality check certificates as proof of ex stock status. Bids without ZENT certificates shall be treated as non-stock holders during evaluation.

REF reserves the right to visit bidders premises and inspect the items stated as EX-STOCK and findings by the visiting team shall be used for evaluation of this tender. **NB: BIDDERS WHO FALSELY CLAIM TO HOLD STOCK SHALL BE DISQUALIFIED FROM THE TENDER PROCESS.** Bidders are allowed to quote for the full or part tender quantity.

Bidders who do not hold the transformers ex stock shall be disqualified as non-compliant.

The proposed award of contract will be by issue of a Notification of Contract Award in terms of section 55 of the Act which will be effective until signature of the contract documents in accordance with Part 3: Contract. Unsuccessful Bidders will receive the Notification of Contract Award and, if they consider they have suffered prejudice from the process, they may within 14 days of receiving this Notification, submit to the Procuring Entity a Challenge in terms of section 73 of the Act, subject to payment of the applicable fee set out in section 44 of and the Third Schedule to the Regulations.

Right to Reject

The Procuring Entity reserves the right to accept or reject any Bids or to cancel the procurement process and reject all Bids at any time prior to contract award.

Corrupt Practices

The Government of Zimbabwe requires that Procuring Entities, as well as Bidders and Contractors, observe the highest standard of ethics during the procurement and execution of contracts. In pursuit of this policy:

1. the Procuring Entity will reject a recommendation for award if it determines that the Bidder recommended for award has, directly or through an agent, engaged in corrupt, fraudulent, collusive or coercive practices in competing for the Contract or been declared ineligible to be awarded a procurement contract under section 99 of the Act;
2. the Authority may under section 72 (6) of the Act impose the sanctions under section 74 (1) of the Regulations; and any conflict of interest on the part of the Bidder must be declared.

Bid Submission Sheet

{Note to Bidders: Complete this form with all the requested details and submit it as the first page of your Bid. Attach the completed Statement of Requirements and any other documents requested in Part 1. Ensure that your Bid is authorised in the signature block below. A signature and authorisation on this form will confirm that the terms and conditions of this Bid prevail over any attachments. If your Bid is not authorised, it may be rejected. If the Bidder is a Joint Venture (JV), the Bid must be signed by an authorized representative of the JV on behalf of the JV, and so as to be legally binding on all the members as evidenced by a power of attorney signed by their legally authorized representatives.

Bidders must mark as "CONFIDENTIAL" information in their Bids which is confidential to their business. This may include proprietary information, trade secrets or commercial or financially sensitive information}.

Procurement Reference Number:

Subject of Procurement:

Name of Bidder:

Bidder's Reference Number:

Date of Bid:

We offer to supply the items listed in the attached Statement of Requirements, at the prices indicated on the attached Price Schedule and in accordance with the terms and conditions stated in your Bidding Document referenced above.

We confirm that we meet the eligibility criteria specified in Part 1: Procedures of Bidding.

We declare that we are not debarred from bidding and that the documents we submit are true and correct.

The validity period of our bid is: …… *{days}* from the date of submission.

We confirm that the prices quoted in the attached Price Schedule are fixed and firm for the duration of the validity period and will not be subject to revision, variation or adjustment.

Bid Authorised by:

Signature	……..	**Name:**	……
Position:	……..	**Date:**	……*(DD/MM/YY)*
Authorised for and on behalf of:			
Company	……		
Address:	……		

Technical Specification and Compliance Sheet

Name of Bidder:

Bidder's Reference Number:

TECHNICAL SPECIFICATIONS FOR THE TRANSFORMERS

Instructions to bidders

Bidders must clearly study and understand all the technical specifications provided per type of lot and bidders **MUST** complete the technical guarantee schedules for each type/lot of transformer without fail. Incorrect information on the guarantee schedules shall lead to disqualification of such bids.

NB: Bidders who fail to comply with these instructions shall be disqualified.

Bidders who hold the transformers quoted ex stock are exempted from completing the technical guarantee schedule ONLY if they attach proof of quality inspection certificate issued by Zesa Enterprises(ZENT). However,the exemption shall only apply to the transformers held ex-stock only.

Summary requirements

	11KV				**19.1 Kv**					**33KV**			
SIZE	**10kVA**	**25Kva**	**50kVA**	**100kVA**	**16 Kva**	**32 kVA**	**64 kVA**	**475 kVA**	**Auto**	**15kVA**	**25 kVA**	**50kVA**	**100kVA**
TENDER QTY	**10**	**65**	**55**	**8**	**8**	**11**	**1**	**2**	**2**	**4**	**3**	**23**	**8**
LOT No	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**

REF SPECIFICATION NO. 18001
DISTRIBUTION TRANSFORMERS

1. SCOPE

This specification covers the manufacture, testing, supply and delivery of distribution transformers and spares. All transformers shall be capable of being loaded continuously at the full rating at ambient temperatures of 35 °C, while exposed to direct tropical sun.

The Supplier shall state name, place and country of manufacture. The Supplier shall state whether or not the transformers are produced under license, in which case licence holders name shall be stated.

Tenders shall include a complete statement of compliance with this specification. For every clause in this specification the Tenderer shall state compliance or non-compliance and shall elaborate where appropriate.

Tenders shall use the words 'comply', 'do not comply' for this specification or in the clauses of an informative nature, 'noted'. Where the words 'do not comply' are used the Tenderer shall state whether modifications could be made and whether modifications would be undertaken. The cost implications of such modifications must be indicated in the statement of compliance as well as the pricing schedules.

Spares as recommended by the supplier should be included in the scope of supply.

The manufacture of the transformers should commence after inspection of the prototype by a REF representative. The supplier will meet all the costs associated with the inspection of the prototype transformers.

2. DETERMINATION OF RESPONSIVENESS

Prior to the detailed evaluation of Tenders, the Authority will determine whether each Tender is substantially responsive to the requirements of the Tender Document.

2.1 For the purpose of this clause, a substantially responsive Tender is one which will conform to all the terms, conditions and specifications of the Tender Document without material deviations or reservations. A material deviation or reservation is one which affects in a substantial way the price, scope, quality completion timing or administration of the works undertaken by the Tenderer under the Contract, or which limits in a substantial way, inconsistent with the Tender Document, the Zimbabwe Electricity Supply Authority's rights or the Tenderer's obligations under the Contract and the rectification of which would affect unfairly the competitive position of other Tenders who have presented substantially responsive Tenders at reasonable price.

2.2 A Tender Determined to be substantially non-responsive will be rejected by the Authority and may not subsequently be made responsive by the Tenderer by correction of the non-conformity.

2.3 The Zimbabwe Electricity Supply Authority may accept any non-material deviation or reservation provided that the acceptance thereof does not prejudice or affect the relative ranking order of any Tender in the evaluation of Tenders.

3. PARTICULARS OF ELECTRICAL SYSTEM

Unless otherwise specified in Schedule of Requirements, it must be assumed that the system on which the equipment will operate is :

a) Three phase overhead-line construction and underground system. The maximum earth fault factor on the network is 1.5.

b) Operated at 50 Hz, with approximately sinusoidal wave form.

c) The highest system voltage does not normally exceed the nominal system voltage by more than 10%. The nominal system voltages are 33 kV and 11 kV.

d) The system frequency variation does not exceed plus or minus 2.5% from 50 Hz.

