

**North Eastern Electricity Supply Company of Orissa Limited (NESCO)
Western Electricity Supply Company of Orissa Limited (WESCO)
Southern Electricity Supply Company of Orissa Limited (SOUTHCO)
Registered Office,
Plot No-N-1/22, Nayapalli, Bhubaneswar, Orissa-751015
Tel No. (0674) 255 0043, Fax No. (0674) 255 8343**

VOLUME- I

(Tender Notification: CSO/27/Power Transformer)

2009 - 2010

Date: 23.10.1009

Section – I

INVITATION FOR BIDS (IFB)

2009-10

(Tender Notification: CSO/27/ Power Transformer)

Date: 23.10.2009

Registered Office of NESCO, WESCO & SOUTHCO

- 1.0 The Registered Office of NESCO, WESCO & SOUTHCO (here in after referred as CSO) invites Sealed tenders in Two part Bids (“Technical Bids” & “Commercial Bids”) for supply of Power Transformers from reputed manufacturers having requisite experience and financial capabilities as specified in clause 6.0 below. The sealed envelopes shall be duly superscribed as “TENDER NOTICE/CSO /26/ Power Transformer due for opening on dt. 04.11.09”.

Sl. No.	Capacity of Transformer	Qty			
		WESCO	NESCO	SOUTHCO	TOTAL
1	3.15 MVA	1	1	2	4
2	5 MVA	3	5	1	9
3	8 MVA	1	1	1	3

- 2.0 The schedule of specifications with detail terms & conditions can be obtained from address given below against demand draft of Rs. 10,000/- plus 4% VAT drawn in favour of NESCO Ltd., payable at Bhubaneswar. The tender papers will be issued in all working days upto of each day & will continue upto 03.11.2009.

The tender documents can also be downloaded from the website of the three companies as stated below:-

www.nescoorissa.com, wescoorissa.com & southcoorissa.com

In case tender papers are downloaded from the above websites, then the bidder has to enclose a demand draft covering the cost of bid documents as stated above in a separate envelope with suitable superscription “Cost of Bid Documents : Tender Notice Ref : CSO/26/Power Transformer”. This envelope should accompany the Bid Documents and to be enclosed in the envelope containing the “Technical Bid” & “Bid Security”.

In case the prospective bidder wants that the tender documents are to be forwarded to him by post, the same can be availed by sending a request letter along with Demand Draft covering the cost of the bidding document + Rs.50.00. This office shall not take any responsibility for delay in receipt of such request letter by the purchaser or delay in receipt of tender documents by bidder in transit on account of any reasons what so ever.

- 3.0 Offers will be received upto 1.00 PM. on dt. 04.11.2009 & the “Technical Bid” will be opened the same day at 3.00 PM. in presence of the authorized representatives of the bidders. After evaluation of Technical Bids, the eligible bidders shall be intimated to attend the Opening of Commercial Bids not later than 15 days from the date of opening of the Technical Bid as stated earlier.
- 4.0 The schedule of specifications with detail terms & conditions are enclosed. It is the sole responsibility of the bidder to ensure that the bid documents reach this office on or before the cut off due date of tender opening.

Registered Office of NESCO, WESCO & SOUTHCO

5.0 Purchaser reserves the right to reject any or all bids without assigning any reason thereof and alter the quantity of materials mentioned in the Tender documents at the time of placing purchase orders. Tender will be summarily rejected if:

- (i). Bid security @ 1% (One percent) of the Tender value is not deposited in shape of Bank Draft in favor of NESCO, payable at Bhubaneswar or Bank Guarantee. Bid security if any submitted against previous Tenders, will not be adjusted towards Bid security against this Tender.
- (ii). The offer does not contain "FOR, Balasore/ Burla / Berhampur price indicating break-up towards all taxes & duties".
- (iii). Complete Technical details are not enclosed.
- (iv). Tender is received after due time due to any reason.

6.0 Qualification Criteria:-

The prospective bidder must qualify all of the following requirements to be eligible to participate in the bidding.

- 1) Bidder must have successfully carried out Type Test of Transformers from any NABL Accredited Laboratory. The said Type Test report should not be prior to 5 yrs. from the date of opening of Technical Bid. Type test is mandatory for each capacity of transformer to be quoted. **The loss parameters of the offered transformers shall be identical to that of the one which has been type tested.**
- 2) Bidder must quote 100% tender qty. against any or all capacity of Power Transformers.
- 3) Bidder should have supplied 100% of the offered quantity in any one year out of the past 5 financial years to Electricity Supply Utilities / PSUs. The bidder should enclose Performance Certificates from the above users as proof of successful operation in field for minimum 2 years.

7.0 Project Completion Schedules:-

Description	Date
Issue of Tender Document	23.10.2009
Receipt of Queries from Bidders (if any)	27.10.2009
Replies to the Queries	28.10..2009
Submission of Bids	04.11.2009 by 1.00 PM
Opening of Technical Bids	04.11.2009 at 3.00 PM
Intimation to Bidders for Opening of Commercial Bid	15.11.2009
Opening of Commercial Bid (To be confirmed later)	21.11.2009 (Tentative Date)
Supply completion	Phased manner & to be completed by 3 months from the date of LOI

8.0 All correspondences with regard to the above shall be made to the following address:

Registered Office of NESCO, WESCO & SOUTHCO

Dy.General. Manager (Tech) / Sr. Manager (MA&RA)

Central Services Office

(NESCO, WESCO & SOUTHCO)

Plot No. N-1/22, Nayapalli, Bhubaneswar – 751 015

Fax: (0674) 255 8343, Ph-(0674) 255 0043

Email: biswakesh.dash@orissadiscoms.com / susanta.sarangji@orissadiscoms.com

Mobile: 93382 14150 / 93376 46022

SECTION – II

**INSTRUCTION TO BIDDERS (ITB)
2009-2010**

(Tender Notification: CSO/27/Power Transformer)

Date: 23.10.2009

Registered Office of NESCO, WESCO & SOUTHCO

A. GENERAL

1.0 NESCO / WESCO / SOUTHCO, hereinafter referred to as the "Purchaser" are desirous of implementing the various Systems Improvement works at their respective licensed area in the state of Orissa.

2.0 SCOPE OF WORK

The scope shall include Design, Manufacture, Shop Testing at works of 3.15 MVA, 5 MVA & 8 MVA Power Transformers conforming to the Technical Specifications enclosed along with Packing, Forwarding, Freight and Insurance and Unloading and proper stacking at Purchaser's stores.

3.0 DISCLAIMER

3.01 This Document includes statements, which reflect various assumptions, which may or may not be correct. Each Bidder/Bidding Consortium should conduct its own estimation and analysis and should check the accuracy, reliability and completeness of the information in this Document and obtain independent advice from appropriate sources in their own interest.

3.02 Neither Purchaser nor its employees will have any liability whatsoever to any Bidder or any other person under the law or contract, the principles of restitution or unjust enrichment or otherwise for any loss, expense or damage whatsoever which may arise from or be incurred or suffered in connection with anything contained in this Document, any matter deemed to form part of this Document, provision of Services and any other information supplied by or on behalf of Purchaser or its employees, or otherwise arising in any way from the selection process for the Supply.

3.03 Though adequate care has been taken while issuing the Bid document, the Bidder should satisfy itself that documents are complete in all respects. Intimation of any discrepancy shall be given to this office immediately.

3.04 This Document and the information contained herein are Strictly Confidential and are for the use of only the person(s) to whom it is issued. It may not be copied or distributed by the recipient to third parties (other than in confidence to the recipient's professional advisors).

4.0 COST OF BIDDING

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

B. BIDDING DOCUMENTS

5.01 The Scope of Work, Bidding Procedures and Contract Terms are described in the Bidding Documents. In addition to the covering letter accompanying Bidding Documents, the Bidding Documents include:

Registered Office of NESCO, WESCO & SOUTHCO

Volume - I

- (a) Invitation for Bids (IFB) - Section - I
- (b) Instructions to Bidders (ITB) - Section - II
- (c) General Conditions of Contract (GCC) - Section – III
- (d) Technical Specifications (TS) & GTP Formats - Section - IV

Volume - II

- (a) Bid Form - Annexure – I
- (b) BG Formats - Annexure – II
- (c) Price Schedule - Annexure – III
- (d) Cost Analysis - Annexure - IV
- (e) GTP Formats - Annexure – V
- (f) Past Performance Details - Annexure - VI

5.02 The Bidder is expected to examine the Bidding Documents, including all Instructions, Forms, Terms and Specifications. Failure to furnish all information required by the Bidding Documents or submission of a Bid not substantially responsive to the Bidding Documents in every respect will may result in the rejection of the Bid.

6.0 AMENDMENT OF BIDDING DOCUMENTS

6.01 At any time prior to the deadline for submission of Bids, the Purchaser may, for any reasons, whether at its own initiative or in response to a clarification requested by a prospective Bidder, modify the Bidding Documents by Amendment.

6.02 The Amendment shall be part of the Bidding Documents, pursuant to Clause 5.01, and it will be notified in writing by Fax / e-mail to all the Bidders who have received the Bidding Documents and confirmed their participation to Bid, and will be binding on them.

6.03 In order to afford prospective Bidders reasonable time in which to take the Amendment into account in preparing their Bids, the Purchaser may, at its discretion, extend the deadline for the submission of Bids.

C. PREPARATION OF BIDS

7.0 LANGUAGE OF BID

The Bid prepared by the Bidder, and all correspondence and documents relating to the Bid exchanged by the Bidder and the Purchaser, shall be written in the English Language. Any printed literature furnished by the Bidder may be written in another Language, provided that this literature is accompanied by an English translation, in which case, for purposes of interpretation of the Bid, the English translation shall govern.

8.0 DOCUMENTS COMPRISING THE BID

The Bid prepared and submitted by the Bidder shall comprise the following components:

- (a) Bid Form, Price & other Schedules (STRICTLY AS PER FORMAT) and Technical Data Sheets completed in accordance with Clause 9.0, 10.0, 11.0 and Technical Specification;
- (b) All the Bids must be accompanied with the required bid security as mentioned in the Section-I against each tender.
- (c) Power of Attorney indicating that the person(s) signing the Bid have the authority to sign the Bid and thus that the Bid is binding upon the Bidder during the full period of its validity, in accordance with clause 12.0.

9.0 BID FORM

9.01 The Bidder shall complete an 'Original' and another one 'Copy' of the Bid Form and the appropriate Price & Other Schedules and Technical Data Sheets furnished in the Volume-II of the Bidding Documents.

9.02 Bid Security

Pursuant to Clause 8.0 (b) above, the bidder shall furnish, as part of its bid, a bid security amounting to 1% (one percent) of the total bid value (FOR Destination) as already specified in the Section-I. The bid security is required to protect the Purchaser against the risk of Bidder's conduct which would warrant the security's forfeiture.

The bid security shall be denominated in the currency of the bid, and shall be in the following form:

- (a) Bank Guarantee issued by any scheduled bank strictly as per the format enclosed and shall be valid for a period of thirty (30) days beyond the validity of the bid.
- (b) Bank Draft in favour of NESCO Ltd, payable at Bhubaneswar.

Unsuccessful bidders' bid security will be discharged or returned as promptly as possible but not later than thirty (30) days after the expiration of the period of bid validity.

The successful bidder's bid security will be discharged upon furnishing the performance security.

The bid security may be forfeited:

- (a) if the Bidder:
 - (i) Withdraws its bid during the period of bid validity specified by the Bidder in the Bid Form; or
- (b) In the case of a successful Bidder, if the Bidder fails:
 - (i) to sign the Contract, or
 - (ii) to furnish the required performance security.

Registered Office of NESCO, WESCO & SOUTHCO

10.0 BID PRICES

10.01 Bidders shall quote with a break-up of prices for individual items. The total Bid Price shall also cover all the Supplier's obligations mentioned in or reasonably to be inferred from the Bidding Documents in respect of Design, Supply, Transportation to site, all in accordance with the requirement of Bidding Documents. The Bidder shall complete the appropriate Price Schedules included herein, stating the Unit Price for each item & total Price.

10.02 The prices offered shall be inclusive of all costs as well as Duties, Taxes and Levies paid or payable during execution of the supply work, break up of price constituents, should be there.

10.03 Prices quoted by the Bidder shall be "Firm" and not subject to any price adjustment during the performance of the Contract. A Bid submitted with an adjustable price quotation will be treated as non-responsive and rejected.

11.0 BID CURRENCIES

Prices shall be quoted in Indian Rupees Only.

12.0 PERIOD OF VALIDITY OF BIDS

12.01 Bids shall remain valid for 120 days from the date of opening of the Commercial Bid.

12.02 Notwithstanding Clause 12.01 above, the Purchaser may solicit the Bidder's consent to an extension of the Period of Bid Validity. The request and the responses thereto shall be made in writing by Fax / e-mail.

13.0 ALTERNATIVE BIDS

Bidders shall submit Bids, which comply with the Bidding Documents. Alternative Bids will not be considered. The attention of Bidders is drawn to the provisions of Clause 22.03 & 22.04 regarding the rejection of Bids, which are not substantially responsive to the requirements of the Bidding Documents.

14.0 FORMAT AND SIGNING OF BID

14.01 The original Bid Form and accompanying documents (as specified in Clause 9.0), clearly marked "Original Bid", plus one copy must be received by the Purchaser at the date, time and place specified pursuant to Clauses 15.0 and 16.0. In the event of any discrepancy between the original and the copies, the original shall govern.

14.02 The original and copy of the Bid shall be typed or written in indelible ink and shall be signed by the Bidder or a person or persons duly authorized to sign on behalf of the Bidder. Such authorization shall be indicated by written Power-of-Attorney accompanying the Bid.

Registered Office of NESCO, WESCO & SOUTHCO

- 14.03 The Bid shall contain no interlineations, erasures or overwriting except as necessary to correct errors made by the Bidder, in which case such corrections shall be initiated by the person or persons signing the Bid.

D. SUBMISSION OF BIDS

15.0 SEALING AND MARKING OF BIDS

- 15.01 Bid submission: One original & one Copy (hard copies) of all the Bid Documents shall be sealed and submitted to the Purchaser before the closing time for submission of the bid. One set print out of Section III & Section IV of the Bid Document duly signed and stamped at every page shall have to be submitted along with the bid.

- 15.02 The Technical Documents and the Bid Security shall be enclosed in a sealed envelope and the said envelope shall be superscribed with "Technical Bid & Bid Security". The price bid shall be inside another sealed envelope with superscription "Price Bid". Both these envelopes shall be sealed inside another big envelope. All the envelopes should bear the Name and Address of the Bidder and marking for the Original and Copy. The envelopes should be super-scribed with "Tender Notice No. & Due date of opening".

- 15.03 The Bidders have the option of sending the Bids in person. Bids submitted by Telex/Telegram/Fax will not be accepted. No request from any Bidder to the Purchaser to collect the proposals from Airlines/Cargo Agents etc shall be entertained by the Purchaser.

16.0 DEADLINE FOR SUBMISSION OF BIDS

- 16.01 The original Bid, together with the required copies, must be received by the Purchaser at the address specified no later than **1.00 PM. on 04.11.2009.**
- 16.02 The Purchaser may, at its discretion, extend the deadline for the submission of Bids by amending the Bidding Documents in accordance with Clause 9.0, in which case all rights and obligations of the Purchaser and Bidders previously subject to the deadline will thereafter be subject to the deadline as extended.

17.0 ONE BID PER BIDDER

Each Bidder shall submit only one Bid either by itself, or as a partner in a Joint Venture. A Bidder who submits or participates in more than one Bid will cause all those Bids to be rejected. However, the bidder may indicate separate prices for supply to WESCO, NESCO & SOUTHCO.

