

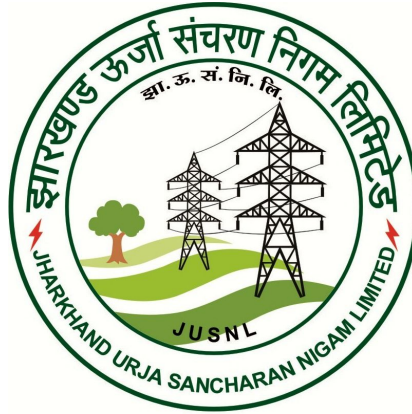
# **JHARKHAND URJA SANCHARAN NIGAM LIMITED**

OFFICE OF THE CHIEF ENGINEER (TRANSMISSION)

ENGINEERING BUILDING, DHURWA, RANCHI-834004

**NIT No 115/ PR/ JUSNL/ 2015 – 16**

**TECHNICAL SPECIFICATION AND GENERAL CONDITION FOR SUPPLY OF  
132/33 kV 50 MVA Power Transformer**



**N.I.T. NO. 115/ PR/ JUSNL/ 2015-16**

**LAST DATE & TIME OF RECEIPT OF TENDER PAPER : Upto 13.30 Hrs. on 10.09.2015**

**DATE OF OPENING OF TENDER (Part-I) : At 16.00 Hrs. on 10.09.2015**

SOLD TO M/S .....

.....

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**COST = Rs. 20,000/-**



# JHARKHAND URJA SANCHARAN NIGAM LIMITED

(CIN No. – U40108JH2013SGC001704)

Regd. Office – Engineering Building, H.E.C., Dhurwa, Ranchi – 834 004

**Fax No. – 0651 – 2400799**

## **TENDER NOTICE**

### **NIT No. 115/ PR / JUSNL/ 2015 – 16**

Sealed tender in two parts each in duplicate i.e. Techno & Commercial (Part-I) and Price Offer (Part – II) is invited from the manufactures having sound financial status for Design, Manufacturing, Supply, Testing & Commissioning of 132/33 kV 50 MVA Power Transformer as per specifications of NIT:

Sl#	Name of Material	Qty.	Cost of tender document (Rs.)	Earnest money (Rs.)	Period of sale of B.O.Q.	Date of submission of tender	Date of opening (Part-I)
01	50 MVA, 132/33 kV Power Transformer	10 Nos.	20,000/-	52.00 Lacs	18.08.2015 to 09.09.2015	10.09.2015 upto 13.30 Hrs.	On 10.09.2015 at 16.00 Hrs.

### **Terms & Conditions: -**

1. Tender document (BOQ) including terms & conditions, tender specification can be purchased from office of **Chief Engineer (Transmission)**, JUSNL, Ranchi on payment of cost of tender document (non – refundable) in shape of demand draft of any nationalized Bank in favour of **Accounts Officer, Jharkhand Urja Sancharan Nigam Limited**, payable at Ranchi.
2. Tender must be accompanied with earnest money mentioned against NIT in shape of Demand Draft / BG of any Nationalised Bank of India, payable at Ranchi in favour of “**Accounts Officer, Jharkhand Urja Sancharan Nigam Limited, Ranchi**” failing which tender will be rejected.
3. Tenderer must submit type tested certificate issued by any Govt. test bed of tendered material alongwith tender.
4. Request for issue/ submission of tender document by post / Courier will not be entertained.
5. Conditional and incomplete tenders shall not be accepted. Tender must be in conformity with our schedules.
6. Tenders received after due date and time of submission will not be entertained.
7. The tenderer must have Annual Turnover during any three years of the last five years of minimum Rs. 8.00 Crore in each year.
8. Quantity mentioned against above NIT’s may increase or decrease.
9. Tender document submitted by the firms must be paginated with initial and seal on each page.
10. JUSNL reserves the right to extend the date of sale/ submission/ opening of tenders or reject the tender without assigning any reason thereof, and also reserves the right to distribute the supply of materials among more than one supplier.

11. Black listed/ Ban on participation in any contract/ tender or any other pecuniary interest directly or indirectly in any construction work/ manufacture/ supply/ financial transaction pertaining to the Nigam by persons employed in the Nigam or their close/ blood relations/ proxies. The bidder should submit an affidavit as a proof in this regard.
12. For any clarification please contact mobile no. 9431102925 or visit our website [www.juvnl.in](http://www.juvnl.in)

Yours faithfully

Sd/-  
Chief Engineer (Transmission)

# **JHARKHAND URJA SANCHARAN NIGAM LIMITED**

## **ENGINEERING BUILDING, HEC, DHURWA, RANCHI-4**

**FAX NO. 0651 – 2400123**

### **General Terms and Conditions for Submission of Tender for Supply of Materials.**

Sealed tenders are invited in duplicate from reputed financially sounds and experienced manufacturers only having adequate Design, Manufacturing, Testing and Commissioning of 132/33 kV 50 MVA Power Transformer as per specifications attached offers of only those tenderers will be considered who will furnish valid ISO 9001 certificate, relevant type test certificate, whichever required, for the above materials on the date of opening of tender (Part – I).

**1. Quantity**

**10 (Ten) Nos. (Actual Quantity may Increase or Decrease)**

- 2.** The tender should be submitted in the prescribed enclosed proforma only in two parts i.e. Part – I (Technical & Commercial Part) and Part – II (Price Part) in two separate envelopes duly sealed and super scribed on the top of the envelopes as Technical and Commercial Part – I/ Price Part – II and addressed to Chief Engineer (Transmission), JUSNL Ranchi – 4. The name of the firm, NIT No., Due date, Name of materials offered, amount of earnest money deposited with money receipt no. and date should be clearly indicated on the cover of the envelop.
- 3.** Both parts of the sealed tenders will be received up to 13.30 hrs. of 10.09.2015 in the office of Chief Engineer (Transmission), JUSNL Ranchi and the Part – I will be opened at 16.00 hrs. on the due date in presence of such of those tenderers or their authorized representatives as may desire to be present. The undersigned may extend the due date of opening of Part – I with intimation to all tenderers.

The Price Part (Part–II) of those tenderers whose offers are found technically and commercially acceptable will be opened later on. The exact date will be intimated to the successful tenderers.

**No offers/ tenders will be accepted after due date and time.**

- 4.** The desirous tenderers can purchase tender documents including terms and conditions, B.O.Q. and technical specification from the office of Chief Engineer (Transmission), JUSNL Ranchi on payment of **Rs. 20,000/- (Rupees Twenty Thousand only)** in shape of demand draft issued by any Nationalized Bank in favour of **Accounts Officer, Jharkhand Urja Sancharan Nigam Limited**, payable at Ranchi. No tenders will be accepted/ considered unless the tenderer buy at least one copy of the tender documents by the prescribed date.

**5. Terms & Conditions: -**

1. Tender document (BOQ) including terms & conditions, tender specification can be purchased from office of **Chief Engineer (Transmission)**, JUSNL, Ranchi on payment of cost of tender document (non – refundable) in shape of demand draft of any nationalized Bank in favour of **Accounts Officer, Jharkhand Urja Sancharan Nigam Limited**, payable at Ranchi.
2. Tender must be accompanied with earnest money mentioned against NIT in shape of Demand Draft / BG of any Nationalised Bank of India, payable at Ranchi in favour of

**“Accounts Officer, Jharkhand Urja Sancharan Nigam Limited, Ranchi”** failing which tender will be rejected.

3. Tenderer must submit type tested certificate issued by any Govt. test bed of tendered material alongwith tender.
4. Request for issue/ submission of tender document by post / Courier will not be entertained.
5. Conditional and incomplete tenders shall not be accepted. Tender must be in conformity with our schedules.
6. Tenders received after due date and time of submission will not be considered.
7. Quantity mentioned against above NIT's may increase or decrease.
8. Tender document submitted by the firms must be paginated with initial and seal on each page.
9. JUSNL reserves the right to extend the date of sale/ submission/ opening of tenders or reject the tender without assigning any reason thereof, and also reserves the right to distribute the supply of materials among more than one supplier.
10. Firm should submit undertaking / affidavit in separate envelop at the time of submission of offer:
  - a. That the firm is not black listed by any firm/ PSU/ Govt.
  - b. That the directors of the firm have no direct / indirect blood relation / proxies or any relation with JUSNL/JUVNL/JVBNL/ JUUNL Employee.

**6. Earnest money:**

- a) Tender (Part – I) must be accompanied with an earnest money amounting to **Rs. 52.00 Lacs** (Rs. Fifty Two Lacs) as specified in the NIT unless exempted from such deposit, failing which the tender will be rejected and price part will not be opened.
- b) The earnest money should be deposited in form of Bank Guarantees of Nationalized Bank of India and reference be given on the cover of the tender/ mode indicated in NIT.
- c) Cheque/ Fixed Deposit receipt/ Money Order or and saving certificate etc. are not acceptable towards deposit of earnest money and tenders with above will be considered without earnest money.
- d) Earnest money deposited by firms against any other tender of the JUSNL/ or of this office will not be considered as earnest money for the present tender under any circumstances.
- e) **No earnest money will be accepted after opening of the tender.**
- f) The earnest money will be liable to be forfeited on revocation of tender before the validity of the quotations expire or on refusal to enter into a contract after the award is made to the tenderer.

## 7. **Exemption**

The tenderers of following categories are exempted from deposit of earnest money subject to the conditions laid down below: -

- a) SSI unit of Jharkhand permanently registered with the department of Industries, Govt. of Jharkhand for the tendered item supported by certified copy of their registration certificate.
- b) The firm registered with DGS&D for manufacture of the item for which tenders have been submitted and the registration certificate remain valid at the time of submission of the tender and/ or during contract period. The tender in such case should be accompanied with a certified Photostat copy of the valid registration certificate failing which the tender shall be rejected.
- c) The State Govt./ Govt. of India undertakings.
- d) Firms registered with NSIC under single point registration scheme for manufacture of the item, provided that certificate is valid on the date of tender and during the period of delivery.

**NB:** Aforementioned certificate must accompany with documentary evidence for its validity on the date of submission of tender/ period of delivery failing which tenders will be rejected.

## 8. **Security Deposit and Contract Agreement:**

The successful tenderers shall have to deposit security money @ 5% (five percent) of the ordered value at the time of executing the contract agreement. However, the SSI units of Jharkhand having permanent valid registration with Department of Industries, Govt. of Jharkhand for the manufacture of the item will be required to deposit security money @ 1% (one percent) of the ordered value. In no case exemption from security money will be granted. Security money to be deposited may be adjusted from the earnest money deposited, if any.

The amount of security money shall be deposited with the **Accounts Officer, JUSNL, Ranchi** in cash or in shape of Bank Draft/ Bank Guarantee as a performance guarantee. The security money thus deposited will be released after completion of satisfactory supply of materials and expiry of guarantee period. Payment will be made only after depositing the security money and execution of contract agreement.

## 9. **Delivery:**

Delivery should commence within **(04) four months** from the date of issue of Letter of Intent and minimum **two units monthly thereafter**.

## 10. **Penalty**

The delivery will be guaranteed under penalty. Our usual terms of penalty is 0.25% of the value of the materials delayed/ undelivered for a week or part thereof with maximum ceiling of 5%.

Equipment will be deemed to have been delivered only when all its component parts are also delivered in stores of JUSNL. If certain components are not delivered in time the equipment will be considered as delayed with such time as the missing parts are delivered.

**11. The JUSNL reserves the right to reject the lowest or any of the tender either in whole or in part without assigning any reason.**

**12. Price:** The price quoted should be **FIRM** and price must be quoted only in the JUSNL's prescribed proforma indicating therein ex-factory price, freight element up to destination, element of Excise Duty, Sales Tax and other charges. The Ex-works price shall be quoted after considering benefit under MODVAT or any other scheme to be retained by the supplier. The materials are to be dispatched to various destinations in Jharkhand as may be required. The responsibility of safe delivery will rest with the supplier. If the price elements are not quoted separately as indicated above, the tender will be liable for rejection. **Freight element will include loading, unloading at site, packing and forwarding etc. at manufacturer's works.**

Arithmetical errors will be rectified on the following basis. If there is discrepancy between unit price and the total price i.e. obtained by multiplying the unit price and quantity, the unit price shall prevail and total price shall be corrected. If the bidder does not accept the correction of errors, his bid will be rejected. If there is a discrepancy between words and figures, the amount in words shall prevail.

**13. Insurance:**

The materials are to be insured with JUSNL's underwriter under its open marine policy in all cases for which the supplier should complete the JUSNL's proforma and send the original to the Chief Claim Officer, JHARKHAND URJA SANCHARAN NIGAM LIMITED, Ranchi for taking over a policy with copy to the consignees and paying officers concerned at the time of dispatch of each consignment.

In case the materials are insured under the JUSNL's open policy the consignee concerned will take prompt action to lodge a claim with the Railway Authority and the Insurance Company with an intimation to the Chief Claim Officer of the JUSNL for the materials received short/ in damaged conditions and no recovery of the cost of such materials shall be effected from the supplier's bill except for sort supply for reason of defective packing or any other lapses on the part of consignor. If packing cases are found in intact conditions at the time of taking delivery and the materials therein are found short, the cost of



such materials shall be recovered from the supplier's bill. Similarly the supplier will be liable for compensation for defective packing.

**14. Import License.**

Import license can not be arranged by the JUSNL for such of these materials which are under banned category of import. When import is desired to be the tenderers under their own quota license, the value of quote specifically available against the tender should be stated. In case of availability suitable indigenous make materials the same may be preferred.

**15. Tests**

Tests will have to be conducted on the materials in case order is placed according to relevant standard and test certificate in triplicate will have to be furnished prior to supply of materials. Each lots of the materials shall be subjected to the test prescribed in the relevant standard (latest edition) before supply is affected. Untested material will not be accepted.

**16. (i) Inspection**

The materials are to be inspected by the JUSNL's representative during the process of manufacturing and prior to dispatch. The suppliers are requested to intimate the progress of manufacturing and testing at least 15 days in advance to Chief Engineer (Transmission), JUSNL, Ranchi to enable them to depute an officer or an authorized representative for inspection. Failure to adhere to the specification will entail rejection of materials. All tests and inspection shall be made at the place of manufacture unless otherwise specially agreed upon by the manufacture and purchaser at the time of purchase. The manufacturer shall offer the inspector representing the purchaser all reasonable facilities without charges to satisfy him that the materials cleared for dispatch after approval of inspection report should be dispatched/ delivered immediately to different consignees.

(ii) The purchaser has the right to have the tests carried out at his own cost by an independent agency whenever there is a dispute regarding the quality of supply.

(iii) During pre-dispatch inspection the firm shall have to produce original copy of type test report/ Calibration Certification of testing equipments from govt. laboratory/ BIS license/ NSIC, DGS&D or SSI registration certificate inspecting officer for verification. If there is any discrepancies found during verification the materials may not be accepted.

**17. Forfeiture of Earnest Money & Security Money Deposit:**

It should be clearly understood that in the event of the tenderers failing to accept and execute the telegraphic and detailed orders, if it is placed within the validity period of the offer, then the full amount of earnest money and security deposit will be forfeited and the JUSNL's decision in this respect will be final and binding on the tenderer.

**18. Guaranteed Particulars**

The performance particulars as required in the specifications should be sent along with the tender, other details not specified may also be given.

**19. Past Performance:**

The tenderer must submit performance certificate atleast 03 (three) nos. transformers of 50 MVA or higher rating for 3 years successful operation of similar or higher rating of 132/33 kV, 50 MVA power transformer manufactured & supplied by the tenderer to any organization of repute.

**20. Turn over criteria**

The tenderer must have Annual Turnover during any three years of the last five years of minimum **Rs. 8.00 Crore** in each year. The tenderer must submit balance sheet, Profit & Loss Account and Auditor's report in support of the above criteria.

**21. Departure from Specification**

Departure from specification of the tender, if any, should be specified in the offer.

**22. Sales Tax:**

Attested copies of up-to-date Sales Tax clearance certificate should accompany the tender failing which the tender will be rejected. State/ Central Sales Tax registration number of the tenderer should also be stated.

**23. Progress Report**

The suppliers will have to submit monthly progress report regularly until completion of delivery to the Chief Engineer (Transmission), JUSNL, Ranchi by the first week of every month following the month in which order is placed.