Designs should allow for these variations.

4. PARTICULARS OF ENVIRONMENT

The transformers shall be capable of operating under the following environmental conditions.

a) **Ambient temperatures:**

(i) Maximum: 40 °C
(ii) Minimum: minus 10 °C
(iii) Maximum daily average: 35 °C

b) **Altitude:**

Maximum altitude of 1 500 metres above sea level. The design shall allow for reduced cooling effect due to high altitude.

c) The transformers will be exposed to direct tropical sunlight.

d) **Humidity:**

Humidity of 13mg per cubic metre absolute and 65% relative before storms with vapour pressure of 17mmHg.

e) Transformers will operate within the tropics and will be subjected to sudden ambient air temperature changes of the order of 10 °C per hour,

occurring at the onset of rain, but the barometric pressure at any given place does not vary by more than approximately 10mm Mercury. Frequent and severe lightning storms occur during summer months, with isoceraunic levels varying between 50 and 100 thunderstorm days per annum.

It is the manufacturers responsibility to make himself familiar with any other climatic and physical conditions pertaining in Zimbabwe and to allow for all conditions in his designs.

Particular attention should be paid in the design of all equipment to ensure that there is no possibility of damage to working parts or insulation through the ingress of dust, insects or vermin.

All orifices and air vents should be covered by easily replaceable weather resisting, fine mesh wire where practicable.

5. STANDARDS, UNITS AND LANGUAGE

Except where modified by the Authority's Specifications, IEC Recommendations (IEC 76) shall apply throughout or British Standards (BS) where they amplify the IEC 76.

In the case of conflict between the above stated Standards and this Specification, the ruling of this Specification will prevail.

All tenders, correspondence, description upon drawings, illustrations or instructions shall be in unambiguous English Language. SI Units of measurements shall be used throughout.

All materials used in the manufacture of the transformers shall be new and of high commercial quality.

The transformers shall be manufactured to high quality standards.

Type test certificates are to be submitted with the tender for each transformer rating and voltage. Type tests are either to be witnessed by or carried out by an internationally recognised Test Institute, e.g. KEEMA and others. A minimum requirement is that the Test Institute is unbiased with no direct connection to any private industries and that the institute is engaged in type tests on behalf of international clients.

The transformers shall be sourced from manufacturers who have ISO 9001 Certification. Documentary evidence of the ISO 9001 Certification shall be provided with the bid. Manufacturers who cannot submit such certification are liable to be rejected.

6. DESIGN

6.1 General

a) The Transformers shall be of the mineral oil immersed core type suitable for outdoor use with ONAN cooling.

The transformers shall be capable of withstanding the maximum possible short circuit current (Assuming an infinite busbar at the H.V) for a period of one second.

b) All transformers shall have a guaranteed life span of at least 25 years operating continuously under full rated power at an ambient temperature of 35 °C on any tapping under the following conditions:

i) With the voltage of the untapped winding at normal, without the need to derate the transformer at the extreme tap positions and without oil temperature rise exceeding 55 °C at the top of the transformer. The winding temperature rise shall not exceed 60 °C.

ii) With voltage applied up to 10% in excess of the rated tapping voltages and without injurious overheating.

(c) Transformers shall be connected in accordance with BS 171: three phase transformers to Vector Group reference Dynll.

(d) The L.V neutrals shall be brought out of the tank to a readily accessible terminal and shall not be earthed inside the tank, unless otherwise specified in the enquiry.

(e) Transformers on a particular contract with similar kVA rating, voltage ratios and connections shall be suitable for parallel operation on all relevant taps under which conditions they should share the load in proportion to their ratings subject to the tolerances on impedance laid down in IEC 76 or BS 171.

(f) If it is required to parallel any transformer with existing transformers then full details of the existing transformers will be provided when tenders are placed.

(g) Low impedance transformers are preferred, a maximum of 5% being envisaged on any size with no plus tolerance.

(h) An oil gauge shall be provided for non-sealed transformers.

The following details shall apply to sealed designs:

i) Transformers sealed by welding are not acceptable, and will be rejected by the Authority.

ii) Any holes or plugs used to facilitate vacuum/pressure testing, leak testing or oil filling of the transformer shall finally be sealed.

iii) The expansion space for the oil shall not be less than 25 percent of the volume of the oil at 20 degrees Celsius, for transformers with conservators and transformers using the tank for expansion, and shall be nitrogen filled. The transformer shall be sealed at atmospheric pressure.

iv) Transformers using the expandable ribs for expansion shall be totally filled with oil and sealed at atmospheric pressure.

v) Pressure valves, pressure/vacuum gauges and non-return valves shall not be fitted.

vi) Drain plugs shall be fitted to transformer tanks up to and including 315 kVA, whilst drain valves shall be fitted to transformer tanks above 315 kVA

vii) Earth studs are required at both the H.V and L.V ends of transformer.

6.2 Windings

(a) Tappings shall be provided in the H.V windings, preferably in the electrical centre of the windings, to permit variation of the number of H.V turns without any variation in the kVA rating. The variations shall be effected by means of a manually operated tapping switch to be provided in accordance with clause 6(4).

(b) All windings and terminations shall be fully insulated and those for service above 1 000 volts shall be designed for impulse voltage tests.

Designs shall be such that electrical stresses are as uniform as possible throughout the windings under impulse conditions.

(c) Windings shall be vacuum impregnated and insulating materials shall not be liable to soften, shrink, become brittle, carbonise, deteriorate, or collapse in any way during service.

(e) L.V windings of Aluminium sheet are not acceptable. Transformers with such windings will be rejected.

6.3 Cores

(a) The magnetic circuit shall be earthed to the core clamping structure, at one point only, and the core assembly to the tank cover. Where transformers are not sealed, readily accessible removable bolted links shall be employed for the earthing connections.

(b) The general construction of the cores, framework and the clamping arrangements shall be robust and such that they will be capable of withstanding completely any stresses which may occur due to handling, transport or service. All cores and yokes shall be terminated and clamped by means of a suitable framework. Suitable means shall be provided for lifting the cores from the tanks.

(c) It shall not be possible for the core to move relative to the tank during handling or transport. Designs which contravene this requirement will be rejected.

(d) Particular attention shall be paid to maintaining low core loss consistent with sound design.

6.4 Tapping Switches

(a) Transformers shall be provided with approved off-circuit type tap changing equipment. A fully insulated off circuit externally manually operated ganged tapping switch shall be separately capable of withstanding the specified impulse voltage when connected to the transformer windings.

(b) Clearly visible tap position indication shall be provided. The tapping switch shall be operated by means of an external handle which can be positively located and locked in each operating position.

The switch shall be mechanically robust and provided with a device between the handle and the switch to permit operation without strain in the event of imperfect alignment between switch and handle. The switch operating shaft shall be fully insulated as between tank and switch and shall be provided with a suitable oil and vacuum tight gland where it passes through the tank.

(c) The use of wood shall be avoided wherever possible and all the supports and terminal boards shall be completely unaffected by hot oil and shall be non-moisture absorbent.

(d) High grade insulating materials shall be used in the construction of tapping switches which shall be designed with special attention to the elimination of points where tracking is likely to occur.

(e) Tapping switches shall be mounted on supports made of suitable high strength insulating material and shall be provided with self-aligning spring

loaded wiping contacts capable of maintaining good electrical contact without the need for periodic maintenance.