18.0 LATE BIDS

Any Bid received by the Purchaser after the deadline for submission of Bids prescribed by the Purchaser, pursuant to Clause 16.0, will be declared "Late" and rejected and returned unopened to the Bidder.

19.0 MODIFICATIONS AND WITHDRAWAL OF BIDS

- 19.01 The Bidder is not allowed to modify or withdraw its Bid after the Bid's submission.
- 19.02 No Bid may be modified to the deadline for Bids.

Registered Office of NESCO, WESCO & SOUTHCO

E. EVALUATION OF BID

20.0 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 the Purchaser's processing of Bids or award decisions may result in the rejection of the Bidder's Bid.

21.0 CLARIFICATION OF BIDS

To assist in the examination, evaluation and comparison of Bids, the Purchaser may, at its discretion, ask the Bidder for a clarification of its Bid. All responses to requests for clarification shall be in writing and no change in the price or substance of the Bid shall be sought, offered or permitted.

22.0 PRELIMINARY EXAMINATION OF BIDS / RESPONSIVENESS

22.01 Purchaser will examine the Bids to determine whether they are complete, whether any computational errors have been made, whether required sureties have been furnished, whether the documents have been properly signed, and whether the Bids are generally in order.

22.02 Arithmetical errors will be rectified on the following basis. If there is a discrepancy between the unit price and the total price per item that is obtained by multiplying the unit price and quantity, the unit price shall prevail and the total price per item will be corrected. If there is a discrepancy between the Total Amount and the sum of the total price per item, the sum of the total price per item shall prevail and the Total Amount will be corrected.

22.03 Prior to the detailed evaluation, Purchaser will determine the substantial responsiveness of each Bid to the Bidding Documents including production capability and acceptable quality of the Goods offered. A substantially responsive Bid is one, which conforms to all the terms and conditions of the Bidding Documents without material deviation.

22.04 A Bid determined as not substantially responsive will be rejected by the Purchaser and / or the Purchaser and may not subsequently be made responsive by the Bidder by correction of the non-conformity.

23.0 EVALUATION AND COMPARISON OF BIDS

23.01 The evaluation of Bids shall be done based on the delivered cost competitiveness basis.

23.02 The evaluation of the Bids shall be a stage-wise procedure. The following stages are identified for evaluation purposes:

In the first stage, the Bids would be subjected to a responsiveness check. The Technical Proposals and the Conditional ties of the Bidders would be evaluated.

Subsequently, the Financial Proposals along with Supplementary Financial Proposals, if any, of Bidders with Techno-commercially Acceptable Bids shall be considered for final evaluation.

23.03 The Purchaser's evaluation of a Bid will take into account, in addition to the Bid price, the following factors, in the manner and to the extent indicated in this Clause:

(a) Supply Schedule

(b) Deviations from Bidding Documents

Bidders shall base their Bid price on the terms and conditions specified in the Bidding Documents.

The cost of all quantifiable deviations and omissions from the specification, terms and conditions specified in Bidding Documents shall be evaluated. The Purchaser will make its own assessment of the cost of any deviation for the purpose of ensuring fair comparison of Bids.

- 23.04 Any adjustments in price, which result from the above procedures, shall be added for the purposes of comparative evaluation only to arrive at an "Evaluated Bid Price". Bid Prices quoted by Bidders shall remain unaltered.

F. AWARD OF CONTRACT

24.0 CONTACTING THE PURCHASER

- 24.01 From the time of Bid opening to the time of contract award, if any Bidder wishes to contact the Purchaser on any matter related to the Bid, it should do so in writing.

- 24.02 Any effort by a Bidder to influence the Purchaser and / or in the Purchaser's decisions in respect of Bid evaluation, Bid comparison or Contract Award, will result in the rejection of the Bidder's Bid.

25.0 THE PURCHASER'S RIGHT TO ACCEPT ANY BID AND TO REJECT ANY OR ALL BIDS

The Purchaser 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 Purchaser's action.

26.0 AWARD OF CONTRACT

The Purchaser will award the Contract to the successful Bidder whose Bid has been determined to be the lowest - evaluated responsive Bid, provided further that the Bidder has been determined to be qualified to satisfactorily perform the Contract. Purchaser reserves the right to award order other bidders in the tender, provided it is required for progress of project & provided he agrees to come to the lowest rate.

27.0 THE PURCHASER'S RIGHT TO VARY QUANTITIES

The Purchaser reserves the right to vary the quantity i.e. increase or decrease the numbers/ quantities without any change in terms and conditions during the execution of the Order.

28.0 LETTER OF INTENT/ NOTIFICATION OF AWARD

The letter of intent / Notification of Award shall be issued to the successful Bidder whose bids have been considered responsive, techno-commercially acceptable and evaluated to be the Lowest (L1). The successful Bidder shall be required to furnish a letter of acceptance within 7 days of issue of the letter of intent /Notification of Award by Purchaser.

29.0 CORRUPT OR FRAUDULENT PRACTICES

30.01 The Purchaser requires that the Bidders observe the highest standard of ethics during the procurement and execution of the Project. In pursuance of this policy, the Purchaser:

(a) Defines, for the purposes of this provision, the terms set forth below as follows:

(i) "Corrupt practice" means behavior on the part of officials in the public or private sectors by which they improperly and unlawfully enrich themselves and/or those close to them, or induce others to do so, by misusing the position in which they are placed, and it includes the offering, giving, receiving, or soliciting of anything of value to influence the action of any such official in the procurement process or in contract execution; and

(ii) "Fraudulent practice" means a misrepresentation of facts in order to influence a procurement process or the execution of a contract to the detriment of the Purchaser, and includes collusive practice among Bidders (prior to or after Bid submission) designed to establish Bid prices at artificial non-competitive levels and to deprive the Purchaser of the benefits of free and open competition.

(b) Will reject a proposal for award if it determines that the Bidder recommended for award has engaged in corrupt or fraudulent practices in competing for the contract in question;

(c) Will declare a firm ineligible, either indefinitely or for a stated period of time, to be awarded an contract if it at any time determines that the firm has engaged in corrupt or fraudulent practices in competing for, or in executing, an contract.

30.02 Furthermore, Bidders shall be aware of the provision stated in the General Conditions of Contract.

SECTION - III

(GENERAL CONDITION OF CONTRACT)

2009-2010

(Tender Notification: CSO/27/Power Transformer)

Date: **23.10.2009**

GENERAL CONDITION OF CONTRACT (GCC)

1.0 General Instructions

- 1.01 All the Bids shall be prepared and submitted in accordance with these instructions.
- 1.02 Bidder shall bear all costs associated with the preparation and delivery of its Bid, and the Purchaser will in no case shall be responsible or liable for these costs.
- 1.03 The Bid should be submitted by the Bidder in whose name the bid document has been issued and under no circumstances it shall be transferred/sold to any other party.
- 1.04 The Purchaser reserves the right to request for any additional information and also reserves the right to reject the proposal of any Bidder, if in the opinion of the Purchaser, the data in support of Tender requirement is incomplete.
- 1.05 The Bidder is expected to examine all instructions, forms, terms & conditions and specifications in the Bid Documents. Failure to furnish all information required in the Bid Documents or submission of a Bid not substantially responsive to the Bid Documents in every respect may result in rejection of the Bid. However, the Purchaser's decision in regard to the responsiveness and rejection of bids shall be final and binding without any obligation, financial or otherwise, on the Purchaser.

2.0 Definition of Terms

- 2.01 "Purchaser" shall mean WESCO/ NESCO / SOUTHCO.
- 2.02 "Bidder" shall mean the firm who quotes against this bid document issued by the Purchaser. "Contractor" or "Seller" shall mean the successful Bidder and/or Bidders whose bid has been accepted by the Purchaser and on whom the "Letter of intent" is placed by the Purchaser and shall include his heirs, legal representatives, successors and permitted assigns wherever the context so admits.
- 2.03 "Site" shall mean the Electricity Distribution Area of the Company.
- 2.04 "Specification" shall mean collectively all the terms and stipulations contained in those portions of this bid document known as Instruction to Bidder, Bid form and other forms as per Volume - III, General Conditions of Contract, Specifications and the Amendments, Revisions, Deletions or Additions, as may be made by the Purchaser from time to time.
- 2.05 "Letter of Intent" shall mean the official notice issued by the Purchaser notifying the Contractor that his proposal has been accepted and it shall include amendments thereto, if any, issued by the Purchaser. The "Letter of Intent" issued by the Purchaser shall be binding on the "Contractor". The date of Letter of Intent shall be taken as the effective date of the commencement of contract.
- 2.06 "Purchase Order" shall mean the Purchase Order and amendments thereof and the drawings, specifications and other documents / papers referred to therein which shall constitute the "Contract".
- 2.07 "Month" shall mean the calendar month and "Day" shall mean the calendar day.
- 2.08 "Codes and Standards" shall mean all the applicable codes and standards as indicated in the Technical Specification.

Registered Office of NESCO, WESCO & SOUTHCO

- 2.09 "Offer Sheet" shall mean Bidder's firm offer submitted to Purchaser in accordance with the specification.
- 2.10 "Contract" shall mean THE "letter of Intent" issued by the Purchaser.
- 2.11 "Contract Price" shall mean the price referred to in the "Letter of intent".
- 2.12 "Contract Period" shall mean the period during which the "Contract" shall be executed as agreed between the Contractor and the Purchaser in the Contract inclusive of extended contract period for reasons beyond the control of the Contractor and/or Purchaser due to force majeure.
- 2.13 "Goods" shall mean all items to be supplied under Purchase Order whether raw materials, processes materials, equipment, fabricated products, drawings or other documents as applicable.
- 2.14 "Store" shall mean the Purchaser store as defined elsewhere in this tender document.

- 3.0 Contract Documents & Priority
 - 3.01 Contract Documents: The Specification, terms and conditions of the contract shall consist solely of these Tender conditions and offer sheet.
 - 3.02 Priority: Should there be any discrepancy between any term hereof and any term of the Offer Sheet, the terms of these tender document shall prevail.

- 4.0 Scope of Work
 - 4.01 The "Scope of Work" shall be on the basis of Bidder's responsibility, completely covering the obligations, responsibility and workmanship, provided in this Bid Enquiry whether implicit or explicit.
 - 4.02 The Purchaser reserves the right to vary the quantity i.e increase or decrease, which shall be communicated to successful bidder during project execution.
 - 4.03 All relevant drawings, data and instruction manuals and other necessary inputs shall be under the scope of contract.

- 5.0 General Requirements
 - 5.01 The bidder shall supply, deliver best quality goods.
 - 5.02 The company also reserves the right to add from the scope of work or delete from the scope of work so assigned to the Supplier, if the circumstances so warrant.
 - 5.03 The contractor shall be responsible for loading and unloading of all materials with proper material handling equipment.

- 6.0 Quality Assurance and Inspection
 - 6.01 Immediately on award of contract, the bidder shall prepare detailed quality assurance plan / test procedure identifying the various stages of manufacture, quality checks performed at each stage, raw material inspection and the Customer hold points. The document shall also furnish details of method of checking, inspection and acceptance standards / values and get the approval of Purchaser before proceeding with manufacturing. However, Purchaser shall have the right to review the inspection reports, quality checks and results of contractors in house inspection department which are not Customer hold points and the contractor shall comply with the remarks

Registered Office of NESCO, WESCO & SOUTHCO

made by purchaser or his representative on such reviews with regards to further testing, rectification or rejection, etc.

- 6.02 Witness and Hold points are critical steps in manufacturing, inspection and testing where the contractor is obliged to notify the Purchaser in advance so that it may be witnessed by the Purchaser. Final inspection is a mandatory hold point. The contractor has to proceed with the work past a hold point only after clearance by purchaser or a witness waiver letter from Purchaser.
- 6.03 The performance of waiver of QA activity by Purchaser at any stage of manufacturing does not relieve the contractor of any obligation to perform in accordance with and meet all the requirements of the procurement documents and also all the codes & reference documents mentioned in the procurement document nor shall it preclude subsequent rejection by the purchaser.
- 6.04 On completion of manufacturing the items can be dispatched only after issue of shipping release by the Purchaser.
- 6.05 All testing and inspection shall be done without any extra cost.
- 6.06 Purchaser reserves the right to send any material out of the supply to any recognized laboratory for testing. In case the material is found not in order with the technical requirement / specification, the charges of testing along with any other penalty which may be levied is to be borne by the bidder. To avoid any conflict the Seller is advised to send his representative to the stores to see that the material sent for testing is being sealed in the presence of bidder's representative.
- 7.0 Packing, Packing List & Marking
- 7.01 Packing: Seller shall pack or shall cause to be packed all Commodities in such a manner as shall be reasonably suitable for shipment by road or rail to Orissa Distribution Companies without any risk of damage in transit. The packing shall be sufficient to withstand, without limitation, rough handling during transit and exposure to extreme temperatures, salt and precipitation during transit, and open storage.
- 7.02 Packing List: One copy of the packing list shall be enclosed in each package delivered. There shall also be enclosed in one package a master packing list identifying each individual package, which is part of the shipment. On any packaging where it is not feasible to place the packing list inside the container, all pertinent information shall be stenciled on the outside and will thus constitute a packing list.
- 7.03 Marking: Seller shall mark each container, box or package for easy identification of his materials as follows:
- Commodity Name:
Name of the Supplier:
Net Weight:
Size:
- 8 Commissioning Spares: The Seller shall replace, free of cost, any spares which may be found defective at the time of commissioning.
- 9.0 Price Basis
- Bidders shall quote individual price breakup for the quoted items.
- The price shall be inclusive of all taxes, Duties and other Levies of whatsoever nature, transportation to site and vice versa and in-transit Insurances.

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The above Prices shall also include unloading and proper stacking at/ from Purchaser Stores to site / stores.

10.0 Terms of Payment

10.01 The Payment shall be made as under:

- a) 100% Payment with taxes & duties on Prorata basis within 45 days of receipt of goods in our specified stores in good condition subject to detailed verification thereof and approval of Guarantee & Test certificate.
- b) For claiming 100% payment a Composite Performance Bank Guarantee of 10% of the total order value of the goods, is to be provided which shall remain valid for a period beyond 90 days from the warranty period as per clause no. 12.0.
- c) All Payments shall be made after certification from Purchaser's Engineer Incharge. All Payments are subject to receipt of correct Documents.

11.0 Price Validity

All bids submitted shall remain valid, firm and subject to unconditional acceptance by Purchaser for 120 days post bid opening date. For awarded Contract, the prices shall remain valid and firm till contract completion.

12.0 Warranty / Guarantee

12.01 The bidder shall guarantee for the equipments/workmanship for a minimum period of 60 months from the date of commissioning or 66 months from the date of last receipt goods at stores, whichever is earlier. The manufacturer shall guarantee to replace or repair to the satisfaction of the purchaser the defective parts at site free of cost within the above period. Should however, the manufacturer fails to do so within a reasonable time, the purchaser reserves the right to effect repair or replacement and recover such charges for repair or replacement from the contractor. Contractor shall have to submit a Composite Performance Bank Guarantee equivalent of 10% of the order value, valid for a period of 90 days beyond the expiry of the warranty period.

12.02 If during the defect liability period any services performed found to be defective, these shall be promptly rectified by contract its own cost (including the cost of dismantling and reinstallation) on the instruction of Purchaser.

13.0 Composite Performance Bank Guarantee

13.01 Within Fifteen (15) days from the date of the Award notice, Seller shall submit a composite Performance Bank Guarantee (CPBG) in favour of Purchaser equivalent to Ten percent (10%) of the total price of the Contract (the "Performance Bank Guarantees"). The CPBG shall be valid for a period beyond 90 days from the warranty period as per clause no. 12.0. The BG format is provided in Vol.-II, Annexure - II of the Bidding Documents

13.02 The Composite Performance Bank Guarantee established under Clause 13.01 shall be forfeited without recourse to the seller and payable against the presentation by Purchaser to the bank with a claim that the seller has failed to comply with any term or condition set forth in the Contract.