**24. Terms of Payment :**

(a) 100% payment will be made by Accounts Officer, Jharkhand Urja Sancharan Nigam Limited, Ranchi on submission of 5% Bank Guarantee of ordered value on non-judicial stamp Rs. 50/- (Rupees fifty) only valid for 24 months from the date of last supply and on receipt of SRV duly signed by the concerned consignee after receipt of the materials in good condition along with approved routine test certificate. However, Excise Duty part will be paid only after production of documentary evidence issued by Excise Department of their jurisdiction Sales Tax will be paid on submission of upto date sales tax clearance certificate by competent authority of respective department. The paying officer will accept the Bank Guarantee after confirmation from the concerned bank.

(b) If the Bank Guarantee is not furnished only 95% (ninety five percent) value of the materials will be paid and rest 5% (five percent) amount will be paid after 24 months from the date of receipt of the materials subject to satisfactory supply performance reported by each consignee.

**24. Validity Period.**

Tenderer should specify the validity period of their offer which should be for period of at least 180 (one hundred eighty) days from the date of opening of tender, which may be

extended on discretion of the JUSNL. The offers with lesser validity period may be out right rejected.

**26. Raw Materials**

No raw materials will be arranged by the JUSNL. Tenderers will have to arrange their requirements of raw materials themselves.

The purchaser reserves the right to inspect the raw material procured by the supplier for the purpose of manufacture of materials to check the genuineness of the raw materials. The purchaser or his representative can demand the original invoices in respect of all the raw materials. The manufacturer should have core cutting m/c installed in their works.

**27. Quantity:**

The requirement mentioned in the tender notice and general conditions is tentative and is subject to increase or decrease at the time of finalization of the tender.

**28.** In case the order is placed, the firm will have to dispatch the materials in the name of the consignee only and “self booking” will not be accepted.

**29. Jurisdiction of Court:**

The civil court Ranchi shall alone have an exclusive jurisdiction to decide any difference/ dispute/ cases for and against JUSNL/ Contractors/ Suppliers arising out of or in respect of the NIT, or contract agreement, or Purchase order.

**30. Contract Form:**

The successful tenderers will have to execute contract agreement in the JUSNL’s proforma prior to the placement of the purchase order. The contract agreement is to be executed on Rs. 100.00 non -judicial stamp paper.

**31. Extension Order:**

In the event of an order being placed on the tenderer, the tenderer requested to give his concurrence that he is willing to accept additional order are on the same terms and conditions if the extension order is placed by JUSNL within 6 (Six) month from the date of acceptance/ placement of order.

**32. Guarantee Period :**

The materials shall be guaranteed for satisfactory performance, against defective or low quality materials and bad workmanship for **Twenty Four Months** from the date of commissioning or **Thirty Months** from the date of delivery in stores. Whichever is earlier. If during the guarantee period the goods are found defective or defects in service the same will be replaced/ repaired by the supplier free of all the charge within one month on receipt of intimation. In case defective stores/ materials are not replaced/ rectified as per the guarantee clause, the JUSNL shall recover an equipment amount plus 15% (fifteen percent) supervision charges from any of the bills.

**33. Termination of Contract:**

In case the contractor/ supplier fails to deliver the materials or any consignment there of within contracted period of delivery or in case the materials are found not in accordance with the prescribed specification and samples the JUSNL shall exercise its discretionary power either:

A) To recover from the supplier the damages as provided in the penalty of general conditions of tender for supply.

**Or**

B) To Purchase elsewhere after giving due notice to the contractor on account and at the risk of contractor such material not so delivered or other of similar description without canceling the contract in respect of consignment not yet due for delivery.

**Or**

C) To cancel the contract reserving JUSNL's right to recover damages.

Notwithstanding the powers, under (a), (b), (c) referred above are in addition to the rights and remedy available to this JUSNL under the General Law of India relating to contracts.

**Note:** a) In the event of risk purchase of stores of similar description, the option of the JUSNL shall be final. In the event of action taken under (a) or (b) above, the supplier shall be liable for any loss which the JUSNL sustain on the account but the supplier shall not be entitled to any saving on such purchases made against default.

b) The decision of the JUSNL shall be final as regards the acceptability of the stores supplied by the supplier on the JUSNL shall not be required to give any reason in writing or otherwise at any time for the rejection of the materials.

34. JUSNL's officer/ authorized representative may inspect the factory regarding availability of adequate manufacturing and testing equipments for producing quality materials in case tenderers being considered for placement of order by the JUSNL.

35. The JUSNL reserves the right to cancel full or part of the awarded contract without assigning any reason of those firms which will be found defaulter for delay in supply of materials or his supply sub-standard quality of the materials.

36. **General:**

Please again note that in incomplete offer not having specific comments on all the points of our specification and not supported by various information desired in our specifications shall be rejected out-right and no further correspondence shall be made with the supplier in respect of their offer which causes delay in finalizing the tender.

37. **There will be pre-bid meeting on 24.08.2015 at 11.30 Hrs. in the office chamber of Chief Engineer (Transmission), JUSNL, Ranchi.**

Chief Engineer (Transmission)

# JHARKHAND URJA SANCHARAN NIGAM LIMITED

## DEPARTMENT OF TRANSMISSION

### TENDER CONDITIONS

The following conditions are to be strictly fulfilled by the firm while submitting their tenders: -

1. Tenders not accompanied by the prescribed earnest money will be rejected outright. The firm registered with DGS&D Permanently registered with Department of Industries, Govt. of Jharkhand/ Registered with NSIC under single point registration for manufacture of the item/ undertaking of Govt. of Jharkhand/ Govt. of India are however exempted but the proof of valid registration viz. certified or attested copy should be submitted along with the tender, otherwise tender will be liable to be rejected.
2. Tenderer has to accept the penalty clause as per tender otherwise tender will be considered as invalid.
3. The offers which are not kept valid for acceptance, for at least 180 days from the date of the opening of the tenders will be rejected.
4. Incomplete tenders which do not contain full details, technical particulars, literature test certificates, performance report, prices of materials, delivery period etc. will be rejected. GTP must be filled up item wise. Incomplete or mentioning as “per IS” will not be acceptable.
5. The prices are specifically asked to be submitted as F.O.R. destination and are not so furnished, the tender shall not be considered as valid and will be rejected.
6. Tender which is not submitted in the JUSNL’s prescribed forms shall be rejected. Any additional particulars can be furnished in the accompanying letter of statement.
7. Tender received in this office after the due date & time shall be rejected.
8. Prices must be indicated both in figure & words failing which the tender may be rejected.
9. Tenderer must submit attested copy of BIS license for the ISI marked materials. License should be valid on the date of tender/ period of supply, otherwise offer shall not be considered as valid and will be rejected.
10. Type test reports for the type tested materials must be enclosed otherwise offer shall not be considered as valid and will be rejected.
- 11. Tenderer must quote FIRM price only.**

Chief Engineer (Transmission)

# **SECTION- II**

## **GENERAL TECHNICAL REQUIREMENTS FOR** **50 MVA 132/33 KV POWER TRANSFORMERS**

# **GENERAL TECHNICAL SPECIFICATION FOR 50 MVA 132/33 KV POWER TRANSFORMERS.**

## **1.1 SCOPE :**

- 1.1.1 This Section provides for design, manufacture, assembly, Inspection and testing at manufactures works before despatch, packing, supply and delivery of Power Transformers at destination sub station complete with all fittings, first filling of Transformer oil and 10% extra Tr. Oil, accessories and associated equipment for efficient and trouble free operation as specified herein after.
- 1.1.2 It is not easy to specify completely herein all details of the design and manufacture of the equipment. However, the equipment shall conform in all respect to the standards of engineering, design & workmanship listed in clause no. 2.3 and shall be capable of performing continuous commercial operation in a manner acceptable to the purchaser who shall have power to reject the material which in his judgement, is not in accordance therewith.
- 1.1.3 The equipment offered shall be complete with all components in all respects. All such components shall be deemed to be within the scope of supply irrespective of whether those are specifically mentioned in this specification and / or the commercial order or not.
- 1.1.4 The scope of work shall also include supervision of erection, testing and commissioning of all the equipment to be supplied against this tender.

## **2.2 ELIGIBILITY :**

- 2.2.1 Tenders of those firms only shall be considered who are themselves manufacturers of the equipment offered and whose engineering organisation is capable of undertaking the manufacture, supply, testing and putting into services of such equipment. The tenderer must be ISO 9001: 2000 company.
- 2.2.2 The offered equipment must be in successful operation for atleast three consecutive years as on date of bid opening. The tenderers shall furnish alongwith Part I of the tenders, the list of past supplies executed for the offered item and performance reports from their users. Tender (Part-I) must accompany with Earnest Money as specified in NIT.

## **2.3 STANDARDS :**

- 2.3.1 The transformers, accessories and associated equipment shall conform to the latest revision and amendments of standards as given below, except to the extent explicitly modified in the specifications.

Indian Standard No.	Title	International & Internationally Recognized Standard.
IS-325	Three phase Induction Motors.	IEC – 34
IS – 335	Insulating oils for transformers and Switch gear.	IEC – 296 BS- 148
IS – 778	Gun metal gate, globe and check valves for general purpose.	
IS – 1886	Code of Practice for installation and maintenance of transformers.	
IS – 2026	Power Transformers	IEC – 76

IS – 2099	Bushings for alternating voltage Above 1000 V	IEC – 137 BS – 223
IS – 2117	Degrees of protn. Pro vided by enclosures for low, voltage switchgear & control gear.	
IS – 2705	Current Transformers	IES – 185
IS – 3203	Code of practice of climatic proofing Of electrical ecuipments.	
IS – 3347	Dimension for porcelain transformer Bushings.	
IS – 3401	Silica gel.	
IS – 3637	Gas operated relays	
IS – 3639	Fittings & Accessories for power Transformers.	
IS – 4253	Cork and rubber.	
IS – 5561	Electric Power connector.	
IS – 5578	Marking & arrangements for	
IS – 11353	Switchgera, bus bars, Main Connections and auxiliary wiring.	
IS – 6272	Industrial cooling fans	
IS – 6600	Guide for loading of oil immersed transformers	BSCP - 0160
IS – 9434	Guide for sampling and analysis of Dissolved gas in oil filled equipments.	
IS – 12676	Oil impregnated paper insulated condensor bushing dimension and requirements. Insulation Co- ordination Indian Electricity Rules, 1956	IEC – 71
2.3.2	The standards mentioned above are available from	
	Standard	Name and address
	IS	BUREAU OF INDIAN STANDARD Manak Bhawan, 9, Bahadur Shah Zafer park, New Delhi 1100001 India.
IEC	INTERNATIONAL ELECTRO TECHNICAL COMMISSION Bureau Central dela Commission Electro Technique International, I, ruo de Verembe, Coneva, SWITZERLAND	



2.3.4 Equipment meeting with the requirements of other authoritative International standards which insure equal or better performance than the standards mentioned above shall also be considered. When the equipment offered by the supplier conforms to other standards, salient points of difference between standards adopted and the standards specified in this specification shall be clearly brought out in the offer. Two copies of such standards with authentic translation in English shall be furnished along with the offer.

## **2.4 DRAWINGS :**

2.4.1 The tenderers shall furnish along with their tenders following particulars/ dimensional drawings of the transformers and other accessories for the purpose of preliminary study:-

- a) General out line drawings.
- b) Sectional views, showing the general construction features and disposition of various fittings.
- c) G.A. drawings of cooler control cabinet and RTCC panel.
- d) Schematic drawing of OLTC, RTCC and cooler control, etc.
- e) Foundation drawings.
- f) Bushing drawings showing the full details of construction of condenser bushing and other relevant data.
- g) Demand on of the largest parts to be shipped and the position in which these are to be transported.
- h) Technical literatures on Tap changer control, cooling system, Relays, Motors, and general constructional features for winding, temperature indicator, Buchholz Relay, Oil Temp. Indicator etc.
- i) Type Test Reports.

2.4.2 All drawings should be in ink and suitable for micro filming. The drawings shall include the following information's.

- i) Dimensions and Tolerance on dimensions.
- ii) Material designation used for different components with reference to standards.
- iii) Fabrication details such as welds, finishes and coatings.
- iv) Catalogue or part number for each component and the total assembly with bill of materials.
- v) Identification Marking.
- vi) Weight of individual components and total assembled weight.
- vii) All dimension and data shall be in S.I. Units.

2.4.3 Within 30 (thirty) days after placement of the order, the supplier shall furnish six sets of the following drawings for the approval of the purchaser.

- i) G.A. drawing showing front, side elevations and plan of the transformer and all accessories with detailed dimensions, position of centre of Gravity.
- ii) Detailed foundation Drawings.
- iii) Drawings of each type of bushings, lifting dimensions, clearance between H.T. & L.T. terminals and ground, quantity of insulating oil, name plate, details etc.
- iv) Large scale drawing of high & low tension windings of the transformer showing the nature and arrangement of insulators and terminal connectors.
- v) Control wiring diagrams and drawings showing temperature indicators, alarm circuits etc.
- vi) Drawing showing construction and mounting details of marshalling Box.
- vii) Schematic diagrams showing the flow of oil in the cooling system as well as each limb and winding longitudinal and cross sectional view showing the duct size, cooling pipes etc. for the transformer heat exchange or drawing to scale shall be furnished.
- viii) Detailed drawing showing wheel loading and ordinates of centre of gravity.
- ix) Crane requirements for assembling and dismantling of transformers.
- x) Dimensional drawing for terminal connectors.

2.4.4 The purchaser shall communicate his approved/comment on the drawings to the supplier within reasonable period. In case any modification is required according to the purchaser's comments the supplier shall modify the drawing and resubmit six copies of the modified drawings for purchaser's approval within two weeks from the date of communications of comments on the drawings.

2.4.5 The manufacturing of the equipment shall be strictly in accordance with the approved drawings and no deviations shall be permitted without written approval of the purchaser. All manufacturing & fabrication prior to the approval of the drawings shall be at the suppliers risk.

## 2.5 **INSTRUCTION MANUALS:**

The supplier shall furnish 06 (Six) copies of operation, maintenance and erection manual per unit of transformer to the office of the Chief Engineer (Trans.), JHARKHAND URJA SANCHARAN NIGAM LIMITED. The manuals shall be bound volumes and shall contain the following documents / Information.

- i) Instructions regarding erection, Testing & commissioning, operation- maintenance of the equipment.
- ii) All relevant information and drawings pertaining to the main equipment as well as auxiliary devices.
- iii) Marked erection drawings identifying the component parts of the equipment as shipped to enable the purchaser to carry out the erection of the equipment with his own personnel.
- iv) Detailed dimensions, assembly and description of all the components.
- v) Apart from the above, each manual shall also contain one set of all the approved drawings, Type test reports as well as acceptance of test reports and routing test reports of the corresponding consignment dispatched.

Note:- These manuals shall be invariably furnished to the office of the Chief Engineer (Trans.) JHARKHAND URJA SANCHARAN NIGAM LIMITED, Ranchi before despatch of the transformers.

## 2.6 **DESIGN AND CONSTRUCTIONAL DETAILS:**

2.6.1 The transformer and the accessories shall be designed to facilitate inspection, cleaning, and repair and for operation where continuity of supply is primary consideration. All components shall be designed to ensure satisfactory operation under such sudden variations of load and voltage as may be met with under working conditions on the system including those due to short circuits.

2.6.2 All materials used shall be of Prime quality and workmanship which should be of the class most suitable for working under the conditions specified and shall withstand the variations of temperature and atmospheric conditions arising under working conditions without undue distortion or deterioration or the setting up of undue stresses in any part and also without affecting the strength and suitability of the various parts for the work which they have to perform.

2.6.3 All outdoor apparatus including bushing insulators with their mountings shall be designed so as to avoid pockets in which matter may be collected. All connections and contacts shall be of simple cross sections and surfaces for carrying continuously the specified current without undue heating and fixed connections shall be secured by bolts or set of screws of sample size, adequately locked. Lock nuts shall be used on stud connections carrying current.

2.6.4 The transformers and all its accessories like CTs, if any, etc. shall be designed to with stand without injury, the thermal and mechanical affects of any external short circuit to earth and of short circuits at the terminals of winding for a period of 2 sec.

2.6.5 The transformer shall be capable of being loaded upto loads of 150% in accordance with IS : 6600. There shall be no limitation imposed by bushing Tap changer, etc.