All clearance between tapping switch contacts and leads shall be indicated on drawings submitted at the time of tendering and such clearances shall be sufficient to prevent tracking or flashover in the event of carbon or sludge deposits forming on leakage paths.

(f) The tappings to be provided on the H.V winding shall be as follows:- Minus 5%: Minus 2.5%: 0%(Normal): Plus 2.5%: Plus 5%

6.5 Bushings

(a) All line terminals and neutral connections where specified, shall be brought out to porcelain outdoor type terminal bushings. The bushings shall be the outdoor type.

(b) Arcing horns with equal double gaps shall be fitted on all transformer bushings above 660 volt. The total gap length (for two gaps) shall be set at 60 to 70mm for 11kV and 140 to 150mm for 33kV nominal voltage.

(c) The bushings shall have minimum Creepage distances of 670mm and 250mm for nominal voltages of 33 and 11kV respectively.

6.6 Tanks and Conservators

6.6.1 General

i) Drain valves may be either screwed or flanged whilst conservator isolator valves shall be flanged. Drain valves shall be complete with captive plugs which shall be either of non-ferrous metal or galvanised.

ii) All internal steel surfaces or tanks and conservators shall be shot blasted and cleaned, and a coat of protecting compound, unaffected by hot oil, should be applied.

iii) All external surfaces and parts made of steel are to be thoroughly shot blasted and cleaned, after which two coats of priming paint, preferably of zinc chromate, one intermediate coat, and one coat of finishing paint are to be applied. The colour of the finishing coat shall be medium Sea Grey, Colour No. 637 to BS 381C.

iv) Transformers on which the paints are found to flake off or deteriorate within the guarantee period shall be suitably cleaned and repainted free of charge by the supplier. Suppliers providing such transformers will not in the future be given the opportunity to offer transformers to REF.

6.6.2 Tanks

i) Each transformer shall be housed in a tank of welded steel plate construction suitably stiffened where necessary but with a flat base.

Wheels as rollers shall be provided for transformers rated above 500 kVA. Transformers rated equal to or less than 500 kVA shall not be provided with wheels as rollers.

ii) The lifting lugs shall be suitable for lifting the transformer bodily by means of a hoist or crane when it is completely assembled and ready for service.

iii) All transformers up to and including 315 kVA rating shall be provided with four fixing lugs on the base drilled with 16mm holes for bolting to a platform.

The fixing holes shall project beyond the ends of the tank and be placed to provide the most practicable stable arrangement.

6.6.3 Conservators

i) Conservators, shall be dimensioned such that oil expansion may occur over the working range of temperature from no load with the transformer cold and at minus 10 degrees Celsius ambient air temperature to full load at plus 40 degrees Celsius ambient air temperature while the sump pipe remains covered and the oil level is visible or indicated.

ii) Drain plugs shall preferably incorporate approved sampling facilities, and shall be mounted at the lowest part of the conservator tank and so designed that the sampling device can be readily cleared in the event of its being blocked by an accumulation of sludge etc., without the necessity of having to dismantle the device completely.

iii) Oil level gauges on conservator tanks shall be of the refracting plate glass or other approved type, marked with the level at 20 degrees Celsius at no-load and capable of indicating the level of oil over the specified working range.

iv) Where dehydrating breathers are specified they shall be of the Silica gel type which give indication of moisture absorption by change in colour of the charge.

An inspection window shall be provided and mounted in a position convenient for inspection. The breather is to incorporate an oil seal to prevent contact with the external air when breathing is not taking place. The breather is to be fitted on the LV end of the transformer.

6.7 Accessories and Fittings

(a) All transformers shall be provided with accessories and fittings in accordance with the tables below, unless otherwise specified in the enquiry:

In the following tables 'Y' means yes (To be provided)
'N' means no (Not to be provided)

	ACCESSORIES AND FITTINGS FOR 11/0.4 and 33/0.4 kVA DISTRIBUTION TRANSFORMERS.						
		Transformer Nominal Ratings					
		11kV Primary Voltage				*33kV Primary voltage*	
		Upto but excluding 100 kVA		*100 kVA but excluding 500 kVA*	*500 kVA and above*	*upto but excluding 500 kVA*	*500 kVA and above*
	TRANSFORMER TANK FITTINGS	*Free Breathing*	*Sealed*				
1	*Conservator*	*N*	*N*	*Y*	*Y*	*Y*	*Y*
2	*Drain valve with captive sealing plug*	*Y*	*N*	*Y*	*Y*	*Y*	*Y*
3	*Lifting lugs*	*Y*	*Y*	*Y*	*Y*	*Y*	*Y*
4	*Thermometer Pocket*	*N*	*N*	*N*	*Y*	*N*	*Y*
5	*Rating and Diagram plate*	*Y*	*Y*	*Y*	*Y*	*Y*	*Y*
6	*Hanger irons*	*Y*	*Y*	*N*	*N*	*N*	*N*
7	*Platform mounting lugs*	*Y*	*Y*	*Y*	*N*	*Y*	*N*
8	*Earthing Terminal*	*Y*	*Y*	*Y*	*Y*	*Y*	*Y*
9	*Lightning arrestor brackets*	*N*	*N*	*N*	*Y*	*N*	*Y*
10	*Dial type thermometer*	*N*	*N*	*N*	*Y*	*N*	*Y*
11	*Jacking pads*	*N*	*N*	*(Required only when the mass of the complete transformer is 1 000 kg or more.)*			
12	*Plain breather*	*Y*	*N*		*N*	*N*	*N*
13	*Oil gauge*	*Y*	*Y*	*On Concervator*			
14	*Mounting plate for Item 6 to be suitable for mounting marshalling box Item 17)*	*N*	*N*	*N*	*Y*	*N*	*Y*
15	*Lashing down facilities*	*Y*	*Y*	*Y*	*Y*	*Y*	*Y*
16	*Marshalling box for Item 10 of Tank fitting and Item 7 of Conservator fittings*						
	Conservator fittings						
1	*Drain plugs*	*N/A*		*Y*	*Y*	*Y*	*Y*
2	*Sampler*	*N/A*		*Y*	*Y*	*Y*	*Y*
3	*Separate filling hole with caps*	*N/A*		*Y*	*Y*	*Y*	*Y*
4	*Dehydrating breather*	*N/A*		*Above 100 kVA*	*Y*	*Y*	*Y*
5	*Plain breather*	*N/A*		*100 kVA*	*N*	*N*	*N*
6	*Oil gauge*	*N/A*		*Y*	*Y*	*Y*	*Y*
7	*Gas and oil actuated relay*	*N/A*		*N*	*Y*	*N*	*Y*
8	*Conservator isolating valve*	*N/A*		*N*	*Y*	*N*	*Y*

(b) Rating and diagram plates shall be of engraved brass or other approved non-corroding material and shall be placed on the L.V side of the transformer.

(c) Where a thermometer pocket is provided, it shall be of a thin walled metal mounted in the tank cover. The pocket shall project 25mm outside of the tank and shall be threaded along the whole projecting portion with a 19mm B.S.P. male thread, a screwed cap shall

be provided to cover the pocket when not in use. The pocket shall have internal dimensions of not less than 19mm diameter and 115mm length.