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- 13.03 The Composite Performance Bank Guarantee established under will be automatically and unconditionally forfeited without recourse if Purchaser in its sole discretion determines that Seller has failed to comply with any Terms or Condition set forth in the contract.
- 13.04 The Composite Performance Bank Guarantees will be released without interest within thirty (30) days from the last date up to which the Composite Performance Bank Guarantee has to be kept valid (as defined in Clause 13.01).
- 13.05 Upon submission of the composite bank guarantee, the bid security (EMD) shall be released

14.0 TECHNICAL INFORMATION / DATA.

The company and the contractor, to the extent of their respective rights permitting to do so, shall exchange such technical information and data as is reasonably required by each party to perform its obligations and responsibilities. The company and the contractor agree to keep each other in confidence and to use the same degree of care as it uses with respect to its own proprietary data to prevent its disclosure to third parties of all technical and confidential information. The technical information, drawings, records and other document shall not be copied, transferred, traced or divulged and / or disclosed to third party in full / part not misused in any other form. This technical information, drawing etc. shall be returned to the company with all approved copies and duplicates. In the event of any breach of this contract, the contractor shall indemnify the company against any loss, cost of damages or claim by any party in respect of such breach

15.0 Effective Date of Commencement of Contract:

The date of the issue of the Letter of Intent/Purchase Order which ever is earlier shall be treated as the effective date of the commencement of contract.

16.0 Taxes & Duties:

All taxes, duties, levies of whatsoever nature, octroi, turnover tax, service tax, income tax, work contract tax etc., levied by State or Central Governments or local bodies shall be to the contractor's account including any taxes, duties and levies which may be levied fresh by the Governments during currency of the Contract. The contractor shall furnish their Excise/Sales Tax registration number, PAN No. etc. in the bid documents as well as Invoice/Challans etc.

17.0 Time – The Essence of Contract

The time and the date of completion of the "Supply" as stipulated in the Letter Of Intent / Purchase order issued to the Contractor shall be deemed to be the essence of the "Contract". The Supply has to be completed not later than the aforesaid Schedule and date of completion of supply.

18.0 Liquidated Damages (LD)

- 18.01 If supply of items / equipments is delayed beyond the supply schedule as stipulated in purchase order/LOI, then the Contractor shall be liable to pay to the Purchaser as LD for such delay, a sum of 1% of the contract price for every week delay or part thereof. The LD shall be computed on the undelivered value of goods as per the delivery schedule.
- 18.02 The total amount of LD for delay under the contract will be subject to a maximum of Ten percent (10%) of the contract price
- 18.03 The Purchaser may, without prejudice to any method of recovery, deduct the amount for such damages from any amount due or which may become due to the Contractor or from the Performance Bank Guarantee or file a claim against the contractor.

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- 19.0 The Laws and Jurisdiction of Contract:
- 19.01 The laws applicable to this Contract shall be the Laws in force in India.
- 19.02 All disputes arising in connection with the present Contract shall be settled amicably by mutual consultation failing which shall be finally settled as per the rules of Arbitration and Conciliation Act, 1996 at the discretion of Purchaser. The jurisdiction of arbitration shall be at Bhubaneswar, Orissa, India
- 20.0 Events of Default
- 20.01 Events of Default. Each of the following events or occurrences shall constitute an event of default ("Event of Default") under the Contract:
- (a) Seller fails or refuses to pay any amounts due under the Contract;
 - (b) Seller fails or refuses to deliver Commodities conforming to this Bid document / specifications, or fails to deliver Commodities within the period specified in P.O. or any extension thereof
 - (c) Seller becomes insolvent or unable to pay its debts when due, or commits any act of bankruptcy, such as filing any petition in any bankruptcy, winding-up or reorganization proceeding, or acknowledges in writing its insolvency or inability to pay its debts; or the Seller's creditors file any petition relating to bankruptcy of Seller;
 - (d) Seller otherwise fails or refuses to perform or observe any term or condition of the Contract and such failure is not remediable or, if remediable, continues for a period of 30 days after receipt by the Seller of notice of such failure from Purchaser.
- 21.0 Consequences of Default.
- (a) If an Event of Default shall occur and be continuing, Purchaser may forthwith terminate the Contract by written notice.
 - (b) In the event of an Event of Default, Purchaser may, without prejudice to any other right granted to it by law, or the Contract, take any or all of the following actions;
 - (i) Present for payment, to the relevant bank the Performance Bank Guarantee;
 - (ii) Purchase the same or similar Commodities from any third party; and/or
 - (iii) Recover any losses and/or additional expenses Purchaser may incur as a result of Seller's default.
- 22.0 Force Majeure
- 22.01 The term "Force Majeure" as employed herein include, but are not limited to, acts of God or force of nature, landslide, earthquake, flood, fire, lightning, explosion, major storm (hurricane, typhoon, cyclone etc.) or major storm warning, tidal wave, shipwreck and perils of navigation, act of war (declared or undeclared) or public enemy, strike (excluding employee strikes, lockouts or other industrial disputes or action solely among employee of Contractor or its subcontractors) act or omission of sovereign states or those purporting to represent sovereign states, blockade, embargo, quarantine, public disorder, sabotage, accident or similar events beyond the control of the parties or either of them.

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Force Majeure shall not include occurrences as follows:

- a) Late delivery of materials caused by congestion at Seller's facilities or elsewhere, an oversold condition of the market, inefficiencies, or similar occurrences.
- b) Late performance by Seller and/or Sub-Seller caused by unavailability of raw materials, supervisors or labour, inefficiencies or similar occurrences.
- c) Mechanical breakdown of any item of Seller's or its Sub-Seller's equipment, plant or machinery.
- d) Delays due to ordinary storm or inclement weather or
- e) Non-conformance by Sub-Seller.

Unless the delay arises out of a Force Majeure occurrence and is beyond both Seller's and Sub-Seller's or Seller's control and an alternate acceptable source of services, equipment or material is unavailable. Additionally, Force Majeure shall not include financial distress of Seller or any Sub-Seller.

22.02 In the event of either party being rendered unable by Force Majeure to perform any obligation required to be performed by them under the Contract, the relative obligation of the party affected by such Force Majeure shall be suspended for the period during which such cause lasts. Time for performance of the relative obligation suspended by Force Majeure shall then stand extended by the period for which cause lasts.

22.03 Upon the occurrence of any Force Majeure event, the party so affected in the discharge of its obligation shall promptly, but no later than seven (7) days give written notice of such event to the other party. The affected party shall make every reasonable effort to remove or remedy the cause of such Force Majeure or mitigate its effect as quickly as possible. If such occurrence results in the suspension of all or part of the Work for a continuous period of more than, the parties shall meet and determine the measures to be taken.

22.04 Any delay or failure in performance by either party hereto shall not give rise to any claims for damages or loss of anticipated profits it, and to the extent, such delay or failure is caused by Force Majeure.

23.0 Transfer and Sub-Letting

The Contractor shall not sublet, transfer, assign or otherwise part with the Contract or any part thereof, either directly or indirectly, without prior written permission of the Purchaser.

24.0 THIRD PARTY INSURANCE

Contractor shall take the Insurance of Equipment during Transit. Any Claim pertaining to this shall be the responsibility of the Contractor.

25.0 Recoveries

When ever under this contract any money is recoverable from and payable by the bidder, the purchaser shall be entitled to recover such sum by appropriating in part or in whole by deducting any sum due to which any time thereafter may become due from the Seller in this or any other contract. Should the sum be not sufficient to cover the full amount recoverable the bidder shall pay to the purchaser on demand the remaining balance.

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26.0 Waiver

Failure to enforce any condition herein contained shall not operate as a waiver of the condition itself or any subsequent breach thereof.

27.0 Indemnification

27.01 Notwithstanding contrary to anything contained in this Tender, Contractor shall at his costs and risks make good any loss or damage to the property of the Purchaser and/or the other Contractor engaged by the Purchaser and/or the employees of the Purchaser and/or employees of the other Contractor engaged by the Purchaser whatsoever arising out of the negligence of the Contractor while performing the obligations under this contract.

27.02 Subject to this Clause 23.0 Purchaser shall, at its sole cost and expense, defend, indemnify and hold harmless Contractor and his assignees /or the employees of the Contractor whatsoever arising out of the negligence or willful act or omission or from the default of the Purchaser in the performance of the Contractor.

SECTION - IV

(TECHNICAL SPECIFICATIONS)

2009-2010

(Tender Notification: CSO/27/Power Transformer)

Date: 23.10.2009

Registered Office of NESCO, WESCO & SOUTHCO

TECHNICAL SPECIFICATION FOR 33/11KV ONAN POWER TRANSFORMERS

1.0 SCOPE

- 1.1 These specifications cover design, engineering, manufacturing, shop-testing, pre-delivery inspection, packing & forwarding, loading at manufacturer's works, transportation, transit insurance, delivery & unloading at site/ stores of 33/11 KV Outdoor step down, ONAN cooled Power Transformers of different ratings (3.15 MVA, 5 MVA & 8 MVA) complete with all accessories/ fittings and spare parts as specified herein, to be used in the electrical distribution networks of NESCO, WESCO, SOUTHCO.
- 1.2 The scope of supply should also include the provision of type test. Rates of type tests shall be mentioned in the appropriate price schedule of the bidding document and will be considered for evaluation.
- 1.3 The Power Transformer shall conform in all respects to highest standards of engineering, design, workmanship, this specification and the latest revisions of relevant standards at the time of offer and the purchaser shall have the power to reject any material, which, in his Judgment, is not in full accordance therewith.

2. SPECIFIC TECHNICAL REQUIREMENTS

1	Rated MVA (ONAN rating)	3.15 MVA , 5 MVA & 8 MVA
2	No. of Phases	3
3	Type of installation	Outdoor
4	Frequency	50 Hz (\pm 5%)
5	Cooling medium	Insulating Oil (ONAN)
6	Type of mounting	On Wheels, Mounted on rails.
7	Rated voltage	
a)	High Voltage winding	33 KV
b)	Low Voltage winding	11 KV
8	Highest continuous system voltage	
a)	Maximum system voltage ratio (HV/LV)	36 KV / 12 KV
b)	Rated voltage ratio (HV/LV)	33 kV / 11 KV
9	No. of windings	Two winding Transformers
10	Type of Cooling	ONAN (Oil natural and Air natural)
11.	MVA Rating corresponding to ONAN cooling system	100%
12	Method of connection :	

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	HV		Delta
	LV		Star
13	Connection Symbol		DYn 11
14	System Earthing		Neutral of LV side to be solidly earthed
15.	Percentage impedance voltage on normal tap and MVA base at 750 C corresponding to HV / LV rating and applicable tolerances		<u>% Impedance</u> <u>Tolerance %</u>
a)	3.15 MVA		6.25 +10
b)	5.0 MVA		7.15 +10
c)	8.0 MVA		8.35 +10
			(No negative tolerance will be allowed)
16.	Intended regular cyclic overloading of windings		As per IEC – 76-1, Clause 4.2 /IS 6600
17a)	Anticipated unbalanced loading		Around 20%
b)	Anticipated continuous loading of windings (HV / LV)		110% of rated current
18a)	Type of tap changer	i)	Off-load tap changer for 5 MVA & 8MVA transformers.
b)	Range of taping	i)	+5% to – 10% in 7 equal steps of 2.5% each on HV winding for 3.15, 5 MVA & 8MVA Transformers.
19	Neutral terminal to be brought out		Brought out separately as alike live terminal
20.	Over Voltage operating Capability and duration		112.5% of rated voltage (continuous)
21	Maximum Flux Density in any part of the core and yoke at rated MVA, rated voltage i.e. 33 KV / 11 KV and system frequency of 50 HZ		≤1.6 Tesla
22	Insulation levels for windings :		33 KV 11 KV
a)	1.2 / 50 microsecond wave shape Impulse withstand (KV _p)		170 75
b)	Power frequency voltage withstand (KV _{rms})		70 28
23	Type of winding insulation		
a)	HV winding		Insulating Paper (Min. TPC)
b)	LV winding		Insulating Paper (Min. TPC)

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24	Withstand time for three phase short circuit	2 Seconds	
25	Noise level at rated voltage and frequency	As per NEMA Publication No. TR-1	
26	Permissible Temperature Rise over ambient temperature of 50°C		
a)	Of top oil measured by thermometer	40°C	
b)	Of winding measured by resistance	50°C	
27	Minimum clearances in air (mm) :-	Phase to phase	Phase to ground
a)	HV	350	320
b)	LV	255	140
28	Terminals		
a)	HV Winding Line end	36 KV oil filled porcelain communicating type of bushings (Antifog type) as per IS 3347	
b)	LV winding	12 KV porcelain type of bushing (Antifog type) as per IS 3347	
29	Insulation level of bushing	HV	LV
a)	Lightning Impulse withstand(KVP)	170	75
b)	1 minute Power Frequency withstand Voltage (KV – 4ms)	70	28
c)	Creepage distance (MM) (minimum)	900	500
30	Material of HV & LV Conductor	Electrolytic copper	
31	Maximum Current density for HV and LV winding for rated current	2.5 A / mm ²	
32	Polarisation index i.e. ratio of megger values at 600 Sec to 60 sec for HV to earth, LV to earth and HV to LV	Shall be greater than or equal to 1.5, but less than or equal to '5'	
33	Core	CRGO-M4 or Better	
34	Temperature Indicator		
a)	Oil	One number	
b)	Winding	One number	
35	Maximum permissible no load loss at rated voltage and rated frequency. (Max)		
	3.15 MVA	-	4.5KW

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	5.00 MVA	-	6.5KW
	8.00 MVA	-	8.5KW
36	Maximum permissible load loss at rated current and at 75° C (Max)		
	3.15 MVA	-	23.00 KW
	5.00 MVA	-	34.00 KW
	8.00 MVA		50.00 KW
37.	Accommodation on tank for outdoor neutral CT (for 5 & 8 MVA transformers)	-	To be provided
38	Neutral side C.T. for owner's use		
i)	Type		Single phase outdoor mounted
ii)	Quantity		One on LV side
iii)	Voltage Class		12 KV
iv)	No. of Cores		One
v)	Current Ratio (A/A)		As per system requirement
vi)	Turn ratio		Identical to the turns ratio provided on HV & LV side
vii)	Knee point voltage		600 volts (minimum)
viii)	Class of Accuracy		PS
ix)	Maximum Secondary resistance (Ohms)		5.0 at 75°C
x)	Location for mounting		In neutral lead before connection to station earth.
xi)	Secondary current of C.T.		1-5 Amps.

2.1 MARSHALLING BOX

A metal enclosed, weather, vermin and dust proof marshalling box fitted with required glands, locks, glass door, terminal Board, heater with switch, illumination lamp with switch etc. shall be provided with each transformer to accommodate temperature indicators, terminal blocks etc. It shall have degree of protection of IP 55 or better as per IS: 2147, Clause 3.12.

2.2 CAPITALIZATION OF LOSSES AND LIQUIDATED DAMAGES

The capitalization of guaranteed losses of the transformer shall be calculated and considered while evaluating the bids. The guaranteed values of no load losses and load losses shall be stated in the bid which should match the corresponding loss figures mentioned in the short circuit type test report

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submitted along with the offer by the bidder. Liquidated damages will be applied to successful bidder for not achieving the quoted guaranteed figures (See Clause 9.0).