- 2.6.6 The transformer shall be so designed that it should be capable of being operated without danger on any tapping to the voltage at that tapping at the rated MVA with voltage partition of 10% corresponding to the voltage at that tapping.
- 2.6.7 The transformers shall be designed with particular attention to suppression of maximum harmonic voltage. Specially, the third and fifth so as to minimize the interference with communication system.
- 2.6.8 Transformer shall be capable of operating under the natural cooled condition upto the specified load. The forced cooling equipment shall come into operation by present contacts of winding temperature indicator and the transformer shall operate as a forced cooled unit, initially as ONAN upto the specified load and then as ONAF. Cooling shall be so designed that during total failure of power supply to cooling fans, the transformer shall be capable to operate at full load for at least 10 (ten) minutes without the calculated winding hottest spot temperature exceeding 140°C. Also stopping of one or two cooling fans should not have any effect on the cooling system.
- 2.6.9 Transformer shall be capable of with standing thermal and mechanical stress caused by symmetrical or asymmetrical faults on any winding.
- 2.6.10 Transformer shall accept without injurious heating, combined voltage and frequency fluctuation, which produces the following over fluxing condition.
- i) 130% for 1 minute.  
144% for 5 Seconds.
  - ii) Over fluxing with stand characteristics upto 170% shall be submitted alongwith the bid by the tenderers.

## 2.7 **TANK :**

- 2.7.1 Tank shall be of welded construction and fabricated from tested quality low carbon steel of adequate thickness.
- All seams and those jointing not required to be opened at site, shall be factory welded and wherever possible they shall be before painting, dye penetration test shall be carried out on welded parts of jacking because, lifting lugs and all load bearing member. The requirement of post weld heat treatment for tank/press relieving parts shall be based on recommendations of BS : 5500 table 4.4.3.1.
- 2.7.2 Tank transformer shall be projected for general rigidity and these shall be designed to prevent retention of water.
- 2.7.3 The transformer shall be of bell type tank construction with the joint at about 500 mm above the bottom of the tank. In case the joint is welded it shall be provided with flanges suitable for repeated welding the joint shall be provided with a suitable gasket to prevent any unwanted materials in the tank. Proper tank welding shall be done to prevent excessive temperature rise of the joint.
- 2.7.4 The tanks shall be designed to withstand:
- i) Mechanical shocks during transportation.
  - ii) Vacuum filling of oil.
  - iii) Continuous internal pressure of 35 KN/M<sup>2</sup> over normal hydrostatic pressure of oil.
  - iv) Short circuit forces.

- 2.7.5 Wherever possible the transformer tank and its accessories shall be designed without pocket wherein gas may be collected. Where pockets can not be avoided, pipes shall be provided to vent the gas into the main expansion pipes.
- 2.7.6 Adequate space shall be provided at the bottom of the tank for collection of sediments.
- 2.7.7 The base of each tank shall be so designed that it shall be possible to move the complete unit by skidding in any direction without injury when using plates or rails.
- 2.7.8 Tank shield shall be such that no magnetic field shall exist outside the tank. They shall be of magnetically permeable material. If required impermeable shields shall be provided at the coil ends. Tank shield shall not resonant when excited at the natural frequency of the equipment. Bidder may confirm about use of tank shield in the schedule of additional information.
- 2.7.9 Suitable guides shall be provided in the tank for positioning the core and coil assembly.
- 2.7.10 Each tank shall be provided with.
- i) Lifting lugs suitable for lifting the equipment complete with oil without any damage or distortion.
  - ii) A minimum four jacking pads in accessible position at 500mm height to enable the transformer complete with oil, to be raised or lowered using hydraulic or screw jacks.
  - iii) Suitable haulage holes shall be provided.
- 2.7.11 The tank shall be provided with two suitable copper alloy or lugs or any other suitable materials for the purpose of grounding.
- 2.7.12 The tank shall be equipped with the following valves with standard screw connections for external piping:-
- i) One drain and lower filter valve located on the low voltage side of the transformer and placed to completely drain the tank. The tenderer may furnish in addition to the above a large valve with eccentric reducer. If considered necessary by him for draining the tank. The valve shall be equipped with a small cock.
  - ii) One filter valve located at the top of the high voltage side. The opening of this valve shall be baffled to prevent separation of the oil.
  - iii) One filter valve located on the high voltage side of the transformer above the bottom of the tank.
  - iv) One relief valve to operate at a pressure below the test pressure of the tank.

## 2.8 **TANK COVER:**

- 2.8.1 The tank cover shall be sloped to prevent retention of rain water and shall not distort when lifted.
- 2.8.2 At least two adequately sized manhole / inspection openings, one at each end of the tank shall be provided for any access to the lower ends of the bushings and earth connections. The inspection covers shall not weight more than 25 kg. The inspection covers shall be provided with two handles.
- 2.8.3 The tank covers shall be fitted with pockets at the position of maximum oil temperature of MCR (Maximum continuous rating) for bulbs of oil and winding temperature indicators. It shall be possible to remove these bulbs without lowering the oil in the tank.
- 2.8.4 Bushings, turrets, covers of inspection openings, thermometer, pockets etc. shall be designed to prevent ingress of water into or leakage of oil from the tank.
- 2.8.5 All bolted construction shall be fitted with weather proof hot oil resistant gasket in between, for complete oil tightness. If gasket is compressible, metallic stops shall be provided to prevent over-compression.

## 2.9 **AXLES AND WHEELS:**

- 2.9.1 The transformers are to be provided with flanged bi-directional wheels and axles. These shall be so designed as not to deflect excessively to interfere with the movement of the transformer. Wheels shall be provided with suitable bearings which shall be must and corrosion resistant. Fittings for lubrication shall also be provided.
- 2.9.2 Suitable locking arrangement alongwith foundation bolts shall be provided for the wheels to prevent accidental movement of transformer.
- 2.9.3 The wheels are required to swivel and they shall be arranged as that they can be turned, through an angle of 90° when the tank is jacked up to clear of rails. Means shall be provided for locking the swivel movement in position parallel to and at right angles to the longitudinal axis of the tank.
- 2.9.4 The rail track gauge shall be 5' 6" (1676 mm) along longer axis as well as along shorter axis.

2.10 **ANTI EARTHQUAKE CLAMPING DEVICE:**

The prevent transformer movement during earthquake clamping device shall be provide for fixing transformer to the foundation. The Bidder shall supply necessary bolts for embedding in the concrete foundation. The arrangements shall be such that the transformer can be fixed to or unfastened from these bolts as desired. The fixing of the transformers to the foundations shall be designed to withstand seismic events to the extent that a static co efficient of 0.3g, applied in the direction of leanest resident to the loading will not cause the transformer or clamping devices as well as bolts to be over stressed.

The details of the device used and its adequacy shall be brought out in the additional information schedule.

2.11 **CONSERVATOR TANK:**

- 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 from minimum ambient temperature to 100°C. Conservator shall be with volumetric capacity at least 7 ½ % of a total volume of oil in the main tank of the transformer.  
The conservator shall be provided with air bag cell to prohibit the direct contact of oil with the atmosphere.
- b) The conservator tank shall be bolted into position so that it can be removed for cleaning purpose.
- c) The conservator shall be fitted with magnetic oil level gauge with low level electrically instated alarm contact.
- d) Conservator shall be provided in such a position as not to obstruct the connection to the transformer.
- e) Separate conservator tank/ compartment in the main conservator shall be provided for OLTC.

2.12 **BREATHER**

Conservator shall be fitted with dehydrating filter breather. It shall be so designed that:

- a) Passage of air is through a dust filter and silicagel.
- b) Silicagel is isolated from atmosphere by an oil seal.
- c) Moisture absorption indicated by a change in colour of the tinted crystals can be easily observed from a distance.
- d) Breather is mounted not more than 1400 mm above rail top level.
- e) Minimum quantity of silicagel to be 1 kg for every 3500 litres of oil in the tank.
- f) It should be colorless.

2.13 **PRESSURE RELIEF DEVICE:**

Adequate no. of pressure relief devices may be provided at suitable locations which shall be of sufficient size for rapid release of any pressure that may be generated in the tank and which may result in damage to the equipment. The device shall operate at static pressure of less than the hydraulic test pressure of transformer tank. It shall be mounted direct on the tank. One set of electrically insulated contacts shall be provided for alarm/tripping, alongwith the recommended settings.

## 2.14 **BUCHHOLZ RELAY:**

A double float type Buchholz relay shall be provided. All the gases 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 and taking gas sample. A copper or stainless steel tube, shall be connected from the gas collector to a valve located about 1200mm above ground level to facilities sampling, with the transformer in service. The device shall be provided with two electrically independent ungrounded contacts, one for alarm on gas accumulation and the other for tripping on sudden rise of pressure.

## 2.15 **TEMPRATURE INDICATOR:**

### 2.15.1 **Oil Temperature Indicator (OTI):**

All Transformers shall be provided with a 150mm dial type thermometer for top oil temperature indication. The thermometer shall have adjustable, electrically independent ungrounded alarm & trip contacts, maximum reading pointer and resetting device mounted in the cooler control cabinet. A temperature sensing element suitable located in a pocket on top oil shall be furnished. This shall be connected to OTI by means of capillary tubes. Accuracy class of OTI shall be +/- 1.5% or better.

### 2.15.2 **WINDING TEMPERATURE INDICATOR (WTI) :**

A device for measuring the hot spot temperature of each of the windings shall be provided (HV, LV).

It shall comprise of following:-

- a) Temperature sensing element
- b) Image coil
- c) Auxiliary CTs, if required to match the image coil, shall be furnished and mounted in the cooler cabinet.
- d) 150mm dial local indicating instrument with maximum reading pointer mounted in cooler control cabinet and with two adjustable electrically independent ungrounded contacts (besides that required for control of cooling equipment), one for high winding temperature alarm and other for trip.
- e) Calibration device
- f) In addition to the above, the following indication equipment shall be provided for each winding :
  - i) Remote winding temperature indicator. It shall be suitable for flush mounting on RTCC panel. The difference between local and remote WTI indication at any given time shall not exceed 1° C. One RWTI shall be provided for each winding in the middle phase (HV,LV).
- g) Auxiliary supply if required, at owner's panel for RWTI shall be 110/220 V DC only.
- h) Accuracy class of WTI shall be +/- 1.5 % or better.
- i) Any special cables required for shielding purpose for connection between cooler control cabinet and remote winding temperature indicator control circuit shall be in supplier's scope of work.

### 2.15.3 **Along with the OTI /WTI the transformer shall also be equipped with Fiber Optic based direct temperature measurement system as per below technical specifications:-**

- a) System shall be of fiber optic rugged. The probes shall be directly installed in each phase of Power transformer to measure the winding hotspot and top oil temperature. There will be total number of at least 8 probes inside the transformer, out of which 1 probe should be installed in top of the transformer for the measurement of top oil temperature. 1 Probe for Core temperature. The remaining 6 will be for Winding temperature measurement.

- b) Temperature range of the system should be -30 degree C to +200 degree C and accuracy of  $\pm 2$  degree C with no recalibration required and should use LED as source of light.
- c) Probe shall be all silica, double PFA Teflon Jacketed, Kevlar cabled fiber with perforated outer jacketed to allow complete oil filling and white Teflon protective Helix wrap for improved visibility and mechanical strength.

2.15.3.1 The measuring unit shall be capable to retain temperature data for at least 90 days at 1 minute interval for all channels and shall have facility to download these data. The system shall have following key features:

- a) Fixing arrangement of sensor at suitable location of the winding in such a way that it will be mechanically protected allowing efficient and secure mounting of sensor tip in the winding in compliance with the annexure E of IEC 60076-2.
- b) The temperature recording of the monitor channels will be obtained in RTCC Panel in control room through repeater.
- c) Alarm output with programmable set points as per user's choice.
- d) IEC 61850 Protocol on RS 485 or RS 232 ports.
- e) User friendly software to allow easy configuration to monitor for data logging and retrieval.

2.15.3.2 Location of optical temperature sensors inside the transformer shall be finalised during detailed engineering.

#### 2.15.4 **WINDING TEMPERATURE INDICATOR (WTI) :**

A device for measuring the hot spot temperature of each of the windings shall be provided (HV, IV, LV). It shall comprise of following :-

- j) Temperature sensing element
- k) Image coil
- l) Auxiliary CTs, if required to match the image coil, shall be furnished and mounted in the cooler cabinet.
- m) 150mm dial local indicating instrument with maximum reading pointer mounted in cooler control cabinet and with two adjustable electrically independent ungrounded contacts (besides that required for control of cooling equipment), one for high winding temperature alarm and other for trip.
- n) Calibration device
- o) In addition to the above, the following indication equipment shall be provided for each winding :
  - j) Remote winding temperature indicator. It shall be suitable for flush mounting on RTCC panel. The difference between local and remote WTI indication at any given time shall not exceed 1° C. One RWTI shall be provided for each winding in the middle phase (HV,IV,LV).
- p) Auxiliary supply if required, at owner's panel for RWTI shall be 110/220 V DC only.
- q) Accuracy class of WTI shall be +/- 1.5 % or better.
- r) Any special cables required for shielding purpose for connection between cooler control cabinet and remote winding temperature indicator control circuit shall be in supplier's scope of work.

#### 2.16 **EARTHING TERMINALS:**

- a) Two (2) earthing pads (each complete with two (2) Nos. taped holes, M 10 bolts, plain and spring washers) suitable for connection to 100x12mm copper/brass grounding unit shall be provided each at position close to the two (2) diagonally bottom corners of tank. Earthing strip upto the ground level shall be provided by the Bidder.
- b) Two earthing terminals suitable for connection to 50x6 mm galvanised steel flat shall also be provided on cooler, marshalling box and any other equipment mounted separately.

#### 2.17 **CORE:**

- i) The core shall be constructed from high grade non-ageing cold rolled super grain oriented silicon steel laminations having high permeability and low hysteresis loss. The bidder should offer the CORE for inspection & approval by the purchaser during the manufacturing stage. Bidder's call notice for this purpose should be accompanied with the following documents, as applicable, as proof towards use of primary CORE material:
  - a) Invoice of supplier
  - b) Mill's test certificate
  - c) Packing list
  - d) Bill of lading
  - e) Bill of entry certificate by customs

CORE material should be directly procured either from the manufacturer or through their accredited marketing organisation of repute and not through any agent.
- ii) The design of the magnetic circuit shall be such as to avoid static discharges, development of short circuit paths within itself or to the earthed clamping structure and production of flux component at right angles to the plane of laminations which may cause local heating.
- iii) Conventional core construction/clamping drives a hole through core laminations. This weakens the core. As such a method of construction/clamping should be adopted so that hole through core laminating is avoided. Boltless CORE or belting arrangement will be preferred. The clamping of core by belting should ensure adequate mechanical strength and the core and winding shall be capable of withstanding the vibration and shock during transportation, installation, service and also prevent movement of core and winding relative to tank during the above conditions. However Bidders may quote as per their own design also.
- iv) Core and winding shall be capable of withstanding the shock during transport installation service and adequate provision shall be made to prevent movement of core and winding relative to tank during these conditions.
- v) All steel section used for supporting the core shall be thoroughly sand blasted after cutting drilling and welding.
- vi) When bell type tank construction is offered, suitable projecting guides shall be provided on core-assembly to facilitate removal of tank.
- vii) Each core lamination shall be insulated with a material that will not deteriorate due to pressure and hot oil. The nature of insulation should be specified in the tender.
- viii) The supporting frame work of core shall be so designed as to avoid presence of pockets which would prevent complete emptying of the tank through drain valve or cause trapping of air during oil filling.
- ix) Manufacturer must have in-house availability of Numerically Controlled Automatic Core Cutting Plant. This must bring following advantages :
  - a) Ensure dimensional accuracy with respect to Cross Sectional area of Built Core
  - b) Ensure proper monitoring & control on quality
  - c) Avoid any possibility of mixing of prime material with defective / second grade material, which would ultimately affect the quality and life of transformers.
- x) The maximum flux density in any part of the core and yoke at rated MVA, voltage and frequency at any tap shall not exceed 1.6 tesla.