(d) Hanger irons, where specified, shall be suitable for suspending the transformer from a 102mm x 51mm Mild Steel Channel cross-arm, bolted to the vertical legs of an 'H' pole. A suitable stop shall be provided at the base of the tank to enable the transformer to be suspended vertically, and rest against a similar 102 mm x 51mm Channel provided on the 'H' pole at a lower level for this purpose. The hanger irons shall be drilled for an M16 bolt to enable them to be bolted to the vertical web of the cross-arm and thereby prevent any lateral movement of the transformer.

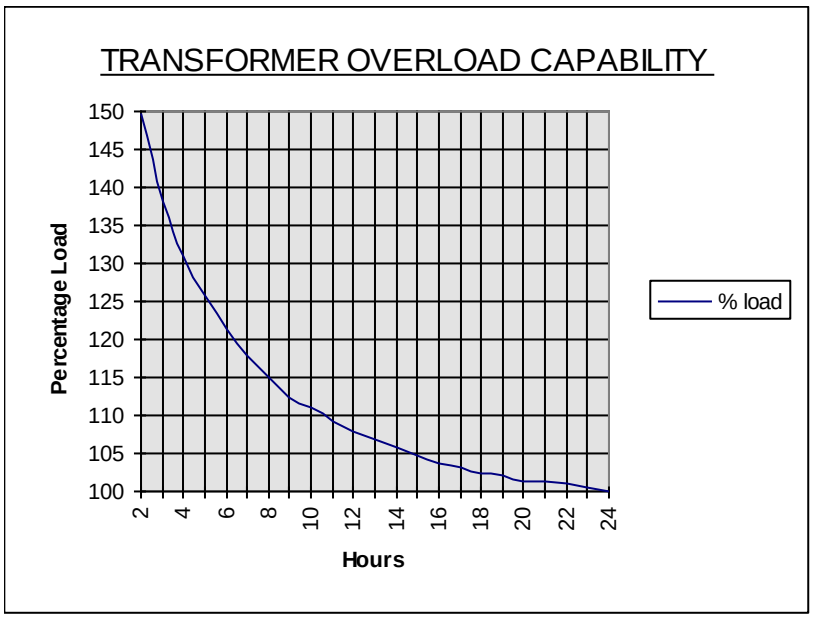
The hanger irons shall be mounted on the LV side of the transformer tank.

7.0 INSULATING OIL

The transformers shall be fitted with low viscosity mineral insulating oil which complies in every respect with the provisions of BS 148.

8.0 OVERLOADING CAPABILITY

The transformer shall be capable of overload at 35 °C ambient temperature without reduction in the anticipated working life of the transformer, as shown in the curve below.



The maximum load at other periods is assumed to be 70% of the transformer rating for the above transformer overload capability curve.

9.0 NOISE POLLUTION

The maximum values for the noise levels of the various distribution transformers shall be as given in the table below:

TRANSFORMER RATING kVA	*MAXIMUM POLLUTION dB(A)*
Less than or equal to 50kVA	*48*
Between 50 and 315kVA	*55*
Between 315 and 500kVA	*56*
Between 500 and 800kVA	*57*
Between 800 and 1000kVA	*58*
Between 1000 and 1600kVA	*60*
Above 1600 kVA	*61*

Transformers with Noise Pollution levels higher than that given above will be rejected by the Authority.

10. TESTS

Electrical tests are to be carried out according to IEC 76. Routine covering test certificates shall be submitted immediately after completion of tests in the factory, for each and every identical group of transformers.

The following tests shall be carried out in addition to the routine tests:

(a) As a type test, a temperature rise test on each different rating of transformer.

(b) As a special test, an impulse voltage withstand test including chopped waves on each different rating of transformer.

NOTE: If tests to (a) and (b) above have been carried out satisfactorily on designs identical in all essential details, tests (a) and (b) may be waived on the production of acceptable certified type test certificates.

11. PACKING AND TRANSPORT

Transformers shall be transported to destination with their tanks full of oil up to the service level.

Bushings and any accessories or fittings likely to be damaged shall be protected adequately against damage in transit.

12. DRAWINGS AND DIAGRAMS

12.1 Drawings to be supplied with the Tender

The following drawings shall be supplied with any tender.

(a) General arrangement drawing of each rating of transformer offered showing :

(i) All dimensions on height, width, depth, etc., minimum clearance (phase to phase and phase to earth) on H.V. and L.V. bushings including clearance H.V. to L.V.

(ii) Weights of oil, core/winding assembly and transformer fully erected.

(iii) Positions and identification in a separate legend of all fittings with type numbers.

(iv) Size and position of all fixing holes.

(b) Detailed dimensioned drawings of tapping switch illustrating type of material, clearances, between tapping points and to earth and method of operation.

(c) Detailed dimensioned drawings of bushings, silica gel or plain oil seal type breather, and conservator.

NOTE: Where sealed transformers are offered, a cross arrangement drawing shall be submitted with the tender showing, in particular, details of the tank construction and internal tank finish and the depth of the expansion space above the oil.

12.2 Drawings to be supplied with the Contract

(a) Latest issues of the drawing listed under Clause 12.1 shall be supplied under the contract. If no modifications are applicable to the drawings supplied with the tender, this shall be confirmed in writing under the contract and further drawings need not be supplied.

(b) Rating and diagram plate shall include the following information:

I) Manufacturer
ii) Size in kVA
iii) Vector group

iv) Voltage rating
v) Year of manufacture
vi) Total weight
vii) Full load loss
viii) No load loss
ix) Volume of oil in litres
x) REF Tender number
xi) REF order number
xii) Percentage impedance
xiii) Voltage table at various tap positions

13. MAXIMUM DIMENSIONS AND WEIGHTS REQUIRED

The dimensions of the transformers are as shown on the drawings above.

The dimensions referred to above shall mean the following:

i) Maximum height shall be denoted by (h1)
ii) Maximum width shall be denoted by (a1)
iii) Maximum depth shall be denoted by (b)

The maximum dimensions in mm and weights in kg shall be as indicated in the table below. Any transformer whose dimensions and weights exceed the stated values will be rejected.

RATING kVA	RATIO	HEIGHT (h1)	DEPTH (b)	WIDTH (a1)	WEIGHT (kg)
10 single ph.	11/0.4	900	770	782	240
10	11/0.4	850	780	800	245
15	11/0.4	929	782	930	360
25	11/0.4	929	782	930	360
50	11/0.4	1500	910	950	445
100	11/0.4	1650	1130	1050	673
15	33/0.4	1415	670	1500	500
25	33/0.4	1415	670	1500	550
50	33/0.4	2025	1230	1280	1180
100	33/0.4	2070	1490	1380	1250

14. EVALUATION OF LOSSES

14.1 Guaranteed Output and Losses, Liquidated Damages

Failure to meet the guaranteed outputs and losses with be dealt with as follows:

Transformer Output

If the guaranteed continuous output at rated voltage of any transformer has to be reduced below the guaranteed value in order to maintain the temperature rises of any part of the transformer within the guaranteed limits, liquidated damages shall be paid at the rate of ZWD (TO BE SPECIFIED) per kVA.

Transformer Losses

If the total transformer losses of any transformer, as determined by these, without any tolerances, at rated voltage, frequency and 100% rated kVA (on principal tapping) exceed the guaranteed total losses, the excess in losses shall be capitalised at the rates stated in Sub-Clause 14.2 below and the resulting amount shall be paid as liquidated damages.