2.3 PERFORMANCE

- i) Transformer shall be capable of withstanding for two seconds without damage to any external short circuit, with the short circuit MV A available at the terminals.
- ii) The maximum flux density in any part of the core and yoke at rated MVA Voltage and frequency shall be 1.6 Tesla (maximum).
- iii) Transformer shall under exceptional circumstances due to sudden disconnection of the load, be capable of operating at the voltage approximately 25% above normal rated voltage for a period of not exceeding one minute and 40% above normal for a period of 5 seconds.
- iv) The transformer may be operated continuously without danger on any particular tapping at the rated MVA \pm 12.5% of the voltage corresponding to the tapping.
- v) The thermal ability to withstand short circuit shall be demonstrated by calculation.
- vi) Transformer shall be capable of withstanding thermal and mechanical stress caused by any symmetrical and asymmetrical faults on any winding.

2.4 AUXILIARY POWER SUPPLIES

The following power supplies shall be available at site:

- i) AC .3-phase, 400 volts, 50Hz. Earthed
- ii) AC 1- phase, 230 volts, 50Hz. Earthed

2.5 DRAWINGS/ DOCUMENTS INCORPORATING THE FOLLOWING PARTICULARS SHALL BE SUBMITTED ALONG WITH THE TECHNICAL BID

- a) General outline drawing showing shipping dimensions and overall dimensions, net weights and shipping weights, quality of insulating oil, spacing of wheels in either direction of motion, location of coolers, marshalling box and tap changers etc.
- b) Assembly drawings of core, windings etc. and weights of main components / parts.
- c) Height of center line on HV and LV connectors of transformers from the rail top level.
- d) Dimensions of the largest part to be transported.
- e) GA drawings / details of various types of bushing
- f) Tap changer and Name Plate diagram
- g) List of Testing & Measuring Instruments along with calibration details.
- h) Illustrative & descriptive literature of the Transformer.
- i) Maintenance and Operating Instructions.

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MISCELLANEOUS :

Padlocks along with duplicate keys for various valves, marshalling box etc. shall be supplied by the supplier, wherever locking arrangement is provided.

Foundation bolts for wheel locking devices of Transformer shall be supplied by the Contractor.

DELIVERY

Delivery shall have to be completed within 2 months of placement of LOI / Purchase Order which ever is earlier.

2.8 SCHEDULES

All Schedules annexed to the specification shall be duly filled by the bidder separately.

2.9 ALTITUDE FACTOR

If the equipment is to be installed in the hilly area, necessary correction factors as given in the Indian Standard for oil temperature rise, insulation level etc. shall be applied to the Standard Technical Parameters given above.

2.10 NAME PLATE

Transformer rating plate shall contain the information as given in clause 15 of IS-2026 (part-I). The details on rating plate shall be finalized during the detailed engineering. Further, each transformer shall have inscription of purchaser's name. The name plate shall also include (i) The short circuit rating, (ii) Measured no load current and no load losses at rated voltage and rated frequency, (iii) measured load losses at 75° C (normal tap only), (iv) D.C resistance of each winding at 75° C.

SERVICE CONDITIONS:

The service conditions shall be as follows:

Maximum a altitude above sea level	1,000m
maximum ambient air temperature	50° C
maximum daily average ambient air temperature	35° C
minimum ambient air temperature	-5°C
maximum temperature attainable by an object exposed to the sun	60°C
maximum yearly weighted average ambient temperature	32°C
maximum relative humidity	100%
average number of thunderstorm days per annum (isokeraunic level)	70
average number of rainy days per annum	120
average annual rainfall	1500 mm
maximum wind pressure	260Kg / m
Isoceraunic level(days per year)	50
Seismic level	0.3 g

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Environmentally, the region where the equipment will be installed includes coastal areas, subject to high relative humidity, which can give rise to condensation. Onshore winds will frequently be salt laden. On occasions, the combination of salt and condensation may create pollution conditions for outdoor insulators.

Therefore, outdoor material and equipment shall be designed and protected for use in exposed, heavily polluted, salty, corrosive, tropical and humid coastal atmosphere.

4. SYSTEM CONDITIONS

The equipment shall be suitable for installation in supply systems of the following characteristics.

Frequency		50 Hz (\pm 5%)
Nominal System voltages		33 KV
		11 KV
Maximum System Voltages	33 KV System	36 KV
	11 KV System	12 KV
Insulation Levels :	33 KV System	170 KV (Peak)
1.2/50 μ sec impulse withstand voltage	11 KV System	75 KV (Peak)
Power frequency one minute withstand (wet and dry) voltage	33 KV System	70 KV (rms)
Neutral earthing arrangements :	11 KV System	28 KV (rms)
	11 KV System	solidly earthed

5. CODES & STANDARDS

- 5.1 The design, material, fabrication, manufacture, inspection, testing before dispatch and performance of power transformers at site shall comply with all currently applicable statutory regulations and safety codes in the locality where the equipment will be installed. The equipment shall also conform to the latest applicable standards and codes of practice. Nothing in this specification shall be construed to relieve the contractor of this responsibility.

The equipment and materials covered by this specification shall conform to the latest applicable provision of the following standards.

IS:5	Colour for ready mixed paints
IS:325	Three Phase Induction Motors
IS:335	New insulating oil for transformers, switch gears
IS:1271	Classification of insulating materials for electrical machinery and apparatus in relation to their stability in services
IS:2026 (Part I to IV)	Power Transformer

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IS:2071	Method of high voltage testing
IS:2099	High voltage porcelain bushings
IS:2147	Degree of protection
IS:2705	Current Transformers
IS:3202	Code of practice for climate proofing of electrical equipment
IS:3347	Dimensions for porcelain Transformer Bushings
IS:3637	Gas operated relays
IS:3639	Fittings and accessories for power Transformers
IS:5561	Electric Power Connectors
IS: 6600 /BS:CP'10:0	Guide for loading of oil immersed Transformers
IS:10028	Code of practice for selection, installation and maintenance of transformers, Part I. II and III
C.B.I.P. Publication	Manual on Transformers

If the standard is not quoted for any item, it shall be presumed that the latest version of Indian Standard shall be applicable to that item.

The equipment complying other internationally accepted standards, may also be considered if they ensure performance superior to the Indian Standards.

5.3 DRAWINGS TO BE SUBMITTED AFTER AWARD OF CONTRACT

- a) The manufacturer shall furnish, within fifteen days after issuing of Letter of Award. Six copies each of the following drawings/documents incorporating the transformer rating for approval.
 - i) Detailed overall general arrangement drawing showing front and side elevations and plan of the transformer and all accessories including radiators and external features with details of dimensions, spacing of wheels in either direction of motion, net weights and shipping weights, crane lift for un-tanking, size of lugs and eyes, bushing lifting dimensions, clearances between HV and L.V terminals and ground, quantity of insulating oil etc.
 - ii) Assembly drawings of core and winding and weights of main components / parts.
 - iii) Foundation plan showing loading on each wheel and jacking points with respect to center line of transformer.
 - iv) GA drawings details of bushing and terminal connectors.
 - v) Name plate drawing with terminal marking and connection diagrams.
 - vi) Wheel locking arrangement drawing.
 - vii) Transportation dimensions drawings.

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- viii) Magnetization characteristic curves of PS class neutral and phase side current transformers, if applicable.
 - ix) Interconnection diagrams.
 - x) Over fluxing withstand time characteristic of transformer.
 - xi) GA drawing of marshalling box.
 - xii) Control scheme/wiring diagram of marshalling box.
 - xiii) Technical leaflets of major components and fittings.
 - xiv) As built drawings of schematics, wiring diagram etc.
 - xv) Setting of oil temperature indicator, winding temperature indicator.
 - xvi) Completed technical data sheets.
 - xvii) Details including write-up of tap changing gear.
 - xviii) HV conductor bushing.
 - xix) Bushing Assembly.
 - xx) Bi-metallic connector suitable for connection to 100 mm² up to 232 mm² AAAC Conductor.
 - xxi) Radiator type assembly.
- b) All drawings, documents, technical data sheets and test certificates, results calculations shall be furnished.
- 5.4 Any approval given to the detailed drawings by the purchaser shall not relieve the contractor of the responsibility for correctness of the drawing and in the manufacture of the equipment. The approval given by the purchaser shall be general with over all responsibility with contractor.
6. GENERAL CONSTRUCTIONAL FEATURES
- 6.1 All material used shall be of best quality and of the class most suitable for working under the conditions specified and shall withstand the variations of temperature and atmospheric conditions without distortion or deterioration or the setting up of undue stresses which may impair suitability of the various parts for the work which they have to perform.
- 6.2 Similar parts particularly removable ones shall be interchangeable.
- 6.3 Pipes and pipe fittings, screws, studs, nuts and bolts used for external connections shall be as per the relevant standards. Steel bolts and nuts exposed to atmosphere shall be galvanized.
- 6.4 Nuts, bolts and pins used inside the transformers and tap changer compartments shall be provided with lock washer or locknuts.
- 6.5 Exposed parts shall not have pockets where water can collect.
- 6.6 Internal design of transformer shall ensure that air is not trapped in any location.
- 6.7 Material in contact with oil shall be such as not to contribute to the formation of acid in oil. Surface in contact with oil shall not be galvanized or cadmium plated.

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- 6.8 Labels, indelibly marked, shall be provided for all identifiable accessories like Relays, switches current transformers etc. All label plates shall be of in corrodible material.
- 6.9 All internal connections and fastenings shall be capable of operating under overloads and over-excitation, allowed as per specified stands without injury.
- 6.10 Transformer and accessories shall be designed to facilitate proper operation, inspection, maintenance and repairs.
- 6.11 No patching, plugging, shimming or other such means of over-coating defects, discrepancies or errors will be accepted.
- 6.12 Schematic Drawing of the wiring, including external cables shall be put under the prospane sheet on the inside door of the transformer marshalling box.
- 6.13 Painting
- 6.13.1 All paints shall be applied in accordance with the paint manufacturer's recommendations. Particular attention shall be paid to the following:
- a) Proper storage to avoid exposure as well as extremes of temperature.
 - b) Surface preparation prior to painting.
 - c) Mixing and thinning
 - d) Application of paints and the recommended limit on time intervals between coats.
 - e) Shelf life for storage.
- 6.13.1.1 All paints, when applied in normal full coat, shall be free from runs, sags, wrinkles, patchiness, brush marks or other defects.
- 6.13.1.2 All primers shall be well marked into the surface, particularly in areas where painting is evident, and the first priming coat shall be applied as soon as possible after cleaning. The paint shall be applied by airless spray according to the manufacturer's recommendations. However, wherever airless spray is not possible, conventional spray be used with prior approval of purchaser.
- 6.13.1.3 The supplier shall, prior to painting protect nameplates, lettering gauges, sight glasses, light" fittings and similar such items.
- 6.13.2 Cleaning and Surface Preparation
- 6.13.2.1 After all machining, forming and welding has been completed, all steel work surfaces including radiators shall be thoroughly cleaned of rust, scale, welding slag or spatter and other contamination prior to any painting.
- 6.13.2.2 Steel surfaces shall be prepared by Sand/Shot blast cleaning in accordance with ISO 8501 part 1 or chemical cleaning by seven tank process including Phosphating to the appropriate quality.
- 6.13.2.3 The pressure and Volume of the compressed air supply for the blast cleaning shall meet the work requirements and shall be sufficiently free from all water contamination prior to any painting.
- 6.13.2.4 Chipping, scraping and steel wire brushing using manual or power driven tools cannot remove firmly adherent mill-scale and shall only be used where blast cleaning is impractical.
- 6.13.3 Protective Coating

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As soon as all items have been cleaned and within four hours of the subsequent drying. They shall be given suitable anticorrosion protection (painting) strictly as stated below.

Painting-Transformer Tank, Pipes, Radiator etc.-

	Surface preparation	Primer Coat	Intermediate Undercoat	Finish Coat	Total DFT	Colour Shade
Tank,Pipes,etc. (External Surfaces)	Blast Cleaning	Epoxy base Zinc Primer (30-40 µm)	Epoxy HB MIO (30-40 µm)	Aliphatic Polyurethane (min 50 µm)	Min 155 µm	697 shade as per IS 5
Tank (Internal surfaces)	Blast Cleaning Sa2 ^{1/2}	Hot oil resistant, non-corrosive varnish or paint or epoxy	-----	-----	Min 30 µm	Glossy white for paint
Radiator (External surfaces)	Chemical/ blast cleaning(Sa2 ^{1/2})	Epoxy base Zinc Primer (30-40 µm)	Epoxy base Zinc Primer (30-40 µm)	PU paint(min 50 µm)	Min 110 µm	Matching shade of tank / different shade aesthetically matching to tank
Radiator and pipes (Internal surfaces)	Chemical cleaning if required	Hot oil proof, low viscosity varnish, flushing with transformer oil.	-----	-----	-----	-----

6.13.4 Painting Procedure

6.13.4.1 Painting shall be carried out in conformity with both specifications and with the paint manufacture's recommendations. All paints in anyone particular system. Whether shop or site applied, shall originate from one paint manufacturer.

6.13.4.2 Particular attention shall be paid to the manufacture's instructions on storage, mixing, thinning and pot life. The paint shall only be applied in the manner detailed by the manufacturer e.g. brush, roller, conventional or airless spray and shall be applied under the manufacturer's recommended conditions. Minimum and maximum time intervals between coats shall be closely followed.

6.13.5.1 All prepared steel surfaces should be primed before visible re-rusting occurs or within 4 hours whichever is sooner. Chemical treated steel surfaces shall be primed as soon as the surface is dry and while the surface is warm.

6.13.5.2 Where the quality of film is impaired by excess film thickness,(wrinkling, mud cracking or general softness) the supplier shall remove the unsatisfactory paint coatings and apply another. As a general rule, dry film thickness should not exceed the specified minimum dry film thickness by more than 25%. In all instances, where two or more coats of the same paints are specified, such coatings may not be of contrasting colors.

6.13.5.3 Paint applied to items that are not be painted, shall be removed at supplier's expense, avail the surface clean, un-stained and undamaged.

6.13.6 Damages to Paints Work

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- 6.13.6.1 Any damage occurring to any part of the painting scheme shall be made good to the same standard of corrosion protection and appearance as that originally employed.
- 6.13.6.2 Any damaged paint work shall be made as follows:
- a) The damaged area, together with an area extending 25mm around its boundary, shall be cleaned down to bare metal.
 - b) A priming coat shall immediately be applied, followed by a full paint finish equal to the originally applied and extending 50mm around the perimeter of the originally damaged.
- 6.13.6.3 The repainted surface shall present a smooth surface. This shall be obtained by carefully chamfering the paint edges before & after priming.
- 6.13.7 Dry Film Thickness
- 6.13.7.1 To the maximum extent practicable, the coats shall be applied as a continuous film of uniform thickness and free of pores. Over-spray, skips, runs, sags and drips should be avoided. The different coats may or may not be the same color.
- 6.13.7.2 Each coat of paint shall allow to harden before the next is applied as per manufacturer's recommendations.
- 6.13.7.3 Particular attention must be paid to full film thickness at edges.