## 2.18 **WINDINGS** :

- 2.18.1 The windings shall be so designed that all coil assemblies of identical voltage ratings shall be interchangeable and field repairs to the winding can be made readily without special equipment. The coil shall be supported between adjacent sections of insulating spacers, and the barriers, brushings and other insulation used in the assembly of the windings shall be arranged to ensure a free circulation of the oil and to reduce a hot spot in the windings.
- 2.18.2 The insulation of the coils shall be such as to develop the full electrical strength of the windings, All 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 there wise be adversely officiated under the operating conditions.
- 2.18.3 All threaded connections shall be provided with locking facilities. All loads from the winding to the terminal board and bushing shall be rigidly supported in prevent injury from vibration. Guide tubes shall be used where practicable.



2.18.4 The windings shall be clamped securely in place so that they are not displaced or deformed during short circuits. The assembled core and windings shall be vacuum dried by vapor phase drying process only and suitably impregnated before removal from the treating. The tenderer must confirm the type of drying to be used alongwith the offer. The copper conductors used in the coil structure shall be best suited to the requirements and all permanent current carrying points in the windings and the leads shall be welded or braced.

**2.19 INSULATING OIL:**

2.19.1 The quality of the oil supplied with transformer shall conform to the oil parameters specified in this clause. No inhibitors shall be used in the oil. The samples will be drawn as follows:-

- i) Prior to filling
- ii) Before and after heat run test.
- iii) Before energisation.

All tests as per IS : 335 shall be conducted on oil samples.

2.19.2 The insulating oil shall be subjected to testing in the oil manufacturer's works before supply, in the presence of the representative of the transformer manufacturer.

2.19.3 Sufficient quantity of oil necessary for first filling of all tanks, coolers and radiator at the proper level alongwith 10% extra oil by weight for topping up shall be supplied in non-returnable steel containers suitable for outdoor storage.

2.19.4 The tenderer shall furnish following information in his offer to enable the purchaser to placed order/s for oil at the option of the purchaser.

- i) Required technical parameters of oil.
- ii) Quantity required for first filling each rating and voltage class of transformer.
- iii) List of manufacturers of oil who are preferred by the tenderer for the transformers offered by them.

2.19.5 The supplier shall dispatch the transformer of rating 50 MVA and above in an atmosphere of Nitrogen. The Bidder shall take care of the weight limitation on transport and handling facility at site. In the latter case necessary arrangement shall be ensured by the supplier to take care of pressure drop of nitrogen during transit and storage till completion of oil filling during erection. A gas pressure testing valve with necessary pressure gauge and adapter valve shall be provided.

Power transformer below 50 MVA rating shall be supplied with oil.

2.19.6 The Bidder shall warrant that characteristic of oil furnished shall comply with the requirements specified in IS – 335, 1993 (Fourth Revision) with the Intent amendment/ revision expiation specified here under and shall be suitable for MVA grade transformers.

2.20 The oil shall have the following main characteristics or equivalent (the requirement indicated is determined in accordance with the test method adopted by IS : 335/1972 amended up to date).

Sl. No.	Characteristic	Requirement	Method of test
1.	Appearance	The oil shall be clear and transparent and free from suspended matter or sediment	A representative sample of the oil shall be in a 100 mm thick layer, ambient temperature
2.	Density at 27°C Maximum	0.89 gm/cm	IS:1448(P-16)1967 or equivalent authoritative Standard.
3.	Kinetics Viscosity at 27°C max.	27 CST	IS:1448(P-20)1960 or equivalent authoritative standard.
4.	Inter facial tension at 27°C min.	0.04N/M	IS : 6104/1971 or equivalent authoritative standard.
5.	Flash point	140°C	IS : 1448 (P-25) 1960 Equivalent authoritative Standard.
6.	Pour Point, Max.	(-) 10°C	IS : 1118 (P-25) 1970

			equivalent authoritative Standard.
7.	Neutralization value (Total Acidity ) max.	0.03 mg KOH/ gm	IS : 335/1972 equivalent authoritative standard.
8.	Corrosive (in terms of classification copper strip)	Non-corrosive	IS : 335-1972 appendix A or equivalent authoritative standard.
9.	Electric strength (Breakdown volt.)	Min	IS : 6792-1972 or equivalent authoritative standard.
a)	New untreated oil	40KV (R.M.S.) If the above value is not attained the oil shall be treated.	
b)	After treatment	60 KV (rms)	
10.	Dielectric dissipation factor (tan delta at 90°C) mix.	0.005	IS: 6262-1971 or equivalent authoritative standard.
11.	Specific Resistance Resistively		
a)	At 90°C min	35x10 <sup>12</sup> ohm cm	IS : 6103-1971 or equivalent authoritative standard.
b)	At 27°C min.	1500x10 <sup>12</sup> ohm cm min.	
12.	Oxidation stability		
a)	Neutralization value after oxidation.	0.02mg/koh/gm	IS: 335-1972 appendix-C or equivalent authoritative
b)	Max. Total sludge after oxidation	0.05 percent by weight.	
13.	Presence of oxidation inhibitor	The oil shall not contain anti oxidant additives.	IS: 335-1972 appendix-D or Equivalent authoritative standard.
14.	Water content	30ppm	IS:2362-1963 or equivalent authoritative standard.
15.	Oxidation Ageing test with copper catalyst for 96 hours as per ASTM – D – 1934		
a)	Resistively at 27°C Min	2.5x10 <sup>12</sup> ohm-cm	
b)	At 90°C Min	0.20x10 <sup>12</sup> ohm-cm	
c)	Total acidity (Maxm.)	0.05 mg/koh/gm	
d)	Total sludge (Maxm )	0.05	
e)	Tan delta at 90°C (Maxm.)	0.20	

**2.21 DIAPHRAGM SEAL TYPE CONSTANT OIL PRESSURE SYSTEM:**

- a) In this system contact of the oil with atmosphere shall be prohibited by using a flexible or nitrile rubber reinforced with nylon cloth air cell.
- b) Diaphragm used shall be suitable for continuous operation in all atmosphere of 100°C to which transformer oil is likely to rise.
- c) The connection of the air cell to the top of the reservoir shall be by an air proof seal promotion entrance of air into the cell only.
- d) The Diaphragm of the conservator shall withstand the vacuum during installation and maintenance. Otherwise provision shall be made to isolate the conservator from main tank during vacuum by providing vacuum sealing valve in the pipe connecting main tank with the conservator.

**2.22 TAP CHANGING MECHANISM:**

**2.22.1 On load tap changer.**

Each transformer shall be provided with an on load tap changing mechanism. This shall be designed suitable for remote control operation from switch boards installed in the control room in addition to being capable of local as well as local electrical operation.

**2.22.2 The on load changers shall include the followings.**

- a) An oil immersed tap selector and arcing switch or arc suppressing tap selection provided with reactor or resistor for reduction of make and break arcing voltage and short circuits.
- b) Motor driven mechanism.
- c) Control and protection devices.
- d) Local tap changer position indicator.
- e) Manual operating device.

**2.22.3** The on load tap changer shall be designed so that the contacts do not interrupt ARC within the main tank of the transformer. The tap selector and arcing switch or ARC suppressing tap selector switch shall be located in one or more all filled compartments. The compartment shall be provided with means of releasing the gas produced by the arcing. It shall be designed so as to prevent the oil in the tap selector compartment, from mixing with the oil in the transformer tank. Bucholtz relay shall therefore be provided to indicate the accumulation of gas alarm.

**2.22.4** The tap change shall be capable of permitting parallel operation with other transformer of the same type.

**2.22.5** The transformer shall give full load output on all taps. The manual operating device shall be so designed on the transformer that it can be operated by a man standing at the level of the transformer track. It shall be strong and robust in construction.

**2.22.6** The control scheme for the tap changer shall be provided for independent control of the tap changers when the transformers are in independent service. In addition, provision shall be made to enable parallel control also at time so that the tap changer will be operated simultaneously when one unit is in parallel with another so that under normal conditions the tap changer will not become out of step and this will eliminate circulating current. Additional feature like master/ follower and visual indication during the operation of motor shall also be incorporated.

**2.22.7** Necessary interlock blocking independent control when the units are in parallel shall be provided.

**2.22.8** Under abnormal conditions such may occur if the contactor controlling on load tap changer sticks, the arrangement must be such as to switch off supply to the motor so that an out of step condition of limited to one tap difference between the units. Details of out of step protection provided for the taps should be furnished in the tender.

**2.22.9** The contactors and associated gear for the tap change driving motors shall be housed in local kiosk mounted adjacent to or on the transformer. The motors shall be suitable for operation with 3 phase, 415 volts 50 cycles external power supply.

**2.22.10** The supplier shall include in scope of supply in addition to the equipment above, the following accessories mounted on a separate panel to be installed on the R.T.C.C. panel to be supplied with each transformer.

- i) Tap raise and lower push bottom switch.
- ii) Remote tap position indicator or other required devices and indication lamps etc.
- iii) An indication lamp showing tap changing in progress, audible out of step alarm.
- iv) Name plate for each component.
- v) Remote winding temperature indicator one no.
- vi) Cooler control switch.
- vii) Hot oil temperature indicator one no.

2.22.11 Complete particular of the tap changing gear including the capacity of the motor shall be stated in the tender.

2.23 **OIL PRESERVING EQUIPMENT:**

2.23.1 Oil preserving equipment shall be inert gas system of conservator or expansion tank type. If the conservator or expansion tank type is provided, oil level in the conservator or expansion tank shall not be below the level of the bushing flanges.

2.23.2 If conservator or expansion tank type is offered the conservator or expansion tank shall have two filter valves one at bottom at one end and the other at the top on the opposite end in addition to the valve specified in accessories for the main tank. The conservator or expansion tank shall also have shut off valve and sump with a small drain valve and sampling cock, the latter not gaged as not to interfere with oil lines. The oil level gauge shall be mounted on the conservator or expansion tank.

2.23.3 If an inert gas pressure system is offered gas cylinder filled with high pressure gas, and automatic reducing valve, a breathing regulator, and mechanical relief valve shall be furnished. Sufficient gas for blowing out and displacing the air in the transformer shall be supplied in addition to the full initial supply of gas required for initial operation. The system proposed shall be automatic in operation, shall provide for expansion and contraction of oil through a temperature range of 20°C without discharging gas, and shall seal the interior from atmosphere within the limits provided in this specification. The oil level in the transformer and in the auxiliary expansion tanks, if required, shall be located below the level of the bushing flanges.

A bracket for attaching block and tackle shall be provided to assist in removal of the gas cylinder.

2.23.4 The tenderer may offer other arrangement which in his opinion is considered to be better than the one mentioned above. The proposal shall be supported with sufficient explanatory notes, operational data etc.

2.24 **TRANSFORMER BUSHINGS:**

2.24.1 The bushings shall have high factors of safety against leakage to ground and shall be so located as to provide adequate electrical clearance between bushings and grounded parts. Bushings of identical voltage rating shall be interchangeable. The bushing shall be equipped with suitable terminals of approved type and size and shall be suitable for bimetallic conductor. The insulation class of the high voltage neutral busbar shall be properly coordinated with the insulation class of the neutral of the high voltage winding.

2.24.2 All main winding and neutral leads shall be brought out through out door type bushing which shall be so located that the full flashover strength will be utilized and the adequate phase clearance shall be realized.

Each bushing shall be so coordinated with the transformer insulation, that all flashover will occur outside the tank.

2.24.3 All porcelain used in bushing shall be of the wet process, homogeneous and free from cavities or other flaws. The glazing shall be uniform in colour and free from blisters, burns and other defects.

The creepage distance of the busbar shall be suitable for use in highly polluted atmosphere.

2.24.4 The bushings for 132 KV shall be of oil filled condenser type preferable hermetically cooled and shall conform to the latest edition of IS:2090 of IEC publication No. 137 & IS 3347 (per III/Section – I as amended upto date.) The characteristics of the oil used in the bushings shall be the same as that of the oil in the transformers.

2.24.5 All bushings shall have puncture strength greater than the dry flash over value.

2.24.6 Main terminals shall be solderless and shall be suitable for connection to ACSR conductor. The spacing between the bushing must be adequate to prevent flash over between phases under all conditions of operation.

2.24.7 Special adjustable arcing horn may also be provided for the bushing as per IS:3716/1966 or IEC publication No. 71 A.

2.24.8 The tenderer shall give the guaranteed with stand voltage for the above and also furnish calibration curve with different settings of the co-ordination gaps to enable purchaser to decide the actual gap setting. Tenderer's recommendations are also invited in this respect.

2.25 **COOLING**

2.25.1 Cooling units shall be of radiator types. The radiators for transformers shall be detachable type and shall be provided with removal valves at the top and bottom so as to enable the removal of radiators without drawing the oil from the transformer tank. The radiator bank shall be designed for name pressure and vacuum conditions as specified for main tank.

- 2.25.2 Each transformer shall be provided with two cooling banks each of 50% capacity and each cooling bank shall be provided with its pump having 100% capacity, fans, valves and other necessary and necessary inter connection as such in case of failure of any of the two pumps, one pump can be utilized for full 100% capacity and can pump oil to both the cooling banks.
- 2.25.3 The cooling system shall be so designed that the transformer shall be capable of operating under the natural cooled condition upto specified load and winding temperature. The forced cooling equipment shall come into operation automatically at the preset value of the winding temperature contacts.
- 2.25.4 All cooling units shall be se designed and attached to and mounted on the transformer tank as to be accessible for cleaning and painting to prevent any accumulation of water on the outer surfaces to completely drain oil and to ensure against formation of gas pockets when the tank is being filled.
- 2.25.5 Cooler units shall be connected to the tank by machined steel flanges welded to the cooling units and the cooling banks/ tank and provided with gaskets. At each cooling unit connections, an indicative shut off valve shall be provided which can be fastened in either open or close position. A separate oil tight blank flange shall be provided for each tank connection for use when the cooler unit is detached. Each cooling unit shall have a lifting eye, an oil drain at the bottom and a vent at the tap.
- 2.25.6 Fans or blowers for air blast cooling shall be mounted so as to ensure that no damage to the coolers occurs due to vibrations of the fans, Wire mesh screens shall be fitted to prevent accidental contact with the blades, the mesh being not greater then 1 inch or 2.5 dm. Also fans shall be so located that they are readily accessible for inspection and repair.
- 2.25.7 In case of ONAN/ONAF cooling system, the transformer shall be capable for giving continuous output of at least 80% of the rated output with all these artificial cooling out of service and without exceeding the prescribed temperature rise.

## 2.26 **COOLER CONTROL**

- 2.26.1 Cooler units shall be suitable for operation with a 415 volts, 3 phase, 50 Hz, external power supply.
- 2.26.2 The pumps and fan motor controls including all relays, starters, switches and wiring shall be furnished. Each motor circuit shall have overload and short circuit protection.
- 2.26.3 Control equipment for fan motors shall be mounted in a marshalling cabinet adjacent to the transformer and shall include the necessary contractors with automatic control and annunciation system and provision for manual and remote operation with indication shall be provided.
- 2.26.4 A single metal enclosed main isolating suitable with HRC fuses shall be provided for incoming supply.
- 2.26.5 The switching IN or OUT of the cooling arrangement shall be controlled by winding temperature and there shall be provision for automatic switching IN or OUT at preset temperature levels which should be capable of adjustment & setting at well.
- 2.26.6 In case of ONAN/ONAF cooled transformers, provision of automatic change over from main supply to stand by auxiliary supply should be available in case of failure of main supply. Necessary alarm etc for this also may be provided.
- 2.26.7 The pumps shall preferably be provided with flow indication showing the condition and direction of oil flow.

## 2.27 **CONTROL CABINET:**

- 2.27.1 All controls alarms, indication and relaying device provided with the transformer shall be wired upto the terminal blocks inside the control cabinet. Not more than two wires shall be connected to one terminal. 10% spare terminals shall be provided.
- 2.27.2 All devices and terminal blocks within the control cabinet shall be clearly identified by symbols corresponding to those used on applicable schematic or wiring diagrams.

## 2.28 **CENTRE OF GRAVITY:**

The center of gravity of the transformer shall below and as near the vertical center line as possible. The transformers shall be stable with or without oil. If the center of gravity is eccentric relative to track either with or without oil its location shall be shown on the drawing.

## 2.29 **FREQUENCY:**

The transformer shall be suitable for continuous operation with a frequency variation of five percent from normal of 50Hz without exceeding the specified temperature rise.

## 2.30 **PARALLEL OPERATION:**

the similar ratio transformer shall operate satisfactory in parallel with each other if connected between high voltage and low voltage busters. Also, wherever specified the transformers shall be suitable for parallel operation with existing transformer, if required by the purchaser.