The payment on account of failure of one or more transformer to meet the guaranteed output and guaranteed losses shall be applied individually, as the case may be, and shall therefore be understood to be cumulative.

Rejection Limits

Should any transformer fail to meet the guaranteed output by more than 5% (five per cent) or the total losses should exceed the total guaranteed losses by more that 1/5 (one fifth), and should the Contractor fail within a reasonable time to modify the transformer in order to increase the output and/or reduce the losses sufficiently, the Purchaser shall have the option to reject the transformer.

14.2 Evaluation of Losses (TO BE STATED)

Transformer losses will be evaluated based on the following figures:

Load losses: ZWD (TO BE STATED)/kW
No load losses: ZWD (TO BE STATED)/kW

15. TECHNICAL GUARANTEE SCHEDULES

15.1 Preamble

15.1.1 The Technical Schedules shall be filled in and completed by the Bidder, and submitted with the Bid (see example below)

DISTRIBUTION TRANSFORMERs		**REF Requirement**				
Clause	**Description**	**Unit**	**Required Values**	**Required Values**	**Required Values**	**Required Values**
1	Name of Manufacturer					
2	Country of Manufacturer					
3	Continuous Maximum Rating (C.M.R.)	kVA	25	50	50	25
4	Normal voltage between phase at no load					
	(a) H.V	Volts	33000	33000	11000	11000
	(b) LV	Volts	400	400	400	400
	No of phases per transformer		3		3	3
5	**Tappings**					
	(a) Plus	%	5	5	5	5
	(b) Minus	%	5	5	5	5
6	Performance Data at Sea					

	Level corrected at sea 75%					
	(a) No load loss at primary voltage	Watts	350	198	330	130
	(b) No load Loss At 10% Primary Overvoltage	Watts	522	240	450	158
	(c) Load loss at C.M.R	Watts	1800	620	1800	580
	(d) Impedance C.M.R and normal ratio	%	≤5	≤5	≤5	≤5
	(e) Maximum temperature rise at C.M.R					
	i) Top oil by thermometer	Deg. Cels	55	55	55	55
	ii) Average resistance per winding	Deg. Cels	60	60	60	60
	iii) Hot Spot corresponding to (ii)	Deg. Cels	60	60	60	60
7	Type of insulation in windings					
	(a) H.V		Enamel Insulation	Enamel Insulation	Enamel Insulation	Enamel Insulation
	(b) LV		Paper	Paper	Paper	Paper
8	Lightning impulse insulation level					
	(a) H.V winding	kV pk	170	170	170	170
	(b) L.V winding	kV pk	N/A	N/A	N/A	N/A
	(c) Tap change					

	equipment and connections					
	i) To earth	kV pk	170	170	170	170
	ii) Between contact	kV pk	1/4 of 170kV pk	1/4 of 170kV pk	1/4 of 170kV pk	1/4 of 170kV pk
9	Are test certificates supplied supporting the insulation level stated in 6 above	Y/N	Yes	Yes	Yes	Yes
10	Silica Gel Breather					
	i) Make of unit fitted					
	ii) Size of unit		125	125	125	125
11	Noise Pollution	dB	48	48	48	48
12	Vector Group	Dyn11	Dyn11	Dyn11	Dyn11	Dyn11
13	Dimensions					
	(i) Height	Mm	Varies	varies	varies	varies
	(ii) Width	Mm	Varies	varies	varies	varies
	(iii) Depth	Mm	Varies	varies	varies	varies
14	Winding Material					
	(i) Primary		Electrolytic copper	Electrolytic copper	Electrolytic copper	Electrolytic copper
	(ii) Secondary		Electrolytic copper	Electrolytic copper	Electrolytic copper	Electrolytic copper
15	Colour		Sea Grey	Sea Grey	Sea Grey	Sea Grey
16	Weight					
	(i) Core & Winding	Kg	Varies	varies	varies	varies
	(ii) Tank & Fitting	Kg	Varies	varies	varies	varies
	(iii) Weight of Oil	Kg	Varies	varies	varies	varies
	(iv) Total Weight	Kg	Varies	varies	varies	varies
17	Power Frequency Voltage					

	Withstand					
	(i) H.V.	kVrms	70	70	70	70
	(ii) L.V.	kVrms	2.5	2.5	2.5	2.5
18	Number of Phases		3	3	3	3
19	Reference Standards	IEC60 076	IEC60074	IEC60075	IEC60076	IEC60076

15.1.2 All documentation necessary to evaluate whether the equipment offered is in accordance with this Specification shall be submitted with the Bid.

15.1.3 All data entered in the Schedules of Technical Guarantees are guaranteed values by the Bidder and cannot be departed from whatsoever.

15.1.4 All data entered in the Schedules of Informative Data are also guaranteed values by the Bidder. These data may only be altered following the Engineer's written consent.

15.1.5 Equipment or Systems offered which are not in accordance with this Specification shall be listed in Schedule III-9.

16.0 Definitions and Abbreviations

The following terms may be met in these Technical Schedules and shall be interpreted as follows:

Hz	shall mean hertz
kW	shall mean kilowatt
MW	shall mean megawatt
VA (kVA, MVA)	shall mean volt-ampere (kilo-, mega-)
A (kA)	shall mean ampere (kilo-)
V (kV)	shall mean volt (kilo-)
W/m	shall mean watt per metre
AC	shall mean alternating current
DC	shall mean direct current
I_N	shall mean rated (nominal) current
U_N	shall mean rated (nominal) voltage
Ah	shall mean ampere-hours
lm	shall mean lumen
lm/w	shall mean lumen per watt
min	shall mean minute
min.	shall mean minimum
(prefix)	shall mean micro
rms	shall mean root mean square
p.u.	shall mean per unit
p/p	shall mean peak to peak
T	shall mean Tesla
kg	shall mean kilogram

N	shall mean Newton
l	shall mean litre
s or sec.	shall mean second
No.	shall mean number
dB	shall mean decibel
Amp	shall mean amperes
F	shall mean Farad
^{o}C	shall mean centigrade
K	shall mean degree Kelvin
m^2	shall mean square metre (mm^2 for millimetre, etc)
m^3	shall mean cubic metre (mm^3 for millimetre, etc)
m^3/s	shall mean cubic metres per second
m	shall mean metre
cm	shall mean centimetre
mm	shall mean millimetre
joules	shall mean joules per hour
tonne	shall mean metric tonne
%	shall mean percentage
Pascal	1 N/m^2
cst	shall mean centistoke

RURAL ELECTRIFICATRICATION AGENCY

TECHNICAL SPECIFICATIONS FOR SWER TRANSFORMERS

1. PARTICULARS OF ELECTRICAL SYSTEM

Unless otherwise specified in Schedule of Requirements, it must be assumed that the system on which the equipment will operate is :

a) Single Wire Earth Return **(SWER)** overhead-line construction and underground system.

b) Operated at 50 Hz, with approximately sinusoidal wave form.

c) The highest system voltage does not normally exceed the nominal system voltage by more than 10%.

d) The system frequency variation does not exceed plus or minus 2.5% from 50 Hz.

Designs should allow for these variations.