7.0 DETAILED DESCRIPTION

7.1 Tank

- 7.1.1 The Transformer tank and cover shall be fabricated from high grade low carbon steel plate of tested quality. The tank shall be of welded construction. Minimum 6 and 8mm thick for side wall and 8mm and 10mm thick for top and bottom cover for 3.15- 5 MVA and 8 MVA transformers respectively.
- 7.1.2 Tank shall be designed to permit lifting by crane or jacks of the complete transformer assembly filled with oil. Suitable lugs and bosses shall be provided for this purpose.
- 7.1.3 All beams, flanges, lifting lugs, braces and permanent parts attached to the tank shall be welded and where practicable, they shall be double welded. The tank shall have sufficient strength to withstand without permanent distortion under following conditions:
- a) Oil filling under vacuum.
 - b) Continuous internal gas pressure of 35 KPa with oil at operating level
 - c) Normal Mechanical shock during transportation, loading & unloading operations.
- 7.1.4 The main tank body of the transformer, excluding tap changing compartments and radiators, shall be capable of withstanding pressure of 760mm of Hg.
- 7.1.5 Inspection hole(s) with welded flange(s) and bolted cover(s) shall be provided on the tank cover. The inspection hole(s) shall be of sufficient size to afford easy access to the lower ends of the bushings, terminals etc.

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7.1.6 All bolted connections to the tank shall be fitted with suitable oil-tight gaskets which shall give satisfactory service under the operating conditions for complete life of the transformer. Special attention shall be given to the methods of making the hot oil-tight joints between the tank and the cover as also between the tank cover and the bushings and all outlets .to ensure that the joint can be remade satisfactorily and with ease, with the help of semi-skilled labour. Where compressible gaskets are used, steps shall be provided to prevent over-compression.

7.1.7 Suitable guides shall be provided for positioning the various parts during assemble or dismantling. Adequate space shall be provided between the cores and windings and the bottom of the tank for collection of any sediment.

7.2 Tank Cover

The transformer top shall be provided with a detachable tank cover with bolted flanged gasket joint. Lifting lugs shall be provided for removing the cover. The surface of the cover shall be suitable sloped so that it does not retain rain water.

7.3 UNDER CARRIAGE

7.3.1 The transformer tank shall be supported on steel structure with detachable plain rollers completely filled with oil. Suitable channels for movement of roller with transformer shall be space accordingly, rollers wheels shall be provided with suitable rollers bearings, which will resist rust and corrosion and shall be equipped with fittings for lubrication. It shall be possible to swivel the wheels in two directions, at right angle to or parallel to the main axis of the transformers.

7.4 CORE

7.4.1 Stage level inspection for core construction shall be carried out by the owner.

7.4.2 Each lamination shall be insulated such that it will not deteriorate due to mechanical pressure and the action of hot transformer oil.

7.4.3 The core shall be constructed either form high grade, non-aging Cold Rolled Grain Oriented (CRGO) silicon steel laminations conforming to grade M4 or better like M3 or HIB or laser grade. The maximum flux density in any part of the cores and yoke at normal voltage and frequency shall not be more than 1.6 Tesla. The Bidder shall provide saturation curve of the core material, proposed to be used.

7.4.4 The bidder should offer the core for inspection and approval by the purchaser during the manufacturing stage. Bidder's call notice for the purpose should be accompanied with the following documents as applicable as a proof towards use of prime core material:

- a) Invoice of the supplier
- b) Mills test certificate
- c) Packing list
- d) Bill of lading
- e) Bill of entry certificate to customs

Core material shall be directly procured either from the manufacturer or through their accredited marketing organization of repute, but not through any agent.

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- 7.4.5 The laminations shall be free of all burrs and sharp projections. Each sheet shall have an insulating coating resistant to the action of hot oil. Core laminations with rusted surface shall be strictly avoided.
- 7.4.6 The insulation structure for the core to bolts and core to clamp plates shall be such as to withstand 2000 V DC voltage for one minute.
- 7.4.7 The completed core and coil shall be so assembled that the axis and the plane of the outer surface of the core assemble shall not deviate from the vertical plane by more than 25mm.
- 7.4.8 All steel sections used for supporting the core shall be thoroughly shot or sand blasted, after cutting, drilling and welding.
- 7.4.9 The finally assembled core with all the clamping structures shall be free from deformation and shall not vibrate during operation.
- 7.4.10 The core clamping structure shall be designed to minimize eddy current loss.
- 7.4.11 The framework and clamping arrangements shall be securely earthed.
- 7.4.12 The core shall be carefully assembled and rigidly clamped to ensure adequate mechanical strength.
- 7.4.13 Oil ducts shall be provided, where necessary, to ensure adequate cooling inside the core. The welding structure and major insulation shall not obstruct the free flow of oil through such ducts.
- 7.4.14 The design of magnetic circuit shall be such as to avoid static discharges, development of short circuit paths within itself or to the earth clamping structure and production of flux component at right angle to the plane of the lamination, which may cause local heating. The supporting framework of the cores shall be so designed as to avoid the presence of pockets, which would prevent complete emptying of the tank through the drain valve or cause trapping of air during filling.
- 7.4.15 The construction is to be of core type. The core shall be provided with lugs suitable for lifting the complete core and coil assembly. The core and coil assemble shall be so fixed in the tank that shifting will not occur during transport or short circuits.
- 7.5 EARTHING OF CORE AND METAL PARTS:
- 7.5.1 All internal metal parts of the transformer, with the exception of individual lamination; and their individual clamping plates shall be earthed.
- 7.5.2 The top clamping structure shall be connected to the tank by a copper strap. The bottom clamping structure shall be earthed by one or more the following methods:
- By connection through vertical tie-rods to the top structure.
 - By direct metal to metal contact with the tank base.
 - By a connection to the structure on the same side of the core as the main earth connection to the tank.
- 7.5.3 The magnetic circuit shall be connected to the clamping structure at one point only.
- 7.5.4 Coil clamping rings of metal at earth potential shall be connected to the adjacent core clamping structure on the same side as the main earth connections.

WINDING

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- 7.6.1 All windings shall be made of electrolytic copper and of continuous Disc type. Winding shall be subjected to a shrinking and seasoning process, so that no further shrinkage occurs during service. Adjustable devices shall be provided for taking up possible shrinkage.
- 7.6.2 All low voltage windings for use in the circular coil concentric winding shall be wound on a performed insulating cylinder for mechanical protection of the winding in handling and placing around the core.
- 7.6.3 Winding shall not contain sharp bends which might damage the insulation or produce high dielectric stresses. No strip conductor wound on edge shall have width exceeding six times the thickness.
- 7.6.4 Materials used in the insulation and assembly of the windings shall be insoluble, non catalytic and chemically inactive in the hot transformer oil and shall not soften or be otherwise affected under the operating conditions.
- 7.6.5 Varnish application on coil windings may be given only for mechanical protection and not for improvement in dielectric properties. In no case varnish or other adhesive be used which will seal the coil and prevent evacuation of air and moisture and impregnation by oil.
- 7.6.6 Winding and connections shall be braced to withstand shocks during transport or short circuit.
- 7.6.7 Permanent current carrying joints in the windings and leads shall be welded or brazed. Clamping bolts for current carrying parts inside oil shall be made of oil resistant material which shall not be affected by acidity in the oil steel bolts, if used, shall be suitably treated.
- 7.6.8 Terminals of all windings shall be brought out of the tank through bushings for external connections.
- 7.6.9 The completed core and coil assemble shall be dried in vacuum at not more than 0.5mm of mercury absolute pressure and shall be immediately impregnated with oil after the drying process to ensure the elimination of air and moisture within the insulation. Vacuum may be applied in either vacuum oven or in the transformer tank.
- 7.6.10 The winding shall be so designed that all coil assembles of identical voltage ratings shall be interchangeable and field repairs to the winding can be made readily without special equipment. The coils shall have high dielectric strength.
- 7.6.11 Coils shall be made of continuous smooth high grade electrolytic copper conductor, shaped and braced to provide for expansion and contraction due to temperature changes.
- 7.6.12 Adequate barriers shall be provided between coils and core and between high and low voltage coil. End turn shall have additional protection against abnormal line disturbances.
- 7.6.13 The insulation of winding shall be designed to withstand voltage stress arising from surge in transmission lines due to atmospheric or transient conditions caused by switching etc.
- 7.6.14 Tapping shall not be brought out from inside the coil or from intermediate turns and shall be so arranged as to preserve as far as possible magnetic balance of transformer at all voltage ratios.
- 7.6.15 Magnitude of impulse surges transferred from HV to LV windings by electro magnetic induction and capacitance coupling shall be limited to BIL of LV winding.
- 7.7 INSULATING OIL
- 7.7.1 The insulating oil for the transformer shall be of EHV grade, generally conforming to IS:335. No inhibitors shall be used in the oil.
- 7.7.2 The quantity of oil required for the first filling of the transformer and its full specification shall be stated in the bid. The bidder shall quote the price of transformer complete with first filling of oil plus 10%

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extra. However, the rate of transformer oil in Rupees per liter shall be quoted separately also. The transformer oil shall be supplied in non-returnable drums.

7.7.3 The design and materials used in the construction of the transformer shall be such as to reduce the risk of the development of acidity in the oil.

7.7.4 The supplier shall warrant that oil furnished is in accordance with the following specifications.

Sl. No	Characteristic	Requirement	Method of Test
01	Appearance	The oil shall be clear & transparent & free from suspended matter or sediment	A representative sample of oil shall be examined in a 100 mm thick layer at ambient temp.
02	Density at 20uC	0.89 g/cmJ Max.	IS:1448
03	Kinematic Viscosity at 27 deg. C Max	27 CST	IS:1448
04	Interfacial tension at 27 °C Min.	0.03 N/m	IS:6104
05	Flash Point	136°C	IS:1448
06	Pour Point Max.	-6°C	IS:1448
07	Naturalization Value (Total Acidity) Max.	0.03 mg KOH/gm	IS:335
08	Electric strength Breakdown (voltage) Min.	72.5 KV	IS:6792
09	Dielectric dissipation factor tan delta at 90° C	0.03 Max	IS:6262
10	Min specific resistance (resistively) at 90°C	35 x 10 ¹² ohm cm (min.)	IS:6103
11	Oxidation stability		
12	Neutralization value after oxidation	0.40mg KOH/g	
13	Total sludge after oxidation	0.10% by weight max.	
14	Presence of oxidation Inhibitor	The oil shall not contain anti oxidant Additives.	IS:335
15	Water content Max:	Less than 14 ppm	IS:2362

7.8 VALVES

- i) Valves shall be of forged carbon steel of minimum 50mm size and of gun mental with gun metal fittings for all sizes. They shall be of full way type with screwed ends and shall be opened by turning counter clockwise when facing the hand wheel. There shall be no oil leakage when the valves are in closed position.
- ii) Each valve shall be provided with an indicator to show the open and closed positions and shall be provided with facility for padlocking in either open or closed position. All screwed valves shall be furnished with pipe plugs for protection. Padlocks with duplicate keys shall be supplied along with the valves.
- iii) All valves except screwed valves shall be provided with flanges having machined raced drilled to suit the applicable requirements, Oil tight blanking plates shall be provided for each connection for use when any radiator is detached and for all valves opening to atmosphere. If any special radiator valve tools are required the contractor shall supply the same.

- iv) Each transformer shall be provided with following valves on the tank:
 - a) Drain valve so located as to completely drain the tank.
 - b) One filter valves on diagonally opposite corners of min. 50mm size.
 - c) Oil sampling valves not less than 8mm at top and bottom of main tank.
 - d) One 15mm air release plug.
 - e) Valves between radiators and main tank.
 - f) Valve of min. size $\frac{3}{4}$ " for conservator drain valve.
- Drain and filter valves shall be suitable for applying vacuum as specified in the specifications.

7.9 ACCESSORIES

Bushing

- i) All porcelain used in bushings shall be homogeneous, non-porous, uniformly glazed to brown colour and free from blisters, burns and other defects.
- ii) Stress due to expansion and contraction in any part of the bushing shall not lead to deterioration.
- iii) Bushing shall be designed and tested to comply with the applicable standards.
- iv) Liquid oil - filled bushings shall be equipped with liquid level indicators and means for sampling and draining the liquid. The angle of inclination to vertical shall not exceed 30 degree.
- v) Oil in oil-filled bushings shall meet the requirements of the transformer oil standards.
- vi) Bushing rated for 400A and above shall have non-ferrous flanges and hardware.
- vii) Fittings made of steel or malleable iron shall be galvanized.
- viii) Bushing shall be so located on the transformers that full flashover strength will be utilized.
Minimum Clearances as required for the BIL shall be realized between live parts and live parts to earthed Structures.
- ix) All applicable routine and type tests certificates of the bushings shall be furnished for approval.
- x) Bushing shall be supplied with bi-metallic terminal connector/ clamp/ washers suitable for fixing to bushing terminal and the PURCHASER'S specified conductors. The connector/clamp shall be rated to carry the bushing rated current without exceeding a temperature rise of 55° C over an ambient of 50° C. The connector/clamp shall be designed to be corona free at the maximum rated line to ground voltage.
- xi) Bushing of identical voltage rating shall be interchangeable.
- xii) The insulation class of high voltage neutral bushing shall be properly coordinated with the insulation class of the neutral of the low voltage winding.
- xiii) Each bushing shall be so coordinated with the transformer insulation that all flashover will occur outside the tank.

7.9.2 Protection & Measuring Devices

- i) Oil Conservator Tank

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- a) The Conservator tank shall have adequate capacity between highest and lowest visible levels to meet the requirement of expansion of the total cold oil volume in the transformer and cooling equipment.
- b) The conservator tank shall be bolted into position so that it can be removed for cleaning purposes.
- c) The conservator shall be fitted with magnetic oil level gauge with low level electrically insulated alarm contact.
- d) Plain conservator fitted with silica gel breather.
- e) The diameter of the conservator pipe from main tank shall be min. of 50 mm dia.

ii) Pressure Relief Device.

The pressure relief devices (including pressure relief valve) provided shall be of sufficient size for rapid release of any pressure that may be generated in the tank and which may result in damage of the equipment. The device shall operate at a static pressure of less than the hydraulic test pressure of transformer tank. It shall be mounted direct on the tank. No intermediate joints shall be accepted. Provision shall be made to prevent the ingress of rain. The same shall be fitted with skirt projection of 20 mm inside the tank. Two diaphragms of suitable size and material shall be used one at the base and other at the mouth of the explosion vent pipe. An oil gauge shall be provided on the pipe for indicating healthiness of the bottom diaphragm. An equalizer pipe of suitable dia shall be provided connecting the pressure relief device and conservator.

iii) Buchholz Relay

A double float type Buchholz relay shall be provided. Any gas evolved in the transformer shall collect in this relay. The relay shall be provided with a test cock suitable for a flexible pipe connection for checking its operation. A copper tube shall be connected from the gas collector to a valve located about 1200 mm above ground level to facilitate sampling with the transformer in service. The device shall be provided with two electrically independent potential free contacts, one for alarm on gas accumulation and the other for tripping on sudden rise of pressure.

iv) Temperature Indicator

a) Oil Temperature Indicator (OTI)

The transformers shall be provided with a mercury contact type thermometer with 50 mm dial for top oil temperature indication. The thermometer shall have adjustable, electrically independent potential free alarm and trip contacts. Maximum reading pointer and resetting device shall be mounted in the local control panel. A temperature sensing element suitably located in a pocket on top oil shall be furnished. This shall be connected to the OTI by means of capillary tubing. Accuracy class of OTI shall be $\pm 1\%$ or better. One No electrical contact capable of operating at 5 A ac at 230 volt supply.

b) Winding Temperature indicator (WTI)

A device for measuring the hot spot temperature of the winding shall be provided. It shall comprise the following. .

- i) Temperature sensing element.
- ii) Image Coil.
- iii) Mercury contacts.
- iv) Auxiliary CTS, If required to match the image coil, shall be furnished and mounted in the local control panel.
- v) 150mm dial local indicating instrument with maximum reading pointer mounted in local panel and with adjustable electrically independent ungrounded contacts, besides that required for control of cooling equipment, one for high winding temperature alarm and on for trip.
- vi) Calibration device.
- vii) Two number electrical contact each capable of operating at 5 A ac at 230 Volt supply.