2.31 **IMPEDANCE:**

Suppliers shall indicate the guaranteed impedance and tolerances and also the upper and lower limits of impedance which can be offered without an increase in the quoted price. Impedances shall include positive and zero sequence and shall be expressed in terms of the branches of the star connected equivalent diagrams, all on the same KVA base and the range shall be given for each branch of the equivalent circuit in turn. The transformer impedance shall be as specified in section III of this specification.

2.31 **NEUTRAL EARTHING ARRANGEMENT:**

- a) The neutral terminals of the star connected windings shall be brought to the ground level by a copper grounding bar which shall be supported from the tank by procession insulators of highest system voltage of 24 KV.
- b) The end of the copper bar shall be brought to the ground level, at a convenient point, for connection to purchaser's ground network through two (2) 100x12mm galvanized stool flats. The connection shall be made by using two (2) bolted neutral grounding terminals with necessary accessories.
- c) Suitable flexible copper strip connection of adequate size shall be provided for connecting to neutral bushing terminals to avoid terminal load on the bushings.

2.33 **INSULATION**

The dielectric strength of winding insulation and of the bushing shall conform to the values given in IS: 2026-1982 (as amended upto date (or I.E.C. publication no. 76).

For rated system voltage of 132KV, 33 KV the following impulse test voltages may be offered.

System voltage	Impulse test voltage
i) 132 KV	550 KV
ii) 33 KV	170 KV

The H.V. winding of the transformers shall have graded insulation. The insulation class of the neutral end of the winding shall be graded to 95 KV (impulse) and 38 KV (Power frequency with stand.)

2.34 **TEMPERATURE:**

The transformer shall be installed outdoor without any protection from sun and rain. The maximum temperature (specified in section – III of this specification) of hot spot shall be limited to 105°C with class A insulation. Each transformer shall be capable of operating continuously at its normal rating without exceeding the temperature rise limits specified below-

Winding (measured by resistance).	Temperature rise °C 45°C for ONAN/ONAF. 50°C for OFAF
Top oil (Measured by thermometer).	35°C
Cores	Not to exceed that permitted for the adjacent part of the winding.

Note: The reference ambient temperature for the purpose of temperature rise shall be 50°C. If the ambient temperature is in excess of this value the temperature rise shall be reduced by an amount equal to the excess ambient temperature.

The transformer shall be free from abnormal noise (other than humming) and vibration.

2.35 **ACCESSORIES**

Each transformer shall be provided with the following accessories:

- i) Dial type thermometers for oil  
For ONAN/ONAF Transformer.
  - a) A dial type thermometer for indicating oil temperature fitted with maximum pointer adjustable alarm and trip contacts.

- b) The dial type indicating thermometer of robust pattern mounted on the side of the transformer at convenient height to read the temperature in the hottest part of the oil and fitted with alarm and trip contacts and contacts for switching in and switching out the cooling system at predetermined temperatures.
- ii) One winding hot spot temperature detector in one winding of each phase as described below:-  
It shall be indicating type responsive to the combination of top temperature and winding current, calibrated to follow the hot test spot temperature of the transformer winding. The winding temperature detector shall operate a remote alarm and trip at predetermined independent temperature in the event of the hottest spot temperature approaching dangerous value and in the case of ONAN/ONAF type transformer shall automatically actuate the fan.
- iii) One magnetic type oil level gauge with low level alarm contacts and a dial showing minimum, maximum and normal oil levels. The gauge shall be readable from the transformer base level. A low gas pressure electric alarm device shall also be provided if the transformer is equipped with inert gas pressure equipment.
- iv) One oil filling valve (inlet).
- v) One oil drain valve.
- vi) One filter valve located at the top of the tank of the H.V. side.
- vii) One filter valve located near bottom of the tank of the H.V. side of the transformer.
- viii) Oil sampling device.
- ix) Pressure relief device.  
A safety valve of the chimney type with an equalizer pipe interconnecting the top of the conservator and uppermost part of the safety valve should be provided to prevent rise of oil in the safety valve pipe. A stop cock should also be provided in the inter connecting pipe. An air release cock shall also be fitted in a convenient position. The safety valve pipe shall preferably take off from the side of the transformer tank near to the tank cover not from the top of tank cover. This is with a view to prevent the gases forming in the tank from rising into the safety valve pipe and thereby passing the bucholtz relay defeating its purpose and for avoiding the necessity for providing a bottom diaphragm for the safety valve off from the tank cover.
- x) One double float gas detector relay (Buchholz relay with alarm and tripping contacts) to detect accumulation of gas and sudden change of oil pressure complete with two shut off valves and flange couplings to permit, easy removal without lowering oil level in the main tank, bleed valve for gas venting and a test valve.
- xi) Radiators complete with fans, etc. described in clause.
- xii) Air cell bag type conservator along with its supporting bracket to be mounted on tank or independent structure, as the case may be (in case of independent structure mounting, the structure shall be within the scope of transformer supplier).
- xiii) Eye bolts and lugs on all parts for case of handling.
- xiv) Two grounding terminals.
- xv) Diagram and rating plate.
- xvi) One set of equipment for control, protection indication and annunciation for each transformer comprising motor contractors, detecting elements or devices, indicating apparatus, instruments, relays, enunciators, etc.
- xvii) Suitable weather proof cubicles for housing the control equipment, terminal blocks, etc (one for each transformer) one number indoor cubicle (RTCC panel) detailed as under clause 2.18.2.10 for each transformer for remote control of cooler fans, on load tap changer, alarm and indicating devices.
- xviii) One set consisting of 4 nos of lifting cum traversing hydraulic jacks (common to all the transformer per substation). Price of jacks should be quoted separately.
- xix) Ladder for access to top cover. The equipment and accessories furnished with the transformer shall be suitably mounted on the transformer for case of operation, inspection and maintenance and the mounting details shall be subject to the approval of the purchase. All valves shall be provided either with blind companion flanges or with pipe plugs for protection.
- xx) Indication, alarm and relay equipment shall have contacts suitable for operation with 250 volts D.C supply. Any other necessities or appliances recommended by the manufacturer for the satisfactory operation of the transformer together with their prices, shall be given in the tender.

### 2.36 **TERMINALS:**

- 2.36.1 The bushing shall be equipped with terminals suitable for connection with ACSR "ZEBRA" conductor having over all diameter 28.62 mm.

2.37 **TERMINALS MARKING**

2.37.1 Each terminal (including the neutral) shall be distinctly marked on both the primary and secondary side in accordance with the diagram of connection supplied with the transformers.

2.38 **CONDUIT AND WIRING:**

2.38.1 All secondary or control wiring from current transformers, temperature detectors and alarm contacts. Shall be enclosed in metal conduits and shall be carried to the weather proof cubicle box mounted on the side of transformers or located closely. Terminal Board shall be installed in the cubicle to provide for ready connections to the control cables.

2.39 **EVALUATION OF LOSSES:**

2.39.1 The measured losses of each transformer shall not exceed the values indicated in the tender by more than the tolerances admissible as per standards. The fixed losses shall be as low as is consistent with modern design, technique, reliability and economical use of material. For the purpose of comparison of bids, the capitalized costs of iron and copper losses at the rates given in section III of this specification shall be added to the quoted price of the transformer.

2.39.2 The no load loss in kilowatts at rated voltage and rated frequency and the total losses in kilowatts at rated output, rated voltage and rated frequency shall be guaranteed under penalty for each transformer. For the purpose of penalty computations, the test figures of the no load and the total losses shall be earmarked with the corresponding guaranteed figures.

2.39.3 The penalties shall be separately evaluated from (I) the excess of the test figures of the no load loss in kilowatts over the corresponding guaranteed value, and (II) the excess of the difference between the test values of the total losses and the no-load loss, in kilowatts over the difference of the corresponding guaranteed values. No tolerance shall be permitted over the test figures of the losses.

2.39.4 The penalties shall be calculated for the excess of no. load loss and for the excess of the difference in the total and no load losses at the rates specified in the section III of this specification. For fraction of the kilowatt, the penalties shall be applied prorata. If the test figures of losses are less than the guaranteed values, no bonus will be allowed.

2.39.5 The tenderer should note that the values assigned for capitalization of losses are based on the present worth factor and therefore capitalization of investment shall not be made separately.

2.40 **TOLERANCE:**

2.40.1 Since Indian standards allow certain tolerance for the acceptance of the transformer no load and load losses, the bidders are requested to indicate whether the figures given for the guaranteed losses in schedule of Guaranteed technical particulars are with or without such tolerances. If tolerances are applicable, the limits for the same should be indicated. In the absence of any information to this effect, the figures for no load and load losses excluding auxiliary loss shall be increased as provided in Indian Standard. Any changes in the figures assigned for transformer losses shall not be permitted after opening of the bids and bid evaluation shall be carried out on the basis of information made available at the time of bid opening.

2.41 **CLEANING AND PAINTING**

2.41.1 Before painting of filling with oil or compound, all un-galvanized parts shall be completely clean and free from rust, scale and grease and all external rough surface in castings, shall be filled by metal deposition. The interior of all transformer tanks and other oil filled chambers and internal structural steel work shall be cleaned of all scale and rust by sand blasting or other approved method. These surfaces shall be painted with an oil resisting varnish or paint unexposed welds need not be painted.

2.41.2 Except for nuts, bolts and washer which may have to be removed for maintenance purpose, all external surfaces shall receive a minimum of three coats of paints, the primary coat shall be applied immediately after cleaning. The second coat shall be of oil paint of weather resisting nature and of a shade or colour easily distinguishable from the primary, and the second and the final coats shall be applied after the primary coat has been touched up where necessary. The final coat shall be of a glossy, oil and weather resisting non-fading paint.

2.41.3 All interior surface of mechanism chambers and kiosks except these which have received anticorrosion treatment shall receive three coats of paints applied to the thoroughly cleaned metal surfaces. The final coat shall be of light coloured anti condensation mixture, any damage to paint work incurred during the transport and erection shall be made good by thoroughly checking the damaged portion and applying the full number of coat appointments that had been applied before damaged was caused.



2.42 **TESTS:**

- 2.42.1 The supplier shall carry out all type tests and routine test of the transformers as per the relevant latest IEC standard. Type tests and special tests, if any shall be carried out on one transformer while routine test shall be conducted on all transformers. All external components and fittings that are likely to effect the performance of the transformer during the test shall be in place.  
Where it is, required test results shall be corrected to a reference temperature of 75°C.

2.43 **TYPE TESTS:**

- 2.43.1 All type tests in accordance with IEC as amended upto date shall be carried out on one unit of transformer by the successful tenderers. In case the tenderers furnish the Latest test reports (within 5 years) of those tests carried out on similar transformers, the purchaser at his discretion may wave off necessity of carrying out these tests.

2.44 **ROUTINE TESTS & FACTORY TESTS:**

- 2.44.1 All standard routine tests in accordance with IEC (amended upto date) alongwith dielectric tests shall be carried out on which transformer.
- 2.44.2 All double welds shall be tested for leaks with air transformer oil to EHV grade transformer oil at a pressure not less than normal pressure plus 35 KN/M<sup>2</sup> measured at the base of the tank. The pressure shall be maintained for a period not less than 12 hours for oil and one hour for hour during which no leakage shall occur.
- 2.44.3 All tanks, single welds, cooling coils, radiator valves and other parts necessary for complete transformer filled with oil to a pressure corresponding to twice the normal head of oil or to the normal pressure plus 35 FM per meter square whichever is lower will be measured at the base of the tank and will be maintained for one hour. If leak occur, the tests shall be conducted again after all the leaks have been stopped.
- 2.44.4 The following tests shall be made on the transformer unless otherwise stated in the schedule of requirement.
- i) Resistance of each winding at all taps.
  - ii) Turn ratio for all sets of windings on each tap.
  - iii) Polarity and phase rotation.
  - iv) Excitation losses at 90%, 100% and 110% of rated voltage measured by the average voltage voltmeter method. The excitation losses given the test report shall be those measured after the implies tests are completed.
  - v) Impedance between each pair of winding.
  - vi) 'Zero' and positive phase sequence impedance on 3 phase transformer.
  - vii) Regulation at rated load and at unity, 0.9 and 0.8 lagging power factor.
  - viii) Load losses at rated frequency by applying a primary voltage sufficient to produce rated current in the windings with the secondary windings short circuited.
  - ix) Separate source voltage withstand test.
  - x) Temperature rise tests at an equivalent to rated load. The current required for the auxilliaries shall be stated in the test reports.
  - xi) Induced voltage withstand test.
  - xii) Impulse tests on one limb of the transformer.
  - xiii) Tan-Delta Test.
  - xiv) Dissolved Gas Analysis.

2.45 **TEST AT SITE**

After erection at site, the transformer shall be subject to the following tests:-

- i) Insulation resistance test.
- ii) Ratio and polarity test.
- iii) Dielectric test on oil.
- iv) Any other tests specified by the purchaser and manufacturers mutually agreed.

2.46 **TESTS ON TRANSFORMER TANK**

- 2.46.1 In addition to the routine tests on welds of the tank, the following tests shall be carried out on one of the transformer tanks.
- i) VACUM TEST

The transformer tank without oil shall be subject to an internal vacuum of 760 mm of mercury for one hour. The permanent deflection of the flats plates after the vacuum has been released shall not exceed the values specified below:-

Horizontal length of flat pleas (in mm)	Permanent deflection (in mm)
Upto & including 750	5.0
751 to 1250	6.5
1251 to 1750	8.0
1751 to 2000	9.5
2001 to 2200	11.0
2251 to 2500	12.5
2501 to 3000	16.0
above 3000	19.0

ii) **PRESSURE TEST**

Transformer tank alongwith its radiators, conservator and other fittings shall be subjected to a pressure corresponding to twice the normal head of oil in the transformer or to the normal pressure plus 35 KN/M<sup>2</sup> which ever is lower, measured at the base of the tank and maintained for one hour. The permanent deflection of the flat plates after the excess pressure has been released shall not exceed the figures specified above for vacuum test.

iii) An explosion vent with its diaphragm in position shall be subjected to as increasing oil pressure. This vent shall operate before reaching the pressure specified in the pressure test as above.

2.47 **TESTS ON LOAD TAP CHANGER**

2.47.1 The various routine and type tests as specified in the IEC publication 214-1906 amended upto date shall be carried out.

Type test certificates and copies of oscillogramme as called for in IEC publication 214 shall be furnished.

2.47.2 After the tap change is fully assembled on the transformer, the following operation tests shall be performed without failure at 100% of the rated auxiliary supply voltage.

- i) Eight complete operation cycles with the transformer not energized.
- ii) One complete operating cycle with the transformer not energized with 85% of the rated auxiliary supply voltage (exceptional).
- iii) One complete operating cycle with the transformer energized at rated voltage and frequency at no load.
- iv) Ten tap change operations with steps on either side of the principle tapping with as far as possible the rated current of the transformer with one winding short circuited. After the transformer is on the transformer, a power frequency test shall be applied to the auxiliary circuit for auxiliary circuits insulation test.

2.48 **FURTHER TESTS/ SPECIAL TESTS:**

The purchaser reserves the right having any other reasonable tests carried out their own expenses either before shipment or at site to ensure that the transformer complies with the requirements of this specification.

2.49 **INSPECTION/ ACCESSORIES TESTS:**

2.49.1 The purchaser shall have access at times to the works and all other places of manufacture where the transformers are being manufactured and the supplier shall provided all facilities for unrestricted inspection of the supplier works, raw materials, manufacture of all the accessories and for conducting necessary tests.

2.49.2 The supplier ladder shall keep the purchaser informed in advance of the time of starting and of the progress of manufacture of equipment in its various stages so that arrangements could be made for inspection.

2.49.3 No material shall be dispatched from its point of manufacture unless the material had been satisfactorily inspected, tested, approved, and dispatch clearance given by the JUSNL.

2.49.4 The acceptance of any quantity of equipment shall in no way relieve the supplier of his responsibility for meeting all the requirement of this specification and shall not prevent subsequent rejection of such equipment are later found to be defective.

2.49.5 The supplier shall inform the purchaser at least thirty days in advance, about the manufacturing program so that arrangement can be made for inspection.

2.49.6 The purchaser reserves the right to insist for witnessing the acceptance/routine testing of bought out items. The supplier shall communicate in the purchaser the details of such testing program at least three weeks in advance. The testing shall not be postponed even if the purchaser is unable to depute his representative for witnessing the testing.