2. PARTICULARS OF ENVIRONMENT

The transformers shall be capable of operating under the following environmental conditions.

a) **Ambient temperatures:**
   (i) Maximum: 40 °C
   (ii) Minimum: minus 10 °C
   (iii) Maximum daily average: 35 °C

b) **Altitude:**
   Maximum altitude of 1 500 metres above sea level. The design shall allow for reduced cooling effect due to high altitude.

c) The transformers will be exposed to direct tropical sunlight.

d) **Humidity:**
   Humidity of 13mg per cubic metre absolute and 65% relative before storms with vapour pressure of 17mmHg.

Transformers will operate within the tropics and will be subjected to sudden ambient air temperature changes of the order of 10 °C per hour, occurring at the onset of rain, but

the barometric pressure at any given place does not vary by more than approximately 10mm Mercury. Frequent and severe lightning storms occur during summer months, with isoceraunic levels varying between 50 and 100 thunderstorm days per annum.
It is the manufacturers responsibility to make himself familiar with any other climatic and physical conditions pertaining in Zimbabwe and to allow for all conditions in his designs.
Particular attention should be paid in the design of all equipment to ensure that there is no possibility of damage to working parts or insulation through the ingress of dust, insects or vermin.

All orifices and air vents should be covered by easily replaceable weather resisting, fine mesh wire where practicable.

3. STANDARDS, UNITS AND LANGUAGE

Except where modified by the Authority's Specifications, IEC Recommendations (IEC 76) shall apply throughout or British Standards (BS) where they amplify the IEC 76.

In the case of conflict between the above stated Standards and this Specification, the ruling of this Specification will prevail.

All tenders, correspondence, description upon drawings, illustrations or instructions shall be in unambiguous English Language. SI Units of measurements shall be used throughout.

All materials used in the manufacture of the transformers shall be new and of high commercial quality.

The transformers shall be manufactured to high quality standards.

Type test certificates are to be submitted with the tender for each transformer rating and voltage.

The transformers shall be sourced from manufacturers who have ISO 9001 Certification or equivalent. Documentary evidence of the ISO 9001 Certification shall be provided with the bid. Manufacturers who cannot submit such certification are liable to be rejected.

4. TECHNICAL SCHEDULES

The Technical Schedules shall be filled in and completed by the Bidder, and submitted with the Bid.

a) All documentation necessary to evaluate whether the equipment offered is in accordance with this Specification shall be submitted with the Bid.

b) All data entered in the Schedules of Technical Guarantees are guaranteed values by the Bidder and cannot be departed from whatsoever.

c) All data entered in the Schedules of Informative Data are also guaranteed values by the Bidder. These data may only be altered following the Engineer's written consent.

Technical schedules A and B
SWER Distribution Transformer – Inland Application
Phase –to neutral connected transformer with centre-tapped low-voltage Winding (16 kVA 19 kV/±240 V)

Schedule A: Purchaser's specific requirements
Schedule B: Particulars of equipment to be supplied

Item	Description		Schedule A	Schedule B
1	**Identification**			
	a) Manufacturer's name			
	b) Country of Manufacture			
2	**Constructional requirements**			
2.1	Transformer dimensions (shown in drawing SDT 01)			
	a) H_o (max.) including surge arrester	mm	1 600	
	b) W_o (max.) including surge arresters	mm	1 080	
	c) L_o (max.)	mm	1 500	
	d) Max. mass	kg	900	
	e) Oil capacity	l		
2.2	Tank			
	a) Tank type: Sealed		Sealed	
	Rigid or Corrugated			
2.3	Bushings			
	MV bushing:		Outdoor	
	a) Material		Porcelain	
	b) Min. creepage distance:	mm/kV	22	
	c) Stem diameter	mm	M12	
	d) Stem type		Threaded	
	L V bushing:		Outdoor	
	a) Material		Porcelain	
	b) Min Creepage distance:	mm/kV	22	
	c) Stem diameter	mm	M12	
	d) Stem type		Threaded	

Phase-to-neutral connected transformer with centre tapped low voltage Winding (16 kVA 19 kV/±240 V)

Item	Description		Schedule A	Schedule B
2.4	Dehydrating breathers		Not required	
2.5	Oil-level gauges		Not required	
	Drain Valve		Not required	
2.6	Earthing terminals			
	a) Distance between L V earth terminal and neutral bushing.	mm	250 to 300	
2.7	Pole-mounting brackets (as shown in drawing SDT 01)			
	a) Mo	mm	400	
	b) h1 (max.)	mm	400	
	c) W1 (max.)	mm	450	
	d) Provide clamp and threaded rods		Yes	
2.8	Winding material HV		Copper	
	LV		Copper	
3	Electrical requirements			
3.1	Rating			
	a) Nominal rating	kVA	16	
	b) Rated primary voltage	kV	19	
	c) Rated secondary no-load voltage	V	±240	
	d) BIL	kV	200	
	e) Number of phases		1 ph	
	f) Vector symbol		N/A	
3.2	Losses			
	a) No-load losses, P_1	kW	0.1 max	
	b) Load losses; P_c	kW	0.4 max	
	c) cost per kW of no-load losses; C_1	USD/kW	$1 531.02	
	d) cost per kW of load losses, C_c	USD/kW	$181.79	
3.3	Impedance Voltage			
	a) Impedance at principle tapping	%	≤4.5	
	b) X/R ratio		xxxxxxxx	
Item	**Description**		**Schedule A**	**Schedule B**
4.0	Rating Plate and Diagram information Requirements			

	I) Manufacturer	Required	
	ii) Size in Kva	Required	
	iii) Voltage rating	Required	
	iv) Year of manufacture	Required	
	v) Total weight	Required	
	vi) Full load loss	Required	
	vii) No load loss	Required	
	viii) Volume of oil in litres	Required	
	ix) REA Tender number	Required	
	x) REA order number	Required	
	xi) Percentage impedance	Required	
	xii) Voltage table at various tap positions	Required	
5.0	Tests		
5.1	Type Tests		
	a) Temperature-rise test	Test Report Number	
	b) Lightning impulse test chopped on tail	Test Report Number	
	c) Short-Circuit withstand test	Test Report Number	
	d) Pollution test	Test Report Number	
	e) Equivalent disturbing current test	Test Report Number	
Item	**Description**	**Shedule A**	**Schedule B**
5.2	Routine Tests		
	a) Measurement of winding resistance	Test Report Number	
	b) Measurement of voltage ratio and check of phase displacement	Test Report Number	
	c) Measurement of short-circuit impedance and load loss	Test Report Number	
	d) Measurement of no-load loss and current	Test Report Number	
	e) 480V across outer terminals	Test Report Number	

	f) Separate source test	Test Report Number	
	g) Induced overvoltage test	Test Report Number	
	h) Measurement of paint thickness	Test Report Number	
	i) Test for effective sealing	Test Report Number	
6.0	Drawings to be submitted with tender		
	a) Outline Drawing	Drawing Number	
	b) Rating and diagram plate	Drawing Number	

Technical schedules A and B
SWER Distribution Transformer – Inland Application
Phase –to neutral connected transformer with centre-tapped low-voltage Winding (32 kVA 19 kV/±240 V)

Schedule A: Purchaser's specific requirements
Schedule B: Particulars of equipment to be supplied