7.10 MARSHALLING BOX

steel, weather, vermin and dust proof marshalling box fitted with required glands, Sheet locks, glass door, terminal Board, heater with switch, illumination lamp with switch, water-tight hinged and padlocked door of a suitable construction shall be provided with each transformer to accommodate temperature indicators, terminal blocks etc. The box shall have slopping roof and the interior and exterior painting shall be in accordance with the specification. Padlock along with duplicate keys shall be supplied for marshalling box. The degree of protection shall be IP-55 or better.

- ii) The schematic diagram of the circuitry inside the marshalling box be prepared and fixed inside the door under a pro pone sheet.
- iii) The marshalling box shall accommodate the following equipment:
 - a) Temperature indicators.
 - b) Terminal blocks and gland plates for incoming and outgoing cables.

All the above equipments shall be mounted on panels and back of panel wiring shall be used for inter-connection. The temperature indicators shall be so mounted that the dials are not more than 1600 mm from the ground level and the door (s) of the compartment(s) shall be provided with glazed window of adequate size. The transformer shall be erected on a plinth which shall be 2.5 feet above ground level.

To prevent internal condensation, a metal clad heater with thermostat shall be provided. The heater shall be controlled by a MCB of suitable rating mounted in the box. The ventilation louvers, suitably padded with felt, shall also be provided. The louvers shall be provided with suitable felt pads to prevent ingress of dust.

- iv) All incoming cables shall enter the kiosk from the bottom and gland plate shall not be less than 450 mm from the base of the box. The gland plate and associated compartment shall be sealed in suitable manner to prevent the ingress of moisture from the cable trench.
- v) The control connection, wiring etc. shall be as per std. specification.

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7.11 TAP CHANGER

7.11.1 OFFLOAD TAPCHANGER

- i) The transformers shall be provided with Off-load Tap
- ii) The Transformer with off-load tap changing gear shall have taps ranging from +5 % to -10% in 7 equal steps of 2.5% each on HV winding for voltage variation.
- iii) The tap changing switch shall be located in a convenience position so that it can be operated from ground level. The switch handle shall be provided with locking arrangement along with top position indication, thus enabling the switch to be locked in position.

7.12 FITTINGS AND ACCESSORIES

The following fittings and accessories shall be provided on the transformers:

- i) Conservator with isolating valves, oil filling hole with cap and drain valve. The conservator vessel shall be filled with constant oil pressure diaphragm oil sealing system.
- ii) Magnetic type oil level gauge (150 mm dia) with low oil level alarm contacts mounted on conservator.
- iii) Prismatic / toughened glass oil level gauge.
- iv) Silica gel breather with oil seal and connecting pipe complete with first fill of activated silica gel or Alumina mounted at a level of 1400 mm above ground level.
 - v) A double float type Buchholz relay with isolating valve. Bleeding pipe and a testing cock, the test cock shall be suitable for a flexible (pipe connection for checking its operation). A 5mm dia. Copper pipe shall be connected from the relay test cock to a valve located at a suitable height above ground level to facilitate sampling of gas with the transformer in service. Interconnection between gas collection box and relay shall also be provided. The device shall be provided with two electrically independent ungrounded contacts, one for alarm on gas accumulation and the other for tripping on sudden oil surge. These contacts shall be wired upto transformer marshalling box. The relay shall be provided with shut off valve on the conservator side as well as on the tank side.
 - vi) Pressure relief devices (including pressure relief valve) and necessary air equalizer connection between this and the conservator.
 - vii) Air release plugs in the top cover.
 - viii) Inspection cover, access holes with bolted covers for access to inner ends of bushing etc.
- ix) Winding temperature (hot spot) indicating device for local mounting complete in all respects.

Winding temperature indicator shall have three set of contacts to operate at different settings:

 - a) To provide winding temperature high alarm
 - b) To provide temperature too high trip
- x) Dial thermometer with pocket for oil temperature indicator with one set of alarm and one set of trip contacts and maximum reading pointer.

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- xi) Lifting eyes or lugs for the top cover, core and coils and for the complete transformer.
- xii) Jacking pads
- xiii) Haulage lugs.
- xiv) Protected type mercury alcohol in glass thermometer and a pocket to house the same.
- xv) Top and bottom filter valves on diagonally opposite ends with pad locking arrangement on both valves.
- xvi) Top and bottom sampling valves with locking arrangement.
- xvii) Drain valve with pad locking arrangement
- xviii) Rating and connection diagram plate.
- xix) Four numbers tank earthing terminals with associated nuts and bolts for connections to Purchaser's grounding strip.
- xx) Bi-directional flagged rollers with locking and bolting device.
- xxi) Marshalling Box (MB)
- xxii) Shut off valve on both sides of flexible pipe connections between radiator bank and transformer tank.
- Xxiii) HV & LV bimetallic connectors.
- xxiii) Cooling Accessories.
 - a) Requisite number of radiators provided with:
 - One shut off valve on top
 - One shut off valve at bottom
 - Air release device on top
 - Drain and sampling device at bottom
 - Lifting lugs.
 - b) Air release device and oil drain plug on oil pipe connectors:
- xxiv) Terminal marking plates for Current Transformer and Main transformer
 - a) Off- Load Tap Changer
- xxv) Oil Preservation Equipment
- xxvi) Oil Temperature indicator
- xxvii) Bi-Metallic Connectors for Bushings (suitable for 232 mm² AAAC)

Note: (i) The fittings listed above are indicative and any other fittings which are generally required for operation of the transformer are deemed to be included in the quoted price of the transformer.

(ii) The contacts of various devices required for alarm and trip shall be potential free and shall be adequately rated for continuous, making and breaking current duties as specified.

RADIO INTERFERENCE AND NOISE LEVEL

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Transformers shall be designed with particular care to suppress at least the third and fifth harmonic voltages so as to minimize interference with communication circuits. Transformer noise level when energized at normal voltage and frequency shall be as per NEMA stipulations.

8. INSPECTION AND TESTING

(i)The purchaser shall carry out a comprehensive inspection and testing programme during manufacture of the transformer. An indicative in inspection is given below. This is, however, not intended to form a comprehensive programme as it is supplier's responsibility to draw up and carry out such a programme duly approved by the purchaser.

(ii)The supplier shall carry out type tests and routine tests on the transformers.

(iii) Only one no of transformer of each rating will be subjected to type test. The charges for conducting each of type tests shall be included in the bid price and no separate type test charges shall be paid. The Purchaser reserves the right to conduct any or all type tests at CPRI/ National Govt. Approved Laboratory, if the type tests were not conducted earlier on transformers of the same rating and design.

(iv)The pre-shipment checks shall also be carried out by the contractor.

(v)The requirements on site tests are as listed in the specifications.

(vi)Certified test report and certificates shall be furnished to the Purchaser Consultants for evaluation as per the schedule of distribution of documents. The Contractor shall also evaluate the test results and rectify the defects in the equipment based on his and the Purchaser's evaluations of the tests without any extra charges to the Purchaser. Manufacturer's Test Certificates in respect of all associated auxiliary and ancillary equipment shall be furnished.

(vii)The bidder shall state in his bid the testing facilities available at his works. In case full testing facilities are not available, the bidder shall state the method proposed to be adopted so as to ascertain the transformer characteristics corresponding to full capacity.

8.1 INSPECTION

i) Tank and Conservator

- a) Inspection of major weld.
- b) Crack detection of major strength weld seams by dye penetration test.
- c) Check correct dimensions between wheels, demonstrate turning of wheels, through 90° and further dimensional check.
- d) Leakage test of the conservator.

ii) Core

Sample testing of core materials for checking specific characteristics and thickness.

Check on the quality of varnish if used on the stampings.

Check on the amount of burrs.

Visual and dimensional check during assembly stage.

Check on completed core for measurement of iron loss, determination of maximum flux density,

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Visual and dimensional checks for straightness and roundness of core, thickness of limbs and suitability of clamps.

High voltage DC tests (2 KV for one minute) between core and clamps.

iii) Insulating Material

- a) Sample check for physical properties of materials.
- b) Check for dielectric strength
- c) Check for the reaction of hot oil on insulating materials.

iv) Winding

- a) Sample check on winding conductor for mechanical and electrical conductivity.
- b) Visual and dimensional checks on conductor for scratches, dent mark etc.
- c) Sample check on insulating paper for PH value, electric strength.
- d) Check for the bonding of the insulating paper with conductor.
- e) Check and ensure that physical condition of all materials taken for windings is satisfactory and free of dust.
- f) Check for absence of short circuit between parallel strands.

v) Checks before Drying Process

- a) Check condition of insulation on the conductor and between the windings.
- b) Check insulation distance between high voltage connections, between high voltage connection cables and earth and other live parts.
- c) Check insulating distances between low voltage connections and earth and other parts.
- d) Insulating test for core earthing.

vi) Check during Drying Process

Measurement and recording of temperature and drying time during vacuum treatment.
Check for completeness of drying

vii) Assembled Transformer

Check completed transformer against approved outline drawing, provision for all fittings, finish level etc.

Jacking test on the assembled Transformer.

viii) Oil

All standard tests in accordance with IS: 335 shall be carried out on Transformer oil sample before filling in the transformer.

Test Report for bought out items

The contractor shall submit the test reports for all bought out / sub contracted items for approval.

- a) Buchholz relay
- b) Sudden pressure rise relay on Main Tank
- c) Winding temperature indicators (for TX capacity <10 MVA)
- d) Oil temperature indicators
- e) Bushings

- f) Bushing current transformers in neutral (if provided)
- g) Marshalling box
- h) Off Load Tap changer
- i) Any other item required to complete the works.
- j) Porcelain, bushings, bushing current transformers, wherever provided, winding coolers, control devices, insulating oil and other associated equipment shall be tested by the contractor in accordance with relevant IS. If such requirement is purchased by the contractor on a sub-contract, he shall have them tested to comply with these requirements.

8.2 TESTS

- i) All standards routine tests in accordance IS: 2026 with dielectric tests corresponding as per latest amendments to IS: 2026 shall be carried out.
- ii) All auxiliary equipment shall be tested as per the relevant IS. Test certificates shall be submitted for bought out items.
- iii) High voltage withstand test shall be performed on auxiliary equipment and wiring after complete assembly.
- iv) Following additional routine tests shall also be carried out on each transformer:
 - a) Magnetic Circuit Test - Each core shall be tested for J minute at 2000 Volt DC
 - b) Oil leakage test on transformer

8.2.1 Type Test Report Submission

The bidder should submit the report of following tests carried out in a NABL accredited laboratory:-

- a) Tan delta measurement and capacitance of each winding to earth (with all other windings earthed) & between all windings connected together to earth.
- b) Measurement of Zero sequence impedance.
- c) Temperature Rise Test
- d) Short Circuit Test
- e) Impulse Test
- f) Tank Vacuum test
- g) Tank Pressure Test
- h) Lightning impulse withstand test for line and neutral terminal.
- i) Measurement of acoustic noise level.
- j) The above type tests will be conducted by the supplier at their own cost, if the design/ test result of the type- tested transformer differs from those of the offered transformer as per their bid.

8.2.2 STAGE INSPECTION

The supplier shall offer the core, windings and tank of each transformer for inspection by the purchaser's representative(s). During stage inspection, all the measurements like diameter, window height, leg centre, stack width, stack thickness, thickness of laminations etc. for core assembly, conductor size, insulation thickness, 1.0., 0.0, winding height, major and minor insulations for both H.V and L.V windings, length, breadth, height and thickness of plates of Transformer tank, the quality of fittings and accessories will be taken / determined. The supplier can offer for final inspection of the transformers subject to clearance of the stage inspection report by the purchaser.

8.2.3 Routine Tests

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Transformer routine tests shall include tests stated in latest issue of IS: 2026 (Part -1). These tests shall also include but shall not be limited to the following:

- i) Measurement of winding DC resistance.
- ii) Voltage ratio on each tapping and check of voltage vector relationship.
- iii) Impedance voltage at all tapings.
- iv) Magnetic circuit test as per relevant ISS or CBIP manual or latest standard being followed.
- v) Load losses at normal tap and extreme taps.
- vi) No load losses and no load current at rated voltage and rated frequency, also at 100% to 112.5 % of rated voltage in steps.
- vii) Absorption index i.e. insulation resistance for 15 seconds and 60 seconds (R 60 / R 15) and polarization index i.e. Insulation Resistance for 10 minutes and one minute (R 10 mt / R 1 mt).
- viii) Induced over voltage withstand test.
- ix) Separate source voltage withstand test.
- x) Tan delta measurement and capacitance of each winding to earth (with all other windings earthed) & between all windings connected together to earth.
- xi) Measurement of zero sequence impedance
- xii) Tests on on-load tap changer (fully assembled on transformer) as per IEC : 214/ 1976 and BS: 4571/1970.
- xiii) Auxiliary circuit tests
- xiv) Oil BDV tests
- xv) Measurement of neutral unbalance current which shall not exceed 2% of the full rated current of the transformer.
- xvi) Magnetic balance test
- xvii) Vector group test.
- xviii) Leakage test.

Six (6) set of certified test reports and oscillographs shall be submitted for evaluation prior to dispatch of the equipment. The contractor shall also evaluate the test results and shall correct any defect indicated by his and Purchaser's evaluation of the tests without charge to the Purchaser.

8.4 TANK TESTS

a) Oil leakage Test:

The tank and oil filled compartments shall be tested for oil tightness completely filled with air or oil of viscosity not greater than that of insulating oil conforming to IS : 335 at that ambient temperature and applying a pressure equal to the normal pressure plus 35 KN/ m² measured at the base of the tank. The pressure shall be maintained for a period of not less than 12 hours of oil and one hour for air and during that time no leak shall occur.

b) Pressure Test

Where required by the Purchaser, one transformer tank of each size together with its radiator, conservator vessel and other fittings shall be subjected to a pressure corresponding to twice the normal head of oil or to the normal pressure plus 35 KN/m² whichever is lower, measured at the base of the tank and maintained for one hour.

c) Vacuum Test

One transformer tank of each size shall be subjected to the vacuum pressure of 6() mm of mercury. The tanks designed for full vacuum shall be tested at an internal pressure of 3.33 KN/m² (25 mm of mercury) for one hour. The permanent deflection of flat plates after the vacuum has been released shall not exceed the value specified in C.B.I.P. Manual on Transformers (Revised 1999) without affecting the performance of the transformer.

8.5 INSPECTION AND TESTING AT SITE

The Engineer authorized from CSO office along with the site engineer shall carry out detailed inspection and routine test for measurement of losses and Impedances covering areas right from the receipt of material up to commissioning stage. An indicative program of inspection will be communicated during commissioning.

8.6 Receipt and Storage Checks

- i) Check and record conditions of each package visible parts of the transformers etc for any damage.
- iii) Visual check of core and coils before filling up with oil and also check condition of core and winding in general.

8.6.1 Installation Checks

- i) Inspection and performance testing of accessories like tap changers etc.
 - ii) Check choking of the tubes of radiators.
- Test on oil samples taken from main tank tap and bottom and cooling system. Samples should be taken only after the oil has been allowed to settle for 24 hours.
- Check the whole assembly for tightness, general appearance etc.
- Oil leakage tests.

8.6.2 Pre-Commissioning Tests

After the transformer is installed, the following pre-commissioning tests and checks shall be done before putting the transformer in service.