#### 2.50 **TEST REPORTS:**

2.50.1 After all the test have been completed the following test reports shall be furnished.

- i) Copies of routine test reports. All records of routine tests reports as well as all test reports for the test conducted during manufacture shall be maintained by the supplier. These shall be produced for verification as & when requested by the purchaser.
- ii) Six copies of test reports for the tests carried out on the ancillary apparatus shall be furnished.
- iii) All auxiliary equipment shall be tested as per the relevant standard. Test certificates shall be submitted for all brought out items.
- iv) Six copies of acceptance test reports and type test reports duly witnessed by the JUSNLs inspector shall be furnished to the purchaser. One copy of the test reports will be returned to the supplier duly approved by the purchaser and only thereafter the material shall be dispatch.

2.50.2 Each test reports shall indicate the following information's:-

- a) Complete identification the date of testing including the serial number of the transformer.
- b) Method of application, where applied, duration and interpretation of results for each test.
- c) Temperature rise graded to 75°C including ambient temperature.

Note:- One copy of all test imports shall be provided in the instruction manual to be furnished as per clause no. 2.05 of this specification.

#### 2.51 **PACKING AND FORWARDING:**

2.51.1 The equipment to be supplied against this tender shall be packed for shipment in such a manner as may facilitate easy handling and avoiding any damage during transit.

2.51.2 The equipment shall be packed in crates suitable for vertical/horizontal transport as the case may be and suitable in withstand handling during transportation and outdoor storage. The supplier shall be wholly responsible for any damage to the equipment during transit due to improper and inadequate packing. The easily damageable items shall be carefully packed and marked with the appropriate caution symbol. Wherever necessary, proper arrangement for lifting such as lifting books etc. shall be provided. Any material, found short inside the packing cases, shall be supplied by the supplier without any extra cost.

2.51.3 Each consignment shall be accompanied by a detailed packing list containing the following information's:-

- i) Name of the consignee.
- ii) Name of consignment.
- iii) Destination.
- iv) Total weight of the consignment.
- v) Sign showing upper/lower side of the crates.
- vi) Handling and packing instructions.
- vii) Bill of material indicating contents of each package.

2.51.4 The transformer shall be shipped filled with oil/inert gas (whichever may be desired by the purchaser depending on the size, etc.)

2.51.5 All parts shall be adequately marked to facilitate field erection. Boxes and crates shall be marked with the contract number and shall have a packing list enclosed showing the parts contained therein.

2.51.6 In case synthetic resin bonded paper type bushing is offered (S.R.B.P.) the lower parts not being oil filled, special attention shall be paid in packing so as to avoid moisture. The details of bushing and method of packing shall be stated in the tender.

#### 2.52 **LABELS**

2.52.1 Labels shall be provided for all apparatus such as relays, switches, fuse contained in any cubicles or marshalling kiosk.

2.52.2 Descriptive labels for mounting indoor or inside cubicles and kiosk shall be of material that will ensure permanency of the lettering. Matter satin finish shall be provided to avoid dazzle from reflected light. Labels mounted on dark surfaces shall have white lettering on a black background. Danger notice shall have red lettering on a white background.

All plates shall be of material which will not be corroded.

2.52.3 Labeling shall be clear, concise and adequate.

2.52.4 Labels shall be supplied as far as possible in the following four standard sizes:

- a) Labels for fuses and links shall measure approximately 28mm to 45mm by 13mm to 19mm and lettering of 3mm to 6mm. shall be used according to the amount of inscription required.
  - b) Labels for relays, contactors thermal devices and similar apparatus shall measure 65mm by 20mm and shall have lettering as specified in above.
  - c) Labels for controllers and changed ever switches shall measure 70mm and where practicable have 20mm letter alongwith 1.5 mm stocks.
  - d) Labels for the doors of junction boxes, marshalling kiosks and similar equipment shall measure 125mm by 50mm and have 13mm lettering with 1.5mm wide stocks.
- 2.52.5 The labels for mounting outdoors shall be weather and corrosion proof. The letters/ diagrams thereon, shall be formed by etching any other such process which will ensure permanency of the lettering/markings.

2.53 **SUPERVISION OF ERECTION, TESTING AND COMMISSIONING**

- 2.53.1 The tenderer shall arrange for the services of the supervisor for the supervision of erection, testing and commissioning of the equipment. The tenderer shall quote his charges for the above services. The general terms and conditions for erection and supervise services is given in section IV of this specification.

2.54 **SPARE PARTS & MAINTENANCE EQUIPMENT:**

- 2.54.1 The tenderer shall quote separately for mandatory spares as specified in the schedule of requirement section III of this specification. The make and type of such spares offered shall be same as these offered alongwith the main transformer and inter changeable with the similar items.  
The price offered for supply of these spares shall be taken into consideration for the purpose of bid evaluation.
- 2.54.2 The tender shall also indicate his proposal and quote their rates for any other spares recommended for the trouble free operation of the equipment for five years. The prices for such optional spares shall be quoted. separately. The price of these optional spares shall not taken into consideration for the purpose of bid evaluation.  
The purchaser shall decide the actual quantities of spare parts to be included in the order on the basis of this list and the item wise price of spare parts.

2.55 **ERECTION AND MAINTENANCE TOOLS**

- 2.55.1 The tenderer shall separately list out in their tender the sets of tools required for initial erection and subsequent maintenance for the power transformer and the associated equipments. Item wise unit price for such tools shall be quoted in schedule F, Section V of this specification. The prices quoted for such tools shall not be taken into consideration for the purpose of bid evaluation.

2.56 **BASIS OF AWARD**

- 2.56.1 The tenderer shall quote for complete equipment required for power transformer as specified in the schedule of requirements. The purchaser reserves the right to split up and award the contract on any all the firms without assigning any reasons.

2.57 **GUARANTEED TECHNICAL PARTICULARS:**

- 2.57.1 The tenderer shall furnish all guaranteed technical particulars as called for in annexure - III of this specification.  
Particulars which are subject to guarantee shall be clearly marked. Tender without information's in this respect may not be considered.

2.58 **GUARANTEE:**

- 2.58.1 The transformer alongwith all fittings and accessories supplied shall carry performance guarantee for the satisfactory performance of the equipment supplied for a period of 24 months from the date of commissioning of the equipment or 30 months from the date of receipt of the last consignment at site/stores, whichever is earlier.
- 2.58.2 If any defects develop during this period in any part of the equipment, the supplier shall replace or repair the same to the satisfaction of the purchaser expeditiously free of cost.
- 2.58.3 The tenderer shall also indicate whether facilities shall be made available by him at site for repair to transformers, on load Tap changers and the accessories offered by them after the guarantee period it so desired by the purchaser.

2.59 **DEVIATION FROM SPECIFICATION**

2.59.1 The tenderers are required to furnish the tenders as per terms and conditions laid down in the specification. However the deviations, if any from the specification shall be separately spelt out, in the absence of which it will be presumed that the provisions of the specification are complied by the tenderer.

## **SECTION-III**

# **SPECIFIC TECHNICAL REQUIREMENTS FOR 50 MVA** **132/33 KV POWER TRANSFORMERS**

## **SPECIFIC TECHNICAL REQUIREMENT FOR 50 MVA 132/33 KV POWER TRANSFORMERS.**

### **3.1 SCOPE**

3.1.1 This section of the specification covers the specific technical particulars, climate and Isoceraunic condition, system particulars suiting which power transformers shall be offered as per the General Technical Requirements given in the Section II.

3.1.2 The specific Technical Requirements and the schedule of requirements are specified hereunder:-

### **3.2 CLIMATE AND ISOCERAUNIC CONDITIONS:**

3.2.1 The climate and Isoceraunic conditions at the site are given below:-

- |       |   |                         |
|-------|---|-------------------------|
| i)    | Maximum ambient temperature in shade-           | 50°C                    |
| ii)   | Minimum ambient temperature in shade-           | 4°C                     |
| iii)  | Maximum daily average ambient temperature-      | 35°C                    |
| iv)   | Maximum yearly average ambient temperature-     | 30°C                    |
| v)    | Maximum relative humidity                       | 100%                    |
| vi)   | Average number of thunder storm days per annum. | 80                      |
| vii)  | Average rainfall per annum.                     | 125cm.                  |
| viii) | Maximum wind pressure                           | 150 kg/m <sup>2</sup>   |
| ix)   | Height above sea level                          | Not exceeding<br>1000m. |
| x)    | Earthquake acceleration.                        | 0.05x2 g.               |

### **3.3 TYPE AND RATING**

3.3.1 The equipment offered shall be suitable for continuous operation at full rated capacity under the conditions specified in clause no. 3.2 above, the type and rating of the transformers proposed for procurement against the tender are specified in Annexure I.

### **3.4 PARALLEL OPERATION**

3.4.1 The transformer proposed for procurement against the tender are also required to operate in parallel with the existing transformers.

### **3.5 AUXILIARY POWER SUPPLY**

3.5.1 The purchase will make separate arrangements of providing low tension A.C. and D.C. supply for auxiliary equipment and control use. All the auxiliary electrical equipment/Accessories shall be suitable for operation on the following supply system:

- (i) For auxiliaries
- |     |  |
|-----|--|
| (a) | 240 volts, single phase 50HZ, neutral grounded<br>A.C. supply. |
| (b) | 415 volts, three phase 50HZ, Neutral grounded<br>A.C. supply.  |
- Tolerance: Frequency- between 90% and 105% of normal frequency of  
50 HZ.  
Voltage- from 110% to 85% of the normal voltage.
- (ii) For control alarm and Protective devices. 250 V available from the station battery.  
The D.C. supply is subject to a variation of 10%

### **3.6 EVALUATION OF LOSSES**

3.6.1 The no load losses and load losses for the purpose of evaluation of the tenders shall be capitalized at the following rates:

No load losses	-	Rs. 162000.00 per KW
Load losses and cooler losses.	-	Rs. 81000.00 per KW

### **3.7 NEUTRAL C.T.**

3.7.1 The tenderer may quote separately for one Multi-Ratio bushing/turret mounted current transformer of suitable ratio class PS as per latest IS for providing one common neutral lead for the purpose of restricted earth fault protection. The GTP will be approved by JUSNL after award.

3.8 **REQUIREMENT AND DESIRED DELIVERY.**

3.8.1 The quantity proposed for procurement and the desired delivery detailed in the schedule of requirement enclosed as Annexure II of this specification.

3.8.2 The quantity mentioned in the schedule is tentative and are subject to increase or decrease by 15% the time of finalization of tender and placement of order at the direction of the purchaser.

3.9 **EARTH QUAKE & WIND DESIGN LOAD**

3.9.1 The equipment offered shall be so designed to withstand repeated earthquake acceleration of 0.05x2g and wind load 150 kg/M<sup>2</sup> in the projected are simultaneous without damage to component part and without treatment of operation.



**ANNEXURE I**  
**TYPE & RATING OF THE TRANSFORMERS**

The type, rating and the specific guaranteed technical particulars for 50MVA 132/33 KV Power Transformers will be as under.

i)	Type	50 MVA Core type construction Oil immersed
ii)	No. of Phase	03 (three)
iii)	Service	Out door
iv)	Reference standard	IS 2026/ IEC – 76 (Latest)
v)	Rated Frequency	50 HZ
vi)	Rated Voltage	
	a) High voltage winding	132 KV
	b) Low voltage winding	33 KV
vii)	Normal Ratio	132/33 KV
viii)	Highest voltage system	
	a) High voltage	145 KV
	b) Low voltage	36 KV
ix)	Capacity	40MVA/ 50MVA
x)	Type of Cooling	ONAN/ONAF 40/50 MVA
xi)	Connections	
	a) High Voltage winding	Star
	b) Low voltage winding	Star
xii)	Insulation level withstand value.	
	a) 1.2x50 Micro second impulse Voltage, KV (Peak).	550/170
	b) Power frequency withstand voltage, KV R.M.S.	230/70
xiii)	Percentage impedance	15% ± IS Tolerance
xiv)	Tap Changer	
	a) Type	High speed transition Resister, ON-LOAD type
	b) Location	On high voltage side.
	c) Number of taps	15
	d) Range of tap	(+ ) 4.288% to (-) 15.575%
	e) Voltage variation that each tap to provide.	In step of 1.429% variation.
	f) Control	Local (Manual/ electrical) Remote/Auto
xv)	Type of core material	Cold Rolled super grain oriented

silice steel  
lamination.  
(As per Cl. No.2.17 of section-II)

- xvi) Flux density of normal voltage and frequency. 1.6 Tesla
- xvii) Over voltage withstand. 130% for 3(three) minutes.
- xviii) System of earthing.  
a) High voltage. Effectively earthed  
b) Low voltage. Effectively earthed
- xix) Creepage distance (in mms)  
a) Total 3625/900  
b) Protected 1700/425
- xx) Percentage impedance at extreme taps between H.V. & L.V. at 75<sup>0</sup>C and 50 MVA base.  
Lowest tap – 14.0%  
Highest tap – 15.4%  
Normal tap – 15%

xxi) **Voltage**

<b><u>Tap Position</u></b>		<b><u>Voltage</u></b>
1	–	138600 Volt
2	–	136700 Volt
3	–	134800 Volt
4	–	132900 Volt
5	–	131100 Volt
6	–	129200 Volt
7	–	127300 Volt
8	–	125400 Volt
9	–	123500 Volt
10	–	121600 Volt
11	–	119700 Volt
12	–	117900 Volt
13	–	116000 Volt
14	–	114100 Volt
15	–	112200 Volt

OR

Nos. of taps – 17,  
Normal tap – 05  
Normal tap voltage –132000 V

**Note: This transformer has to be run in parallel with existing transformer, no. of taps and normal taps, impedance etc. will be decided at the time of approval of drawings.**

## ANNEXURE II

### BILL OF QUANTITY FOR 10 X 50 MVA POWER TRANSFORMERS

<b>Sl. No.</b>	<b>Description of equipment</b>	<b>Qty in Nos.</b>
1.	Three phase 50 Hz ONAN/ONAF 50 MVA, 132/ 33 KV Power transformer with OLTC, RTCC, fitting & Control equipment etc. with first filling of oil Plus 10% extra oil.	10 (Ten) Nos.
2.	Spare parts	
	i) H.V. Bushing	10 Nos.
	ii) L.V. Bushing	10 Nos.
	iii) Neutral Bushing	10 Nos.
	iv) Set of gaskets	10 Nos.
	v) Buchholz relay	10 Nos.
	vi) Magnetic oil guage	10 Nos.
	vii) Buchhols Relay for OLTC	10 Nos.
	viii) Winding temp. Indicator	10 Nos.
	ix) Oil temp indicator	10 Nos.
	x) Silicagel breather	10 Nos.
	xi) Pressure relief device	10 Nos.
	xii) Fan.	10 Nos.
	xiii) Contactor for fan.	10 Nos.
	xiv) Contactor for tap changer.	10 Nos.

**ANNEXURE III**  
**GUARANTEED TECHNICAL PARTICULARS FOR POWER TRANSFORMER. TO BE FILLED UP**  
**BY THE TENDERER**

*(These information are also to be furnished in the form of MS excel format (soft copy) alongwith Part-1)*

The manufacturer shall furnish the guaranteed technical particulars for the offered equipment strictly in accordance with this schedule, duly filled in and signed and submitted with part I of the tender. Care should be taken for indicating the specific values as far as possible and notes like refer I.S.S., items are proprietary in nature, hence can not be indicated etc should be avoided.