Item	Description		Schedule A	Schedule B
1	**Identification**			
	a) Manufacturer's name			
	b) Country of Manufacture			
2	**Constructional requirements**			
2.1	Transformer dimensions (shown in drawing SDT 01)			
	a) H_o (max.) including surge arrester	mm	1 600	
	b) W_o (max.) including surge arresters	mm	1 080	
	c) L_o (max.)	mm	1 500	
	d) Max. mass	kg	900	
	e) Oil capacity	l		
2.2	Tank			
	a) Tank type: Sealed		Sealed	
	Rigid or Corrugated			
2.3	Bushings			
	MV bushing:		Outdoor	
	a) Material		Porcelain	
	b) Min. creepage distance:	mm/kV	22	

	c) Stem diameter	mm	M12	
	d) Stem type		Threaded	
	L V bushing:		Outdoor	
	a) Material		Porcelain	
	b) Min Creepage distance:	mm/kV	22	
	c) Stem diameter	mm	M12	
	d) Stem type		Threaded	

Phase-to-neutral connected transformer with centre tapped low voltage Winding (32 kVA 19 kV/±240 V)

Item	Description		Schedule A	Schedule B
2.4	Dehydrating breathers		Not required	
2.5	Oil-level gauges		Not required	
	Drain Valve		Not required	
2.6	Earthing terminals			
	a) Distance between L V earth terminal and neutral bushing.	mm	250 to 300	
2.7	Pole-mounting brackets (as shown in drawing SDT 01)			
	a) Mo	mm	400	
	b) h1 (max.)	mm	400	
	c) W1 (max.)	mm	450	
	d) Provide clamp and threaded rods		Yes	
2.8	Winding material HV		Copper	
	LV		Copper	
3	Electrical requirements			
3.1	Rating			
	a) Nominal rating	kVA	32	
	b) Rated primary voltage	kV	19	
	c) Rated secondary no-load voltage	V	±240	
	d) BIL	kV	200	
	e) Number of phases		2 ph	
	f) Vector symbol		xxxxxxxxx	
3.2	losses			
	a) No-load losses, P_1	kW	0.17 max	
	b) Load losses; P_c	kW	0.63 max	
	c) cost per kW of no-load losses; C_1	USD/kW	$1 531.02	
	d) cost per kW of load losses, C_c	USD/kW	$181.79	

3.3	Impedance Voltage		
	c) Impedance at principle tapping %	≤4.5	
	d) X/R ratio	xxxxxxxx	
Item	**Description**	**Schedule A**	**Schedule B**
4.0	Rating Plate and Diagram information Requirements		
	I) Manufacturer	Required	
	ii) Size in kVA	Required	
	iii) Voltage rating	Required	
	iv) Year of manufacture	Required	
	v) Total weight	Required	
	vi) Full load loss	Required	
	vii) No load loss	Required	
	viii) Volume of oil in litres	Required	
	ix) REA Tender number	Required	
	x) REA order number	Required	
	xi) Percentage impedance	Required	
	xii) Voltage table at various tap positions	Required	
5.0	Tests		
5.1	Type Tests		
	f) Temperature-rise test	Test Report Number	
	g) Lightning impulse test chopped on tail	Test Report Number	
	h) Short-Circuit withstand test	Test Report Number	
	i) Pollution test	Test Report Number	
	j) Equivalent disturbing current test	Test Report Number	
Item	**Description**	**Shedule A**	**Schedule B**
5.2	Routine Tests		
	j) Measurement of winding	Test Report	

	resistance	Number	
	k) Measurement of voltage ratio and check of phase displacement	Test Report Number	
	l) Measurement of short-circuit impedance and load loss	Test Report Number	
	m) Measurement of no-load loss and current	Test Report Number	
	n) 480V across outer terminals	Test Report Number	
	o) Separate source test	Test Report Number	
	p) Induced overvoltage test	Test Report Number	
	q) Measurement of paint thickness	Test Report Number	
	r) Test for effective sealing	Test Report Number	
6.0	Drawings to be submitted with tender		
	c) Outline Drawing	Drawing Number	
	d) Rating and diagram plate	Drawing Number	

Technical schedules A and B
SWER Distribution Transformer – Inland Application
Phase –to neutral connected transformer with centre-tapped low-voltage Winding (64 kVA 19 kV/±240 V)

Schedule A: Purchaser's specific requirements
Schedule B: Particulars of equipment to be supplied

Item	Description		Schedule A	Schedule B
1	**Identification**			
	a) Manufacturer's name			
	b) Country of Manufacture			
2	**Constructional requirements**			
2.1	Transformer dimensions (shown in drawing SDT 01)			
	a) H_o (max.) including surge arrester	mm	1 600	
	b) W_o (max.) including surge arresters	mm	1 080	
	c) L_o (max.)	mm	1 500	
	d) Max. mass	kg	900	
	e) Oil capacity	l	xxxxxxxx	

2.2	Tank			
	a) Tank type: Sealed		Sealed	
	Rigid or Corrugated			
2.3	Bushings			
	MV bushing:		Outdoor	
	a) Material		Porcelain	
	b) Min. creepage distance:	mm/kV	22	
	c) Stem diameter	mm	M12	
	d) Stem type		Threaded	
	L V bushing:		Outdoor	
	a) Material		Porcelain	
	b) Min Creepage distance:	mm/kV	22	
	c) Stem diameter	mm	M12	
	d) Stem type		Threaded	

Phase-to-neutral connected transformer with centre tapped low voltage Winding g(64 kVA 19 kV/±240 V)

Item	Description		Schedule A	Schedule B
2.4	Dehydrating breathers		Not required	
2.5	Oil-level gauges		Not required	
	Drain Valve		Not required	
2.6	Earthing terminals			
	a) Distance between L V earth terminal and neutral bushing.	mm	250 to 300	
2.7	Pole-mounting brackets (as shown in drawing SDT 01)			
	a) Mo	mm	400	
	b) h1 (max.)	mm	400	
	c) W1 (max.)	mm	450	
	d) Provide clamp and threaded rods		Yes	
2.8	Winding material HV		Copper	
	LV		Copper	
3	Electrical requirements			
3.1	Rating			
	a) Nominal rating	kVA	64	
	b) Rated primary voltage	kV	19	
	c) Rated secondary no-load voltage	V	±240	
	d) BIL	kV	200	
	e) Number of phases		2 ph	
	f) Vector symbol		xxxxxxxxx	

3.2	losses		
	a) No-load losses, P_1 kW	0.29 max	
	b) Load losses; P_c kW	0.99 max	
	c) cost per kW of no-load losses; C_1 USD/kW	$1 531.02	
	d) cost per kW of load losses, C_c USD/kW	$181.79	
3.3	Impedance Voltage		
	e) Impedance at principle tapping %	≤4.5	
	f) X/R ratio	xxxxxxxx	
Item	**Description**	**Schedule A**	**Schedule B**
4.0	Rating Plate and Diagram information Requirements		
	I) Manufacturer	Required	
	ii) Size in kVA	Required	
	iii) Voltage rating	Required	
	iv) Year of manufacture	Required	
	v) Total weight	Required	
	vi) Full load loss	Required	
	vii) No load loss	Required	
	viii) Volume of oil in litres	Required	
	ix) REA Tender number	Required	
	x) REA order number	Required	
	xi) Percentage impedance	Required	
	xii) Voltage table at various tap positions	Required	
5.0	Tests		
5.1	Type Tests		
	k) Temperature-rise test	Test Report Number	
	l) Lightning impulse test chopped on tail	Test Report Number	
	m) Short-Circuit withstand test	Test Report Number	
	n) Pollution test	Test Report Number	

	o) Equivalent disturbing current test	Test Report Number	
Item	**Description**	**Shedule A**	**Schedule B**
5.2	Routine Tests		
	s) Measurement of winding resistance	Test Report Number	
	t) Measurement of voltage ratio and check of phase displacement	Test Report Number	
	u) Measurement of short-circuit impedance and load loss	Test Report Number	
	v) Measurement of no-load loss and current	Test Report Number	
	w) 480V across outer terminals	Test Report Number	
	x) Separate source test	Test Report Number	
	y) Induced overvoltage test	Test Report Number	
	z) Measurement of paint thickness	Test Report Number	
	aa) Test for effective sealing	Test Report Number	
6.0	Drawings to be submitted with tender		
	e) Outline Drawing	Drawing Number	
	f) Rating and diagram plate	Drawing Number	