- i) Dry out test
 - ii) Insulation resistance Test
- DC Resistance measurement of windings
Ratio test on all taps
Phase relationship test (Vector grouping test)
Buchholz relay alarm & surge operation test
Low oil level (in conservator) alarm
Temperature Indicators
Marshalling kiosk
Protective relays
Magnetizing current

8.6.3 The following additional checks shall be made:

- i) All oil valves are incorrect position closed or opened as required All air pocket are cleared.
 - ii) Thermometer pockets are filled with oil.
 - iii) Oil is at correct level in the bushing, conservator, diverter switch & tank etc.
- Earthing connections are made.
Colour of Silica gel is blue.
Bushing arcing horn is set correctly and gap distance is recorded.
C T polarity and ratio is correct.

8.7 PERFORMANCE

The performance of the transformer shall be measured on the following aspects.

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- i) The transformer shall be capable of being operated without danger on any tapping at the rated KV A with voltage variations of $\pm 10\%$ corresponding to the voltage of the tapping.
- ii) Radio interference and Noise Level
The transformer shall be designed with particular attention to the suppression of third and fifth harmonics so as to minimize interference with communication circuits.

8.8 FAULT CONDITIONS

- a) The transformer shall be capable of withstanding for two (2) seconds without damages any external short circuit to earth.
- b) Transformer shall be capable of withstanding thermal and mechanical stresses conveyed by symmetrical or asymmetrical faults on any winding. This shall be demonstrated through calculation as per IS : 2026.
- c) Transformer shall accept, without injurious heating, combined voltage and frequency fluctuation which produce the 125% over fluxing condition for one minute.
- d) Certified test report and oscillographs shall be furnished to the Purchaser /Consultant for evaluation as per the schedule of distribution of documents. The Contractor shall also evaluate the test results and rectify the defects in the equipment based on his and the Purchaser's evaluations of the tests without any extra charges to the Purchaser. Manufacturer's Test Certificates in respect of all associated auxiliary and ancillary equipment shall be furnished
- e) The bidder shall state in his proposal the testing facilities available at his works. In case full testing facilities are not available, the bidder shall state the method proposed to be adopted so as to ascertain the transformer characteristics corresponding to full capacity testing.

8.9 WITNESSING OF TESTS AND EXCESSIVE LOSSES

- i) The purchaser and or his representative reserve the right to witness any or all test for all transformers.
- ii) The Purchaser reserves the right to reject the Transformer if losses exceed the maximum specified in the technical specification or if temperature rises of oil and winding exceed the values specified.

9. CAPITALISATION OF LOSSES AND LIQUIDATED DAMAGES FOR EXCESSIVE LOSSES

9.1 LOSSES:

Transformer with lower losses shall be preferred. The bidder shall indicate the values of load and no load losses of the transformer in his bid.

9.2 CAPITALIZATION OF LOSSES

For total cost evaluation, the capitalized cost of losses will be taken into account as per the following:

Capitalized Cost of Transformer = Cost of Transformer (as per Bid) + A x W_i + B x W_e

- a. Where W_i = No Load losses in KW & A = Rs. 1, 52,847.00 for no load losses.
- b. W_e = Load losses in KW & B = Rs. 20,175.00 for load losses.

The no load loss in KW at rated voltage & frequency and the load loss in KW at rated current, rated frequency, rated output and at 75^o C shall be quoted and these figures shall be guaranteed.

9.3 LIQUIDATED DAMAGE

Liquidated damages for non-performance of transformers shall be recovered from the supplier in case he is unable to achieve the quoted guaranteed loss figures at the rate equivalent to the double of the rate considered for evaluation i.e. at the following rates:

- a) For each KW of excess in no load losses: Rs. 3,05,694.00
- b) For each KW of excess in load losses: Rs. 40,350.00

However, the transformer(s) shall be rejected out rightly, if any of the losses i.e. no load loss or load loss or both exceed (s) the specified maximum permissible loss as mentioned in the technical specification.

10.0 SPARE PARTS

In case the manufacturer goes out of production of spare parts, then he shall make available the drawings of spare parts and specification of materials at no extra cost to the Purchaser to fabricate or procure spare parts from other sources.

10.1 Mandatory Spare Parts

The suppliers shall provide the following mandatory spares for each of Transformer supplied.

- a) H.V & LV Bushing - Each 1 No with each transformer
- b) Bimetallic connector - 1 complete set for HT & LT beside the set provided with transformer

10.2 INSTRUCTION MANUAL

Eight sets of the instruction manuals shall be supplied at least four (4) weeks before the actual dispatch of equipment. The manuals shall be in bound volumes and shall contain all the drawings and information required for erection, operation and maintenance of the transformer. The manuals shall include amongst other, the following particular:

- a) Marked erection prints identifying the components, parts of the transformer as dispatched with assembly drawings.
- b) Detailed dimensions, assembly and description of all auxiliaries.
- c) Detailed views of the core and winding assembly, winding connections and tapings tap changer construction etc. These drawings are required for carrying out overhauling operation at site.
- d) Salient technical particulars of the transformer.
- e) Copies of all final approved drawings.
- f) Detailed O&M instructions with periodical check lists and Performa etc.

10.3 COMPLETENESS OF EQUIPMENT

All fittings and accessories, which may not be specifically mentioned in the specification but which are necessary for the satisfactory operation of the transformer, shall be deemed to be included in the specification and shall be furnished by the supplier without extra charges. The equipment shall be complete in all details whether such details are mentioned in the specification or not, without any financial liability to the Purchaser under any circumstances.

11.0 COMMISSIONING

The equipments shall be commissioned as per CBIP manual, IS: 10028 and manufacturer's recommendations. All the related drawings and manuals shall be pre-requisite for release of final payment.

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12.0 NON COMPLIANCE SCHEDULE

On this schedule the bidder shall provide a list of non compliance with this specification, documenting the effects that such non compliance is likely to have on the equipment's life and operating characteristics. Each Non Compliance shall refer to the relevant clause of the specification.

Where there are no deviations from specifications, the bidder shall so indicate by stating "No deviations" in this schedule.

Clause No.	Non Compliance

13.0 Type Test Certificates Schedule

13.1 On this schedule a list of the test certificates included with the bid shall be provided. Each certificate listed shall be referred to the relevant specification clause and item of equipment to which the test applies.

Sl. No.	Particular of Test	Type Test Certificate Ref	Year of Test

13.2 In case of any doubt in the Type test reports submitted by the bidder, the Purchaser reserves the right to verify the original Type Test Reports, as well as to refer to the concerned laboratory directly without recourse to be bidder.

VOLUME- II

(SAMPLE FORMS)

2009-2010

(Tender Notification: CSO/27/Power Transformer)

Date: 23.10.2009

BID FORM

DESIGN & SUPPLY OF POWER TRANSFORMER TO WESCO/ NESCO/ SOUTHCO

To
**Central Services Office
(NESCO, WESCO & SOUTHCO)
Plot No. N-1/22, Nayapalli
Bhubaneswar – 751 015**

Sir,

1. We understand that NESCO/WESCO/SOUTHCO is desirous of procuring 3.15 MVA / 5 MVA / 8 MVA Power Transformers in their respective licensed distribution network area in the state of Orissa.
2. Having examined the Bidding Documents for the above named works, we the undersigned, offer to deliver the goods in full conformity with the Drawings, Conditions of Contract and specifications for the sum of..... (figures.....) or such other sums as may be determined in accordance with the terms and conditions of the contract. The above amounts are in accordance with the Price Schedules attached herewith and are made part of this bid.
3. If our Bid is accepted, we undertake to deliver the entire goods within 120 days (4 months) from the date of award of purchase order/letter of intent.
4. If our Bid is accepted, we will furnish a performance bank guarantee for an amount of 10% (Ten) percent of the total contract value for due performance of the Contract in accordance with the General Conditions of Contract.
5. We agree to abide by this Bid for a period of 120 days from the date fixed for bid opening under clause 9.0 of GCC, and it shall remain binding upon us and may be accepted at any time before the expiration of that period.
6. We declare that we have studied the provision of Indian Income Tax Law and other Indian Laws for supply of equipments/materials and the prices have been quoted accordingly.
7. Unless and until Letter of Intent is issued, this Bid, together with your written acceptance thereof, shall constitute a binding contract between us.
8. We understand that you are not bound to accept the lowest, or any bid you may receive.
9. There is provision for Resolution of Disputes under this Contract, in accordance with the Laws and Jurisdiction of Contract, Clause 19 of GCC.

Dated this..... day of..... 20.....

Signature..... In the capacity of

.....duly authorized to sign for and on behalf of

(IN BLOCK CAPITALS).....

FORMAT FOR BID SECURITY BANK GUARANTEE

(To be issued in a Non Judicial Stamp Paper of Rs. 50/- purchased in the name of the bank)

Whereas [name of the Bidder] (hereinafter called “the Bidder”) has submitted its bid dated [date of submission of bid] for the supply of [name and/or description of the goods] (hereafter called “the Bid”).

KNOW ALL PEOPLE by these presents that WE [name of bank] at [Branch name and address], having our registered office at [address of the registered office of the bank] (hereinafter called “the Bank”), are bound unto North Eastern Electricity Company of Orissa Ltd., with it’s Registered Office at Plot No-N-1/22,Nayapalli, Bhubaneswar – 751 015, (hereinafter called “the Purchaser”) in the sum of Rsfor which payment well and truly to be made to the said Purchaser, the Bank binds itself, its successors, and assigns by these presents. Sealed with the Common Seal of the said Bank this ____ day of _____ 20____.

THE CONDITIONS of this obligation are:

1. If the Bidder withdraws its Bid during the period of bid validity specified by the Bidder on the Bid Form; or
2. If the Bidder, having been notified of the acceptance of its Bid by the Purchaser during the period of bid validity:
 - (a) fails or refuses to execute the Contract Form, if required; or
 - (b) fails or refuses to furnish the performance security, in accordance with the Instructions to Bidders/ GENERAL CONDITIONS.;

We undertake to pay to the Purchaser up to the above amount upon receipt of its first written demand, without the Purchaser having to substantiate its demand, provided that is its demand the purchaser will note that amount claimed by it is due to it, owing to the occurrence of one or both of the two conditions, specifying the occurred condition or conditions.

This guarantee will remain in force up to and including thirty (30) days after the period of bid validity, and any demand in respect thereof should reach the Bank not later than the above date.

(Signature of the bank)

Signature of the witness

Registered Office of NESCO, WESCO & SOUTHCO

ROFORMA FOR COMPOSITE PERFORMANCE BANK GUARANTEE

(To be issued in a Non Judicial Stamp Paper of Rs. 50/- purchased in the name of the bank)

Bank Guarantee No.....
Date.....
Ref.....

To

NESCO/ WESCO /SOUTHCO (As the case may be)

Registered Office at:

**Plot No.: N-1/22, Nayapalli ,
Bhubaneswar – 751 015**

Dear Sirs,

In consideration of the (WESCO/NESCO/SOUTHCO) here in after termed as "Purchaser" having awarded to M/s. with its Registered Office/Head Office at..... (Hereinafter referred to as the 'Contractor' which expression shall unless repugnant to the context meaning thereof, include its successors administrators, executors and assigns), a Contract by issue of Letter of Award No.dated.....and the same having been acknowledged by the Contractor, valued for.Rs.....and the Contractor having agreed to provide a Composite Performance Guarantee for the faithful performance of the entire Contract including guarantee & warrantee obligation equivalent to 10% (Ten Percent) of the said value of the Contract to the Purchaser.

We.....(Name & Address of the Bank) having its Registered Office at..... hereinafter referred to as the 'Bank', which expression shall, unless repugnant to the context or meaning thereof, include its successors, administrators, executors and assigns) do hereby Guarantee and undertake to pay the Purchaser, on demand any and all monies payable by the Contractor to the extent of.....**.....as aforesaid at any time upto(days/month/year) without any demur, reservation, contest, recourse or protest and/or without any reference to the Supplier. Any such demand made by the Purchaser on the Bank shall be conclusive and binding notwithstanding any difference between the Purchaser and the Contractor or any dispute pending before any Court, Tribunal, Arbitrator or any other authority. The Bank undertakes not to revoke this Guarantee during its currency without previous consent of the Purchaser and further agrees that the Guarantee herein contained shall continue to be enforceable till the Purchaser discharges this Guarantee.

The Purchaser shall have the fullest liberty without affecting in any way the liability of the Bank under this Guarantee, from time to time to extend the time for performance of the Contract by the Contractor. The Purchaser shall have the fullest liberty, without affecting this Guarantee, to postpone from time to time the exercise of any powers vested in them or of any right which they might have against the Contractor, and to exercise the same at any time in any manner, and either to enforce or to forbear to enforce any covenants, contained or implied, in the Contract between the Purchaser and the Contractor or any other course or remedy or security available to the Purchaser. The Bank shall not to be released of its obligations under these presents by any exercise by the Purchaser of its liberty with reference to the matters aforesaid or any of them or by reason of any other act of forbearance or other acts of omission or commission on the part of the Purchaser or any other

Registered Office of NESCO, WESCO & SOUTHCO

indulgences shown by the Purchaser or by any other matter or thing whatsoever which under law would, but for this provision have the effect of relieving the Bank.

The Bank also agrees that the Purchaser at its option shall be entitled to enforce this Guarantee against the Bank as a principal debtor, in the first instance without proceeding against Supplier and notwithstanding any security or other Guarantee the Purchaser may have in relation to the Contractor's liabilities.

Notwithstanding anything contained hereinabove our liability under this Guarantee is restricted toand it shall remain in force upto and including and shall be extended for such period, as may be desired by M/s..... on whose behalf this Guarantee has been given.

Dated this..... day of 20..... At.....

WITNESS

(Signature)..... (Signature).....

(Name)..... (Name).....

..... (Official Address)
(Designation with Bank Stamp)

Attorney as per Power of Attorney No.....
Dated.....

NOTE:

1. **The date will be ninety (90) days after the end of Warranty Period as specified in the Contract.
2. The stamp papers of appropriate value shall be purchased in the name of issuing bank.
3. Performance security is to be provided by the successful bidder in the form of a bank guarantee, which should be issued by any Scheduled Bank.

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Annexure-III

TENDER NOTICE NO. CSO/26/Power Transformer dtd.21.10.2009, Due date of opening 04.11.2009

Price Schedule for Goods Offered

Name of Bidder -----Page -----Of-----

1	2	3	4	5							6	7
S I. N o.	Item Description	Tender Qty (In Nos.)	Offered Qty(In Nos)	Price for KM (In Rs.)							Unit Price (a+b+c+d+e+f+g)	Total Price (col.4x6) (In Rs.)
				Ex-works	Excise Duty Amnt. @ of	Sales Tax/VAT Amnt. @ of with Surcharge (If any)	Packing & Forwarding	Inland transportation, insurance & other local costs incidental to delivery	Entry Tax @ of.	Any other taxes & duties		
				(a)	(b)	(c)	(d)	(e)	(f)	(g)		

Signature of Bidder-----

- Note:** 1) In case of discrepancy between unit price & total, the unit shall prevail.
 2) Uniform Price Schedules shall have to be enclosed for supply to three companies, WESCO, NESCO & SOUTHCO. f
 In case of submission different price schedules, lowest rate shall be considered.