Sl. No.	Description	As per Tenderer
1.	Name of the manufacturer and place of manufacture	:
2.	Service (Indoor/outdoor)	:
3.	Reference standard	:
4.	Type/No of phase	:
5.	Rated frequency	:
6.	Normal ratio of transformer	:
7.	Rated voltage in KV.	:
	i) High voltage winding	:
	ii) Low voltage winding	:
8.	Connection including vector group reference no. and symbol.	
	i) High voltage winding	:
	ii) Low voltage winding	:
	iii) Vector group reference	:
9.	Normal full load single phase/three phase output with temperature rise as specified in the specification.	
	i) HV winding (KVA)	:
	ii) LV winding (KVA)	:
10.	Continuous single phase/three phase output under site conditions as specified in the specification (after applying derating factor if any).	
	i) High voltage wind (KVA)	:
	ii) Low voltage winding (KVA)	:
11.	Type of cooling and corresponding Normal full normal full load output.	ONAN    ONAF
	i) High voltage winding (KVA)	:
	ii) Low voltage winding (KVA)	:
12.	Overload capacity (for two house) starting from full load and with temperature as specified in this specification (KVA) indicate specification value.	:
13.	Tapings.	
	i) Type of tap changer.	:
	ii) Number	:
	iii) Range	:
	iv) Location	:
14.	Type of core construction	:
15.	Temperature rise above ambient temperature of 50°C	
	i) In oil by thermometer (°C)	:
	ii) In winding by resistance (°C)	:
	iii) Hot spot temperature (°C)	:
16.	Limit for hot spot temperature for which the transformer is designed (°C)	:
17.	i) Guaranteed NO-LOAD LOSS at normal ratio, rated frequency and 75°C average winding temperature (in KW) (indicate the maximum value)	:

	ii) Tolerance, if any	:	No positive tolerance
18.	i) Guaranteed LOAD LOSS at normal ratio, rated output, rated voltage, rated frequency at 75°C avg. winding temperature including the auxiliary losses at rated output (KW).	:	
	a) I <sup>2</sup> R Loss at 75°C	:	
	b) Eddy Current and stray loss as percentage of load loss @75°C	:	
	ii) AUXILIARY LOSSES at rated output as included above (KW).	:	
19.	TOTAL LOSSES at normal ratio, rated output/voltage/frequency and maximum attainable temperature at site including auxiliary losses (KW).		
20.	Exciting current and power factor.		
	i) At normal voltage & frequency	:	
	ii) At maximum voltage & normal frequency	:	
21.	Efficiency at 75°C (in percentage)	:	At unity P.F.      At 0.8 p.f. Lag
	i) On 100% load	:	
	ii) On 75% load	:	
	iii) On 50% load	:	
	iv) On 25% load	:	
22.	Maximum Efficiency (% of full load)	:	
23.	Load at which the efficiency occurs.	:	
24.	Regulation at full load at 75°C expressed at % age of normal voltage.		
	i) At unity power factor	:	
	ii) At 0.9 power factor (lag)	:	
25.	Resistance at 75°C		
	i) H.V. winding	:	
	ii) LV winding	:	
26.	Impedance voltage drop at normal ratio at 75°C (expressed as % of normal voltage on full load.	:	
27.	i) Percentage reactance at rated current and frequency.	:	
	ii) Percentage impedance at rated current and frequency at 75°C	:	
	a) Positive sequence.	:	
	b) Zero sequence.	:	
	iii) Range of variation offered.	:	
	iv) Tolerance applicable, if any.	:	
28.	a) Maximum current density in winding.		
	i) High voltage winding (Amp/Sq. (m)	:	
	ii) Low voltage winding (Amp/Sq.(m)	:	
	b) Conductor area of cross section (sq.mm)		
	i) HV Winding	:	
	ii) LV Winding	:	
29.	Flux density in core (in TESLA)		
	i) Under normal voltage and frequency	:	
	ii) At 11% rated voltage and frequency	:	
	iii) Whether the transformer will withstand 130% over voltage for three minutes or not.	:	Indicate Yes/No
30.	No load current in Amp. referred to HV at 50 No.		
	i) At 90% rated voltage	:	
	ii) At 100% rated voltage	:	
	iii) At 110% rated voltage	:	
31.	RMS symmetrical value and duration of short circuit current for which the transformer is protected against mechanical and thermal stresses.	:	
32.	RMS asymmetrical value of short current	:	

- current for which the transformer is protected against mechanical stress.
33. Core
    - i) Type of core joint (Butt or interleaved) :
    - ii) Material of laminations :
    - iii) Thickness of laminations :
    - iv) Net core area (Sq. meters) :
    - v) Type of joints between core limb and yoke. :
  34. Details of last lot of Prime CRGO Steel imported
    - i) Quantity (kg) :
    - ii) Name of supplier :
    - iii) Date of customs clearance :
    - iv) Details of bill of lading :
  35. Type of windings
    - i) High Voltage. :
    - ii) Low voltage :
  36. Type of Axial core supports
    - i) High Voltage winding :
    - ii) Low voltage winding :
  37. Type of Radial supports.
    - i) High Voltage winding. :
    - ii) Low voltage winding. :
  38. Winding Insulation.
    - i) High Voltage winding :
    - ii) Low voltage winding :
  39. Insulating material
    - i) Turn insulation :
    - ii) HV side :
    - iii) EV side :
    - iv) Between HV, LV as applicable :
    - v) Between core & LV side :
    - vi) For core and plates :
    - vii) For core laminations. :
  40. Test Voltages: :
  - 40.1. Power frequency High voltage tests.
    - i) Test voltage for 1 minute with stand test on line end of HV winding (KV rms) :
    - ii) Test voltages for 1 minute with stand test on neutral end of HV winding (KV rms) :
    - iii) Test voltage for 1 minute withstand test on both line & neutral ends of LV winding (KV rms) :
  - 40.2 Lighting Impulse withstand voltage teste.
    - i) Test voltages for 1.2/50 micro second full wave withstand test on HV winding (KV crest) :
    - ii) Test voltage for 1.2/50 micro second full wave withstand test on LV winding (KV crest) :
    - iii) Test voltage for 1.2/50 micro second full wave withstand test on Ter winding (KV crest) :
    - iv) Test voltage for 1.2/50 micro second full wave withstand test on HV neutral. :
  - 40.3. Switching impulse withstand voltage tests
    - i) High Voltage winding :
    - ii) Low voltage winding :
  - 40.4 Induced over voltage withstand tests.
    - i) High Voltage winding :
    - ii) Low voltage winding :
  41. Inter Turn Insulation
    - i) Extent of end turns reinforcement (%) :
    - ii) Extent of reinforcement of turns adjustment :

- to tapping (%) :
- iii) Test voltage for 1 min . 50Hz, inter turn insulation test on (i) (KV rms) :
- iv) Test voltage for 1 min, 50Ms, inter turn insulation test on (ii) (KV rms) :
- v) Test voltage for 1 min 50mz, inter turn insulation test on main body of the winding KV rms :
- 42. Maximum continuous ratings (Approx).
  - i) At 50°C ambient temp at site (KVA) :
  - ii) At 50°C ambient temp at site (KVA) :
  - iii) At 30°C ambient temp at site (KVA) :
  - iv) At 25°C ambient temp at site (KVA) :
- 43. Clearance
 

In oil		out of oil	
Between phases	Phase to ground	Between phases	Phase to ground
i) High Voltage.		:	
ii) Low voltage		:	
- 44. Details of tank
  - i) Material for tank. :
  - ii) Type of tank :
  - iii) Thickness of side plate (mm) :
  - iv) Thickness of bottom plates (mm) :
  - v) Thickness of top cover plates (mm) :
  - vi) Thickness of tube radiator (mm) :
- 45. Approximate weight (in kgs)
  - i) Core :
  - ii) Bare Copper :
  - a) High Voltage Winding :
  - b) Low voltage Winding :
  - c) Connection leads :
  - d) Total :
  - iii) Weight of core and winding :
  - iv) Weight of tank with cover :
  - v) Weight of fittings and accessories detached for transport. :
  - vi) Weight of oil required for first filling including bushings, conservator, cooling system etc. :
- 46. Weight of complete transformer with all fittings & accessories but without oil (in kgs.) :
- 47. Weight of complete transformer with all fittings and accessories with oil (Kgs.) :
- 48. Net untanking weight :
- 49. Minimum clear weight for lifting core and windings from tank in meters (untanking weight) :
- 50. Dimension of the transformer.
  - i) Maximum height of tap bushings. :
  - ii) Over all weight :
  - iii) Over all width :
- 51. Shipping details.
  - i) Weight of Heaviest package in kgs. :
  - ii) Dimensions of largest package :
- 52. Width of Rail gauge for installation in (in metro) :
- 53. Details of on load tap changer
  - i) Make :
  - ii) Type :
  - iii) Ratings. :
  - a) Rated voltage :
  - b) Rated Current. :
  - c) Step voltage :

	d) Number of steps	:	
	iv) Time to complete one tap change step in seconds	:	
	v) Direction selector switch transition time (cycles).	:	
	vi) Control	:	
	vii) Auxiliary supply details	:	
	viii) Voltage control	:	
	ix) Line drop compensation.	:	
	x) Protection Devices provided or not	:	
	xi) Value of maxm short circuit current.	:	
	xii) Maxm Impulse withstand test voltage with 1.2/50 micro second full wave between switch and ground.	:	
	xiii) Maxm. Impulse withstand test voltage with 1.2/50 micro second full wave between the remote terminal and ground with selector terminal at one end of the rage.	:	
	xiv) Maxm power frequency test voltage between switch assembly & ground.	:	
	xv) Maxm. impulse withstand test voltage with 1.2/50 micro second across the taping range.	:	
	xvi) Minimum temperature of the tap changer which must not be exceeded during operation.	:	
	xvii) Approx overall weight of tap changer (Kgs)	:	
	xviii) Approx overall dimension of tap changer (in metres)	:	
	xiv) Approx overall quantity of oil (Kgs.)	:	
	xx) Number of operations after which the change oil recommended.	:	
	xxi) Reference standard.	:	
54.	<b>BUSHING PARTICULARS</b>		<b>HV LV NATURAL</b>
	i) Type	:	
	ii) Creepage distance in	:	
	iii) Weight of assembled bushing kgs	:	
	iv) Maximum current rating of the bushings	:	
	v) Phase to earth clearance in Air of live parts at the top of bushings	:	
	vi) Grade of oil in bushing	:	
	vii) Quantity of oil in bushing (Ltr)	:	
	viii) One minute dry power frequency withstand voltage (Kv rms).	:	
	ix) 10 sec one minuteL wet power frequency withstand voltage (KV rms)	:	
	x) Impulse withstand test voltage with 1.2/50 micro second full wave.	:	
	xi) Dry flashover voltage.	:	
	xii) Wet flashever voltage.	:	
	xiii) Power frequency visible corons discharge voltage (where for applicable).	:	
	xv) Free space required at the top for removal of Bushing.	:	
	xvi) Reference standard.	:	
55.	<b>Cooling system.</b>		
	i) Grade of oil	:	
	ii) Volume / weight of oil for cooling system.	:	
	iii) Total radiating surfaces in metre sq.	:	
	iv) Method of dry out transformer at site.	:	
	v) Type/make of material used for radiator.	:	
	vi) Total number of Radiators for transformer and dimensions of tubes	:	



56.	vii) Total weight of Radiators in Kgs. Cooling Equipment.	:	Cooler fan motor	Cooler pump Motor
	i) Make	:		
	ii) Type	:		
	iii) Number connected.	:		
	iv) Number in stand by	:		
	v) Ratings	:		
	a) Rated power/ voltage	:		
	b) Capacity ltrs/min.	:		
	c) BHP of driven equipment.	:		
	d) Any other details	:		
	vi) Auxiliary power requirement	:		
	vii) Automatic operation of cooler pumps/motors provided.	:	Indicate Yes or No.	
	viii) Transformer capacity with following cooling units out of services.	:		
57.	Explosion vent Diaphragm:	:		
	i) Make and type	:		
	ii) Material	:		
	iii) Thickness	:		
	iv) Minimum pressure at which the diaphragm is likely to rupture (kg/cm <sup>2</sup> )	:		
58.	Details of Bushing CT:		Phase CT	
		Neutral CT	132 KV	33 KV
			Class	Class
	i) Type	:		
	ii) Number furnished	:		
	iii) Current ratio.	:		
	iv) Rated Burden (VA)	:		
	v) Accuracy class	:		
	vi) Knee point voltage	:		
	vii) Service voltage	:		
	viii) C.T. internal resistance at 75°C	:		
	ix) BIL	:		
	x) Thermal current for 3 sec.	:		
	xi) Dynamic current.	:		
	xii) Reference standard.	:		
59.	Oil Temperature Indicator.	:		
	i) Type and size.	:		
	ii) Whether supervisory alarm contact provided (Yes/no)	:		
60.	Oil level indicator.	:		
	i) Type	:		
	ii) Whether supervisory alarm contact provided (yea/no)	:		
61.	Winding temperature indicator.	:		
	i) Type	:		
	ii) Whether supervisory alarm contact provide (Yes/No)	:		
	iii) If, yes, sizes & nos thereof	:		
	iv) Ratio and type of CTs used for W.T.I.	:		
62.	Breathers.	:		
	i) No. of Breathers provided.	:		
	ii) Type of dehydrating used.	:		
	iii) Quantity.	:		
63.	Capacity/Volume of conservator.	:		
64.	Volume of Oil	:		
	i) Transformers	:		
	ii) Bushings	:		
	iii) Cooling systems.	:		

- iv) Conservator etc. :
- v) Total volume of oil required :
- vi) Total volume of oil required plus 10% extra :
- vii) Volume of oil in tank is case the main tank is transported oil filled. :
- 65. Characteristics of TR. Oil. :
- i) Make and appearance. :
- ii) Density (gms/cu.cm.) :
- iii) Kinematics viscosity (CST) :
- iv) Interfacial tension at 27°C (N/M) :
- v) Flash point. :
- vi) Pour point :
- vii) Acidity i.e. Neutralization value in mg. of KOH/gm.: :
- viii) Corrosive sulphur in % :
- ix) Electric strength (Breakdown voltage) (in KV rms) :
- a) New untreated oil as received. :
- b) After treatment. :
- x) Dielectric dissipation factor (Tan-Delta) At 90°C :
- xi) Specific resistance (ohm/Cm) :
- xii) Oxidation stability. :
- a) Neutralization value after oxidation :
- xiii) Water content (PPm) :
- xiv) Oxidation ag test with copper catalyst for 96 hours as per ASTM-D-1934 :
- a) Resistivity at 27°C (Minimum) :
- b) Resistivity at 90°C (minimum) :
- c) Total acidity (Maximum) :
- d) Total sludge (Maximum) % :
- e) Tan Delta at 90°C (Maximum) :
- 66. Any other particulars needed to be mentioned. :

Place:-

Date:-

Name:

Status:

Name of the tendering company

And seal.

# **BIDDING SCHEDULES**

## **Section - IV**

**JHARKHAND URJA SANCHARAN NIGAM LIMITED  
RANCHI**

SCHEDULE – A

**Tender Proforma Part – I (Technical & Commercial)**

NIT No. 115 /PR/ JUSNL/ 2015–16

DUE DATE OF THE TENDER : 10.09.2015

1. Name & Full address of the tenderer :  
With Tel & Fax No.
  
2. Name of Materials :
  
3. Name of Manufacturer :
  
4. Quantity offered :
  
5. Whether the F.O.R. destination price has :  
been quoted giving freight element
  
6. Price variation clause if any :
  
7. Delivery period :
  
8. Validity of the offer :
  
  
9. Acceptance of the payment terms :
  
10. Details of deviation from the tender :  
Specification if any
  
11. Acceptance of the technical specification :  
of the materials for which offer is made
  
12. Guarantee performance particulars & :  
copies of performance & test certificates  
of materials have been attached
  
13. Guarantee :
  
14. Acceptance of penalty clause :
  
15. Particulars of payment made for Purchase of :  
BOQ and specification
  
16. Amount of earnest money paid with money :  
receipt No. & Date
  
17. Whether the firm is registered SSI Unit of  
Jharkhand or registered with NSIC/  
DGS&D (give details) of registration etc.

& attach photo state copy of certificates

18. Name of place where the materials will be manufactured & will be available for inspection by officer of the JUSNL.
19. Whether upto-date Sales Tax and Income Tax clearance certificates submitted
20. Sales Tax Registration No. :
21. Whether proof of financial capability submitted :
22. Whether details of orders executed & performance certificate submitted in attested/ certified copy. :
23. List of enclosures :
24. Remarks :

Signature of tenderer with full name

Designation:.....

Seal:.....

**JHARKHAND URJA SANCHARAN NIGAM LIMITED**  
**ENGINEERING BUILDING, HEC, DHURWA, RANCHI-4**

**SCHEDULE – B – I**

**TENDER PERFORMA PART – II (PRICE)**

NIT No. 115 /PR/ JUSNL/ 2015–16

DUE DATE OF THE TENDER : 10.09.2015

1. Name & full address of Tenderer :
2. Name of Manufacturer :
3. Name of Materials :
4. Tender notice no. & Date :
5. Quantity offered :
6. Price (Both in words & figures) :
  - a) Ex – factory price :
  - b) Excise Duty :
  - c) Sales Tax :
  - d) **Freight including loading, unloading at site, packing & forwarding etc.** :
  - e) Other charges, if any :
  - f) Insurance (will be arranged by the JUSNL) :
7. Discount, if any :
8. The price should be quoted considering benefit of “MODVAT”/ any other assistance available to the supplier and the benefit by them. A certificate/ undertaking to this effect should also accompany the tender.