Technical schedules A and B
SWER Isolation Transformer (475 kVA 33kV/19 kV)– Inland Application

Schedule A: Purchaser's specific requirements
Schedule B: Particulars of equipment to be supplied

Item	Description		Schedule A	Schedule B
1	**Identification**			
	a) Manufacturer's name		xxxxxxx	
	b) Country of Manufacture		xxxxxxx	
2	**Constructional requirements**			
2.1	Transformer dimensions (shown in drawing SIT 01)			
	a) H_o (max.) including surge arrester	mm	1 600	
	b) W_o (max.) including surge arresters	mm	1 800	
	c) L_o (max.)	mm	1 800	
	d) Max. mass	kg	2 200	
	e) Oil capacity	l	xxxxxx	
2.2	Tank			
	a) Tank type: Sealed		Sealed	
	Rigid or Corrugated		xxxxxxx	
2.3	Bushings			
	MV bushing:		Outdoor	
	a) Material		Porcelain	
	b) Min. creepage distance:	mm/kV	22	
	c) Stem diameter	mm	M12	
	d) Stem type		Threaded	
	L V bushing:		Outdoor	
	a) Material		Porcelain	
	b) Creepage distance:	mm/kV	22	
	c) Stem diameter	mm	M12	
	d) Stem type		Threaded	

SWER Isolation Transformer (475 kVA 33kV/19 kV)– Inland Application

Item	Description	Schedule A	Schedule B
2.4	Dehydrating breathers	Not required	
2.5	Oil-level gauges	Not required	
	Drain Valve	Not required	
2.6	Winding material MV	Copper	
	SWER	Copper	

2.7	Electrical requirements			
	Rating			
	a) Nominal rating	kVA	475	
	b) Rated primary voltage (p-to-p)	kV	33	
	c) Rated secondary voltage (p-to-g)	V	19	
	d) MV BIL	kV	200	
	e) SWER BIL		200	
	f) Vector symbol		xxxxxxxxx	
3	losses			
3.1	a) No-load losses, P_1	kW	1.24 max	
	b) Load losses; P_c	kW	5.35 max	
	c) cost per kW of no-load losses; C_1	USD/kW	$1 531.02	
	d) cost per kW of load losses, C_c	USD/kW	$181.79	
4.0	Rating Plate and Diagram information Requirements			
	I) Manufacturer		Required	
	ii) Size in kVA		Required	
	iii) Voltage rating		Required	
	iv) Year of manufacture		Required	
	v) Total weight		Required	
	vi) Full load loss		Required	
	vii) No load loss		Required	
	viii) Volume of oil in litres		Required	
	ix) REA Tender number		Required	

SWER Isolation Transformer (475 kVA 33kV/19 kV)– Inland Application

	x) REA order number	Required	
	xi) Percentage impedance	Required	
	xii) Voltage table at various tap positions	Required	
5.0	Tests		
5.1	Type Tests		
	p) Temperature-rise test	Test Report Number	
	q) Lightning impulse test chopped on tail	Test Report Number	
	r) Short-Circuit withstand test	Test Report Number	
	s) Pollution test	Test Report Number	
	t) Equivalent disturbing current test	Test Report Number	

5.2	Routine Tests		
	bb) Measurement of winding resistance	Test Report Number	
	cc) Measurement of voltage ratio and check of phase displacement	Test Report Number	
	dd) Measurement of short-circuit impedance and load loss	Test Report Number	
	ee) Measurement of no-load loss and current	Test Report Number	
	ff) Separate source test	Test Report Number	
	gg) Induced overvoltage test	Test Report Number	
	hh) Measurement of paint thickness	Test Report Number	
	ii) Test for effective sealing	Test Report Number	
6.0	Drawings to be submitted with tender		
	g) Outline Drawing	Drawing Number	
	h) Rating and diagram plate	Drawing Number	

NB:

<u>All</u> transformers will be inspected by ZESA Enterprises (Pvt) Ltd before delivery to Rural Electrification Agency Central Stores. The cost of inspection will be borne by the supplier. Rural Electrification Agency will accept transformers which have passed ZESA tests only.

Annexure 1

DECLARATION ON NON-ENGAGEMENT IN CORRUPT OR FRAUDULENT PRACTICES FORM

The Chief Executive

Rural Electrification Fund

6th Floor Megawatt House

44 Samora Machel Ave

P. Bag A250,Avondale

Harare

Zimbabwe

TENDER NUMBER: _____

TENDER DESCRIPTION: _____

I_____ the undersigned (*Director of Company*) on behalf of _____ (*Name of Organisation*), do hereby declare that our organization has not been engaged in any corrupt or unethical practices during the subsistence of our organisation.

Name in Full _____

I. D. Number _____

Signature _____

Date _____

Annexure 2

LETTER OF TENDER (TENDER FORM)

NAME OF TENDER: Supply & Delivery of transformers

Tender Number REF/……../……/2018

TO: The Chief Executive

Rural Electrification Fund (REF)

6th Megawatt House,44 Samora Machel Avenue, Harare, Zimbabwe

We, [*insert name of Tenderer*], herewith enclose a Tender for selection of our firm as Contractor/Supplier for **……**

We have examined the Conditions of Contract, Employer's Requirements, Schedules, the attached. Appendix and Addenda Nos __ of the above-named Works. We have examined, understood and checked these documents and have ascertained that they contain no errors or other defects. We accordingly offer to design, execute and complete the Works and remedy any defects therein, in conformity with this Tender which includes all these documents and the enclosed Proposal, for the lump tender sum of:
USD/RTGS_____

We agree to abide by this Tender until _date__/_month___/_year___ [i.e. _____ days from the tender opening date] and it shall remain binding upon us and may be accepted at any time before that date. We acknowledge that the Appendix to Tender forms part of this Letter of Tender.

If this offer is accepted, we will provide the specified Performance Security, commence the Works as soon as is reasonably practicable after the Commencement Date, and complete the Works in accordance with the above-named documents within the Time for Completion. We guarantee that the Works will then conform to the Schedule of Guarantees.

Unless and until a formal Agreement is prepared and executed, this Letter of Tender, together with your written acceptance thereof, shall constitute a binding contract between us. Our Tender is binding upon us and subject to the modifications resulting from pre-award contract negotiations.

We understand that you are not bound to accept the lowest or any tender you may receive.

Signature _____ in the capacity of _____

Duly authorized to sign tenders for and on behalf of _____

Address: _____

Date: _____