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ANNEXURE - IV					
COST DATA					
Sl. No.	PARTICULARS	UNIT	UNIT RATES (RS.)	QTY.	AMT (Rs)
1.	CORE (M4 or better)	KG			
2.	ALLUMINIUM / COPPER WITH DPC	KG			
3	INSULATION PAPER	Meter			
4.	OIL	LTRS			
5.	TANK	Kg			
6.	CHANNELS	KG			
7	INSULATORS / BUHIUNGS	NO			
8	Radiators	No			
9	OTHERS	LUMP SUM			
				TOTAL	
	WASTAGE @%				

Guaranteed Technical Data Schedule for 33/11 KV Three Phase Power Transformer (To be furnished by the bidder)

Sl. No.	Description	3.15 MVA	5 MVA	8 MVA
1.	Name and address of the Manufacturer			
a)	Transformer			
b)	HV & LV Bushings			
c)	Bimetallic connectors			
d)	Transformer Oil			
e)	Of load tap changer			
f)	Instruments			
2.	Service (Indoor / Outdoor)			
3.	Normal continuous rating in KV A under site conditions at all taps:			
a)	HV winding (KVA)			
b)	LV winding (KVA)			
4.	Rated Voltage			
a)	HV winding (KV)			
b)	LV winding (KV)			
5.	Rated frequency (Hz)			
6.	No. of phases			
7.	Type of transformer			
8.	Connections			
a)	HV winding			
b)	L V winding			
9.	Connections symbols			
	HV - LV			
10.	Tapings			
a)	Range			
b)	Number of steps			
c)	Position of tapping on HT winding for high voltage variation			
11.	Reference ambient temperatures			
a)	Maximum ambient air temperature CC)			
b)	Maximum daily average ambient temperature (°C)			
c)	Minimum ambient air temperature (°C)			
d)	Maximum yearly weighted average ambient temperature (°C)			
12.	Maximum temperature rise over ambient temperature			
a)	In oil by thermometer (°C)			
b)	In winding by resistance measurement (DC)			
c)	Limit for hot spot temperature for which the transformer is designed (° C)			
d)	Type and details of winding hot spot temperature detector (DC).			
e)	Temperature gradient between windings and oil (°C)			

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f)	Type of maximum winding temperature indicator (°C)			
13.	Voltage to earth for which the star point will be insulated			
14.	Cooling type			
15	Losses (Should be same with the type test report from NABL accredited laboratory submitted along with the Bid.)			
a)	Fixed (Iron) losses of 3 phase Transformer (KW) at rated voltage & rated frequency (KW)			
b)	Load losses at rated current at principal Tap at 75° C (KW)			
16	Max. Current density in winding at rated current for normal tap position			
a)	HV winding (Amps/ sq.mm.)			
b)	LV winding (Amps / sq.mm.)			
17.	Impedance voltage at rated current, frequency and at 7So C expressed as percentage of rated voltage at :-			
a)	Principal (normal) tap (%)			
b)	Highest tap (%)			
c)	Lowest tap (%)			
18.	Reactance at rated current & frequency as percentage of rated voltage at:			
a)	Principal (normal) tap			
b)	Highest Tap			
c)	Lowest Tap			
19.	Resistance at 7So C			
a)	H.V. winding at normal tap position			
b)	L.V. winding			
c)	Resistance voltage drop at 7So C winding temperature expressed as percent of rated voltage (%)			
	i) Principal! normal tap			
	ii) Highest tap			
	iii) Lowest tap			
20.	Capacitance on open circuit conditions			
21.	Insulation level			
a)	Separate source power frequency voltage withstand			
	i) HV winding (KV rms)			
	ii) LV winding (KV rms)			
b)	Induced over voltage withstand			
	i) HV winding (KV rms)			
	ii) LV winding (KV rms)			
c)	Full wave lightning impulse withstand voltage			
	i) HV winding (KV peak)			
	ii) LV winding (KV peak)			
d)	Power frequency high voltage tests			
	i) Test voltage for one minute withstand test on high voltage windings (induced)			
	ii) Test voltage for one minute withstand test on low voltage windings			
	iii) Test voltage for one minute withstand test on neutral end of low voltage windings			
e)	Lightning impulse withstand tests			
	i) Impulse test on high voltage winding 1.2/50 1-1 sec full wave withstand (KV peak)			

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	ii) Impulse test on low voltage winding 1.2/50 1-1 sec full wave withstand (KV peak)			
	iii) Wave form for impulse test			
22.	No load current, no load loss, no load power factor at normal ratio and frequency (Amp/ KW/ P.F.)			
a)	10 percent of rated voltage			
b)	25 percent of rated voltage			
c)	50 percent of rated voltage			
d)	85 percent of rated voltage			
e)	100 percent of rated voltage			
f)	105 percent of rated voltage			
g)	110 percent of rated voltage			
h)	112.5 percent of rated voltage			
i)	115 percent of rated voltage			
j)	120 percent of rated voltage			
23.	Efficiency at 75° C at unity power factor			
a)	Full load			
b)	75% load			
c)	50% load			
d)	25% load			
24	The minimum voltage of load at which the transformer will run at			
a)	Maximum efficiency (%)			
b)	Maximum efficiency of the transformer			
25.	Regulation at full load at 75° C			
a)	At unity power factor (%)			
b)	At 0.8 power factor (lagging) (%)			
26.	Core data			
a)	Grade of core material used			
b)	Thickness of core plate lamination (mm)			
c)	Whether core laminations are of cold rolled grain oriented			
d)	Details of oil ducts in core			
	i) Whether in the plane & at right angle to the plane of winding			
	ii) Across the plane of lamination			
e)	i) Insulation of core lamination			
	ii) Insulation of core plates			
	iii) Type of core joints			
27.	Flux density			
a)	Designed maximum flux density at normal tap at rated voltage and rated frequency (Tesla)			
b)	Operating continuous flux density (Tesla)			
	i) at normal tap			
	ii) at maximum tap			
	iii) at minimum tap			
c)	Designed maximum operating flux density which the transformer can withstand for one minute at normal tap (Tesla)			
d)	Designed maximum operating flux density which the transformer can withstand for five seconds at normal tap (Tesla)			
28	Inter- Tap insulation			

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a)	Extent of extreme end turns reinforcement			
b)	Extent of end turns reinforcement			
c)	Extent of turn adjacent to tapping reinforced			
d)	Test voltage for 10 seconds 50Hz inter-turn insulation test on (a)			
e)	Test voltage for 10 seconds 50Hz inter-turn insulation test on (b)			
f)	Test voltage for 10 seconds 50Hz inter-turn insulation test on (c)			
29.	Windings:			
a)	Material			
b)	Type of windings:			
	i) HV windings			
	ii) LV windings			
c)	Insulation of HV windings			
d)	Insulation of LV windings			
e)	Insulation between HV & LV windings			
30	Continuous rating under following conditions:			
a)	At 40°C ambient air temp. at site			
b)	At 30°C ambient air temp. at site			
c)	At 20°C ambient air temp. at site			
31	Transformer Tank			
a)	Material			
b)	Thickness			
	Top			
	Sides			
	Bottom			
c)	Details of painting (inner / outer surface)			
32	Dimensions of 3 phase transformers:			
a)	Max. Height to top of bushings (mm)			
b)	Over-all length (mm)			
c)	Over-all breadth (mm)			
33	Weight data of transformer components: (Tolerance + 5%) (approximate values not allowed)			
a)	Core excluding clamping (Kg)			
b)	Core with clamping (Kg)			
c)	HV winding insulated conductor (Kg)			
d)	LV winding Insulated conductor (Kg)			
e)	Coils with insulation (Kg.)			
t)	Core and windings (Kg)			
g)	Weight of steel (Kg)			
h)	Fittings and accessories (Kg)			
i)	Oil required for first filling including 10% extra (ltrs I Kg)			
	1. Oil in main tank (Ltrs)			
	2. Oil in the conservator (Ltrs)			
	3. Oil in the radiators (Ltrs)			
	4. Overall total quantity of oil with 10% extra oil for first filling (ltrs I Kg)			
j)	1. Transportation weight excluding accessories (Kg)			
	2. Shipping details			
	i) Weight of heaviest package (Kg.)			

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	ii) Dimension of largest package (Kg)			
k)	Un tanking weight (Kg)			
l)	Total weight of transformer with oil and fittings (Kg)			
34	Bushing data:			
a)	Type of bushing insulator			
	i) HV			
	ii) LV	-		
	iii) Neutral			
b)	Material of bushing (inner part outer part)			
c)	Weight of bushing insulator (Kg.)			
d)	Quantity of oil in one bushing (lt.)			
e)	Minimum dry withstand & flash over power frequency voltage of bushing (KV)			
t)	Minimum wet withstand & flash over power frequency voltage of bushing (KV)			
g)	Minimum withstand & flashover impulse level (KV)			
h)	Voltage rating (KV)			
i)	Current rating (Amps.)			
j)	Thermal Short Time current & Duration			
k)	Rated Dynamic current & its duration			
l)	Cantilever with stand loading			
m)	Clearance in oil			
	phase to phase (mm)			
	phase to earth (mm)			
n)	Creep age distance in oil & air (mm)			
o)	Minimum level of immersing! medium (oil) (mm)			
p)	Maximum pressure of immersing medium (oil) Kg! cm2			
q)	Free space required at top for removal of bushings (mm)			
r)	Angle of mounting			
35	Conservator (Main Transformer)			
a)	Total volume of the Conservator (Cub mtr/ Ltrs.)			
b)	Volume of the conservator between the highest and lowest level (Cubic mtr. / Ltrs)			
36.	Calculated time constants for natural cooling			
37.	Type of axial coil supports:			
a)	HV winding			
b)	LV winding			
38	Details of Off-circuit tap changer			
a)	Make			
b)	Type			
c)	Rating			
	i) Rated Voltage			
	ii) Rated current			
	iii) Step voltage			
	iv) Number of steps			
d)	Whether Diverter switch provided with gas vent and buchholz relay (Yes! No)			
e)	Whether a separate oil surge relay with trip contacts provided (Yes! No)			

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f)	Pressure relief valve			
39	Dispatch details:			
a)	Approx. mass of heaviest Package (Kg)			
b)	Approx. dimensions of largest Package			
	i) Length (mm)			
	ii) Breadth (mm)			
	iii) Height (mm)			
40.	Un-tanking height (mm)			
41.	Bimetallic connectors HV/LV			
a)	Normal current rating (A)			
b)	Short time current rating (A)			
c)	Tensile strength (Kg)			
d)	Maximum temperature limit			
e)	Dimensional sketch enclosed indicating tolerances (Yes/No)			
f)	Minimum clearance (mm)			
	Phase to phase			
	Phase to Earth			
42	CORE ASSEMBLY :-			
a)	Core diameter (mm)			
b)	Core window height (mm)			
c)	Core leg centre (mm)			
d)	Gross core cross - sectional area (mm ²)			
e)	Total height of core (mm)			
f)	Details of top end frame			
g)	Details of Bottom end frame			
h)	Details of clamp plate (material, thickness, insulation)			
i)	Total core weight (Kg)			
j)	Core loss, basing on core loss graph at operating flux density (rated voltage and rated frequency) (KW)			
k)	Core stacking factor			
l)	Net core area (Sq.mm)			
m)	Margin towards corner joints, cross-fluxing, dielectric loss (KW)			
n)	Total core loss at rated voltage and rated frequency (KW)			
o)	Describe location / method of core grounding			
p)	Details of core- belting			
	i) Material, grade and type			
	ii) Width			
	iii) Thickness			
	iv) Fixing method			
43	DETAILS OF WINDING			
a)	Type of winding			
b)	Material of the winding conductor			
c)	Maximum current density of windings at rated current and conductor area			
d)	Whether windings are pre-shrunk ?			
e)	Whether adjustable coil clamps are provided for HV and LV Windings?			
f)	Whether steel rings are used for the windings? If so, whether these are split?			
g)	Whether electrostatic shields are provided to obtain uniform voltage Distribution in the windings?			
h)	Winding Insulation (Type & Class)			
i)	Insulating material, used for			

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	i) H.V winding			
	ii) LV winding			
	iii) Tapping connection			
j)	Insulating material used between			
	i) L.V and H.V winding			
	ii) Core & L.V winding			
k)	H.V to H.V winding between phases			
l)	Type of axial supports			
	i) H. V winding			
	ii) L.V winding			
m)	Type of radial supports			
	i) H.V winding			
	ii) L.V winding			
n)	Maximum allowable torque on coil clamping bolts			
o)	Clamping ring details			
	i) Thickness of ring mm			
	ii) Diameter of ring mm			
	iii) No. & size of pressure screw			
p)	Bare conductor size (mm ²)			
	i)HV			
	ii)LV			
q)	Insulated conductor size (mm ²)			
	i)HV			
	ii)LV			
r)	No. of conductor in parallel (Nos.)			
	i) HV			
	ii) LV			
s)	No. of turns / phase			
	i)HV			
	ii)LV			
t)	No. of discs / phase			
	i)HV			
	ii) LV			
u)	No. of turns / Disc			
	i)HV			
	ii)LV			
v)	Gap between discs (mm)			
	i)HV			
	ii) LV			
w)	Inside diameter (mm)			
	i) HV			
	ii) LV			
x)	Outside diameter (mm)			
	i)HV			
	ii)LV			
y)	Axial height after shrinkage (mm)			
	i)HV			
	ii) LV			
z)	D.C Resistance			
i)	L.V winding at 75u C (Ohms)			
ii)	H.V winding at normal tap at 75° C (Ohms)			
iii)	H.V winding at highest tap at 75° C (Ohms)			
iv)	H.V winding at lowest tap at 75° C (Ohms)			

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v)	Total I ² R losses at 75° C for normal tap (KW)			
vi)	Total I ² R losses at 75° C for highest tap (KW)			
vii)	Total I ² R losses at 75°C for lowest tap (KW)			
viii)	Stray losses including eddy current losses in winding at 75°C (KW)			
	a) Normal tap position			
	b) Highest tap position			
	c) Lowest tap position			
	d) Any special measures, taken to reduce eddy current losses and Stray losses. Mention in details			
ix)	Load losses at 75°C (I ² R + Stray)			
	a) Normal tap position (KW)			
	b) Highest tap position (KW)			
	c) Lowest tap position (KW)			
x)	Details of special arrangement, provided to improve surge voltage			
	Distribution in the windings.			
44.	DETAILS OF TANK:			
a)	Material of Transformer tank			
b)	Type of tank			
c)	Thickness of sheet (No approximate value to be mentioned)			
	i) Sides (mm)			
	ii) Bottom (mm)			
	iii) Cover (mm)			
	iv) Radiators (mm)			
d)	Inside dimensions of main tank (No approximation in dimensions to be used)			
	i) Length (mm)			
	ii) Breadth (mm)			
	iii) Height (mm)			
e)	Outside dimensions of main tank (No approximation in dimensions to be used)			
	i) Length (mm)			
	ii) Breadth (mm)			
	iii) Height (mm)			
f)	Vacuum recommended for hot oil circulation (torr / mm of Hg)			
g)	Vacuum to be maintained during oil filling in transformer tank (torr / mm of Hg)			
h)	Vacuum to which the tank can be subjected without distortion (torr / mm of Hg)			
i)	No. of bi-directional wheels provided			
j)	Track gauge required for the wheels			
	i) Transverse axis			
	ii) Longitudinal axis			
k)	Type and make of pressure relief device and minimum pressure at which it operates (Kpa)			
45	CONSERVATOR:-			
a)	Thickness of sheet (mm)			
b)	Size (Dia x length) (mm)			
c)	Total volume (Litres)			
d)	Volume between the highest and lowest visible oil levels (Litres)			

PAST PERFORMANCE DETAILS

Capacity of Transformer	FY	Name/Address of the Customer	Order Ref.	Order Qty.	Supply Qty.	Date of Supply	Performance Certificate Ref.
3.15 MVA	2004-05						
	2005-06						
	2006-07						
	2007-08						
	2008-09						
5 MVA	2004-05						
	2005-06						
	2006-07						
	2007-08						
	2008-09						
8 MVA	2004-05						
	2005-06						
	2006-07						
	2007-08						
	2008-09						

Note: 1) Copies of necessary documents in support of above details needs to be submitted along with the bid.
 2) The Purchaser reserves the right to make correspondence with the costumers regarding confirmation of any/all of the above facts.