Signature of tenderer with full name

Designation:.....

Seal:.....

Note: Breakup in the schedule of price attached must be filled up.

## SCHEDULE OF PRICE B II

Sl No.	Item Description	Qty.	Unit Ex-works price in Rs.	Unit Freight charge Rs.	Unit Excise Duty leviable at present (Rs.)	Unit sales tax leviable at present (Rs.)	Entry Tax (Rs.)	Specify other taxes leviable if any (Rs.)	Unit Landed price including sales tax, entry tax, excise duty and freight (Rs.)	Total Landed price including sales tax, entry tax, excise duty and freight (Rs.)
1	Three phase 50 Hz ONAN/ONAF 50 MVA, 132/ 33 KV Power transformer with OLTC, RTCC, fitting & Control equipment etc. with first filling of oil Plus 10% extra oil..	10 Nos.								
2.	<b><u>SPARES</u></b> i) H.V. Bushing ii) L.V. Bushing iii) Neutral Bushing iv) Set of gaskets v) Buchholz relay vi) Magnetic oil guage vii) Buchholzs Relay for OLTC viii) Winding temp. Indicator ix) Oil temp indicator x) Silicagel breather xi) Pressure relief device xii) Fan. xiii) Contactor for fan. xiv) Contactor for tap changer.	10 Nos. 10 Nos. 10 Nos. 10 Nos. 10 Nos. 10 Nos. 10 Nos. 10 Nos. 10 Nos. 10 Nos. 10 Nos. 10 Nos. 10 Nos. 10 Nos.								
3	<b><u>Type Test/ Special test Charges</u></b> Short Circuit Test Lightning Impulse Test Temperature Rise Test Dissolve Gas Analysis test Capacitance & tan delta test Vacuum test on tank Zero Phase sequence test Pressure test on tank Measurement of power taken by cooling	LS								

equipment									
Measurement of accostic noise level									

<b>A</b>	Indicate whether sales tax will be extra or is included in the price quoted.	State: - Extra/ included
<b>B</b>	If extra over the price quoted, indicate percentage of quoted price.	State: Percent
<b>C</b>	Indicate whether excise duty will be extra or is included in the price quoted.	State: - Extra/ included
<b>D</b>	If extra to the price quoted indicate percentage of quoted price	State: Percent
<b>E</b>	INDICATE PRICE	State: - FIRM

Note: - Any vagueness in the answers to the questionnaire will disqualify the tender.

Signature:

Name:

Designation:

Date: -

Name of the Company:

Place: -



**TO BE FILLED IN AND SIGNED BY THE TENDERER**

Schedule – C

**Schedule of General Particulars**

1. Name of Bidder/ Manufacturer :
2. Address of Bidder/ Manufacturer :
3. Telegraphic address of Bidder/ Manufacturer :
4. Name & designation of the officer of the Bidder/ Manufacturer to whom all reference shall be made for expeditious technical co-operation :
5. Place of Manufacturer :
6. Service of facilities available :
7. Availability of spare parts :
8. Bidder proposal no. & date :
9. Offer is valid upto : Give date upto which valid
10. i) Earnest money deposited or not : State Yes/ No  
ii) If deposited indicate amount & details  
iii) If not, state DGS&D registration no. and tech detail of validity of registration : Date upto which it is valid.  
iv) For SSI units of Jharkhand state, details of registration number of SSI registration enclosed or not. : State Yes/ No  
v) Whether Govt. of India or State Govt. undertaking. If yes give details to authenticate the claim : State Yes/ No  
vi) Enclose Photostat copy of the letter of registration with DGS&D, SSI for SSI unit of Jharkhand with the bid. : State Yes/ No
11. i) Security deposit of five percent of the value of the order has to be deposited within 15 days from issue of L.O.I. on the successful bidder. : State willing to deposit/ not willing  
ii) This deposit has to be kept with the JUSNL for the entire guarantee period. : State willing to deposit/ not willing
12. Whether delivery schedule indicated in the specification is acceptable. : State Yes/ No
13. Whether penalty for delay of delivery as indicated in the specification is acceptable. : State Yes/ No
14. Whether latest copy of income tax clearance certificate and sales tax certificate enclosed with the bid or not. : State Yes/ No
15. Whether terms of payment indicated in the specification is acceptable. : State Yes/ No
16. Whether guarantee clause indicated in the specification is acceptable. : State Yes/ No
17. Whether 5% bank guarantee as stipulated under performance guarantee clause will be submitted. : State Yes/ No
18. Whether agreeable to enter into a contract in event of order. : State Yes/ No
19. Whether unit F.O.R. destination prices have been quoted in the price bid. : State whether freight is included or extra to the price quoted.
20. Whether prices quoted are also applicable on reduced quantity or not? Rebate on account of : Indicate amount

- quantity increase, if any, applicable may be mentioned.
21. Whether a statement showing deviations from general conditions enclosed. : State Yes/ No
  22. Whether a statement showing deviations from technical specification enclosed. : State Yes/ No
  23. Whether the bidder is agreeable to manufacture & supply the equipment in case deviations stipulated by him is not acceptable to JUSNL. : State Yes/ No
  24. Whether excise duty is leviable. : If so, say extra or included in the price quoted.
  25. Whether sales tax is chargeable. : If so, say extra or included in the price quoted.
  26. Whether certificate/certificates of past performance enclosed or not. : State Yes/ No
  27. Annual production units for past 5 years. :
  28. Whether unit F.O.R. destination price of all individual items quoted in the price bid or not? : State Yes/ No

Signature:

Name:

Designation:

Name of the Company:

Date: -

Place: -

**(TO BE FILLED IN AND SIGNED BY THE TENDERER)**

**SCHEDULE – ‘D’**

**Schedule of Deviations Technical Specification**

We/ I have carefully gone through the Technical specification and We/ I have satisfied our selves/ myself and hereby confirm that our/ my offer strictly conforms to the requirements of the technical specification except for the deviation which are given below: -

<b>Sl No.</b>	<b>Description (Clause/ page)</b>	<b>Stipulations in specification</b>	<b>Deviation offered</b>	<b>Remark</b>
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Signature:

Name:

Designation:

Name of the Company:

Date: -

Place: -

**(TO BE FILLED IN AND SIGNED BY THE TENDERER)**

**SCHEDULE – ‘E’**

**Schedule of Erection & Maintenance tools**

The tenderer shall furnish below a list of special tools, accessories and equipments required for installation, testing and maintenance and their prices.

<b>Item No.</b>	<b>Description</b>	<b>Number recommended</b>	<b>Units Prices</b>			<b>Purpose of use</b>
			<b>For works</b>	<b>For Site</b>	<b>Total</b>	

Signature:

Name:

Designation:

Name of the Company:

Date: -

Place: -

**(TO BE FILLED IN AND SIGNED BY THE TENDERER)**

**SCHEDULE – ‘F’**

**SCHEDULE OF SPARES QUOTED**

The tenderer shall furnish below a list of spare parts quoted in the price bid. This should be strictly as per the quantity mentioned in the specification.

<b>Item No.</b>	<b>Description</b>	<b>Recommended</b>	<b>Quoted</b>	<b>Purpose of Use</b>
---------------------	--------------------	--------------------	---------------	---------------------------

Signature:

Name:

Designation:

Name of the Company:

Date: -

Place: -

**(TO BE FILLED IN AND SIGNED BY THE TENDERER)**

**SCHEDULE – ‘G’**  
**SCHEDULE OF PAST EXPERIENCE**

<b>Sl No.</b>	<b>Purchaser</b>	<b>Date of initial Operation</b>	<b>Major technical details</b>
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Date: -

Place: -

Signature:

Name:

Designation:

Name of the Company:

**(TO BE FILLED IN AND SIGNED BY THE TENDERER)**

**SCHEDULE – ‘H’**

**SCHEDULE OF DRAWINGS**

The tenderer shall furnish below the list of drawings, which shall be furnished by them.

<b>Sl No.</b>	<b>Name of Drawing</b>	<b>When to be submitted (to be given in days) after issue of letter of intent.</b>
---------------	------------------------	--

Signature:

Name:

Designation:

Name of the Company:

Date: -

Place: -

**(TO BE FILLED IN AND SIGNED BY THE TENDERER)**

**SCHEDULE – ‘I’**  
**SCHEDULE OF DELIVERY**

Guaranteed delivery completion period counted from the date of issue of letter of intent for: -

<b>Sl No.</b>	<b>Name of the equipment</b>	<b>Commencement period in month</b>	<b>Rate of the supply per month</b>	<b>Total completion period in month</b>
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Signature:

Name:

Designation:

Name of the Company:

Date: -

Place: -



# **FORMATS**

**CONTRACT FORM**

This contract made this ..... only of ..... of the Thousand  
Nine Hundred ..... Between the JUSNL, constituted under section 5 of the Electricity  
(supply) Act, 1948 (hereinafter referred to as “The JUSNL” on the one part and Sri  
..... in the own behalf and on behalf of other members of the  
Joint Family/ Proprietor of the firm ..... S/ o Sri  
..... by religion ..... P.O. ....  
P.S. .... District ..... (in the state of .....)  
at present residing at Vill/ Town .....  
District .....

**OR**

..... as partnership firm/ joint stock company duly registered under the Indian  
Partnership Act. 1932/ Indian Company Act. 1913/ 1956 bearing registration No. .... 19  
with the Registrar of Firms/ Registrar of Joint Stock Company at ..... in the State of  
..... and having its registered office at ..... acting through its  
..... namely Sri ..... S/o .....  
Permanent resident of Village/ Town ..... P.O. .... P.S. ....  
District ..... in the state of ..... as present residing at Village/ Town  
..... P.O. .... P.S. .... District  
..... (Hereinafter referred to as the “Contractor/ Supplier”. Which expression,  
shall unless excluded or repugnant to the context, including his heirs, legal representatives,  
successors, executors, administrators and permitted assigns) on the other part.

Whereas the JUSNL agrees to purchase ..... quantity of ..... materials  
and the supplier/ contractor has agreed to sell the said materials in accordance with JHARKHAND  
URJA SANCHARAN NIGAM LIMITED’s notice inviting Tender No. .... General  
conditions of tenders and the bill of quantity and contractors/ supplier proposal No. ....  
Dated ..... and ..... on the following terms and conditions.

- (i) The contractor/ supplier agrees to deliver the above said materials in conformity with  
the provisions of the general conditions of NIT and other documents referred to above  
which forms as part of this contract within ..... months from execution of  
this contract.
- (ii) The JUSNL hereby agrees to pay the contractor/ supplier on due performance of the  
contract price of ..... from the JUSNL’s fund in the manner  
and in accordance with terms specified in the NIT as also in the P.O. No. ....  
dated ..... to be issued.
- (iii) Other conditions if any, to be mentioned.

In witness whereof the said parties hereto have hereunto set and subscribed their respective hand and seal the day and year first above written.

I signed by/ or on behalf of the Contractor/ supplier ..... Authorized by the contractor/ supplier under deed of ..... Dated ..... strike off the words not needed. Where the signature is made under authorization made by a deed resolution, the customer should furnish and attested copy of deed/ resolution.

Signature on behalf of the JUSNL

Signature on behalf of the Contractor/ Supplier

Seal of the Contractor/ Supplier

1. Witness

1. Witness

2. Witness

2. Witness

**FOR “SECURITY DEPOSIT” / “PERFORMANCE GUARANTEE”**

**FORM OF GUARANTEE BOND**

**(TO BE USED BY NATIONALISED BANKS)**

This deed of guarantee is made this ..... Day of ..... between  
.....

(Name of the Bank and its)

Constitution with detailed address including its head office (hereinafter called “the Bank”, which expression shall, where the context so admits include its successor and permitted assign) of the one part and the JHARKHAND URJA SANCHARAN NIGAM LIMITED being the JUSNL constituted under section – 5 read with section – 12 of the Electricity (Supply) Act, 1948 (Act. No. I, IV of 1948) having its head office at H.E.C., Engineering Building, Dhurwa, Ranchi (hereinafter called “The JUSNL” which expression shall, where the context so admits include its successor and permitted assign) of the other part.

**1. WHERE AS** ..... (Name of the contractor or supplier if a Co.) being a company registered under the Indian Companies Act having its registered office at ..... (Name of the contractor (S) or supplier (S). If a partnership firm) ..... bearing registration no. .... of the year ..... with the registration of firms at ..... and having its registered office at ..... (Name of contractor or supplier if individual ..... Fathers name ..... resident of ..... P.S. .... District ..... and having his principal place of business at ..... (hereinafter called “The said contractor (S)/ the said supplier (S) entered into an agreement no. .... dated ..... with the JUSNL for Rs. .... (Hereinafter called “the said agreement”) has been placed an Order No. .... dated ..... for the supply of ..... to the JUSNL (here in after called “The said purchase order”).

**2. WHEREAS**, in accordance with clause ..... of the said agreement/ the said purchase order, the said contractor (S) said supplier (S) in required to deposit with the JUSNL Rs. .... only as cash security for the due performance of the terms and conditions of the said agreement/ the said purchase order.

**AND WHEREAS**, in accordance with ..... of the said agreement/ the said purchase order, the Bank have at the request of the said contractor (S)/ the said supplier (S) agreed to give their guarantee and the JUSNL has agreed to accept the said Bank Guarantee for the aforesaid sum.

**NOW THESE PRESENT WITNESSETH AS FOLLOWS: -**

In consideration of the JUSNL having agreed to exempt the said contractor (S)/ the said supplier (S) from the demand under terms and conditions of the said agreement/ the said purchase order of security deposit/ performance for the due fulfillment by the said contractor (S)/ the said supplier (S) of the terms and conditions in the said agreement/ the said purchase order on production of a Bank Guarantee for Rs. .... (Rs. .... only) we, ..... Bank do hereby undertake to pay to the JUSNL an amount not exceeding Rs. .... Against any loss of damage or non-payment caused to or suffered or would be caused to or suffered or would be caused to or suffered by the JUSNL by reason of any breach by the said contractor (S)/ the said supplier (S) of any of the terms and conditions contained in the said agreement/ the said purchase order.

3. We ..... Bank do hereby undertake to pay the amount due and payable under this guarantee without any demurrage, merely on a demand from the JUSNL stating that amount claimed is due to way of loss of damage caused to or would be caused to or suffered by the JUSNL by reason of any breach of the said contractor (S)/ the said supplier (S) of any of the terms and conditions contained in the said agreement/ the said purchase order or by reason of the said contractor's (S) the said supplier's failure to perform the said agreement/ the said purchase order. Any such demand on the bank shall be conclusive as regards the amount due and payable by the Bank under the guarantee. However, our liability under this guarantee shall be restricted to amount no exceeding Rs. ....

4. We, ..... Bank further agree that the guarantee here in contained remain in full force and effect during the period that would be taken for the performance of the said agreement/ the said purchase order and that it shall continue to be enforceable till all the dues of the JUSNL under or by virtue of the said agreement/ the said purchase order has been fully paid and its claims satisfied or discharged or till the JUSNL certificate that the terms and conditions of the said agreement/ the said purchase order/ fully and properly carried out by the said contractor (S)/ the said supplier (S) and accordingly discharges the before ..... We shall be discharged from all liability under this guarantee there after.

5. We, ..... Bank further agree with the JUSNL that the JUSNL shall have the fullest liberty without our consent and without affecting in any manner our obligations hereunder to vary any of the terms and conditions of the said agreement/ the said purchase order or to extend time of performance by the said contractor (S)/ the said supplier (S) from time to time or to postpone for anytime or from time to time, any of the powers exercisable by the JUSNL against the said contractor (S)/ the said supplier (S) and to forbear or enforce any of the terms and conditions relating to the said agreement/ the said purchase order and we shall not be

relieved from our liability by reason of any such variation, or extension being granted to the said contractor (S)/ the said supplier (S) or for any forbearance act of omission on the part of the JUSNL or any indulgence by the JUSNL to the said contractor (S) the said purchase order or by any such matter or thing what so ever which under the law relating to sureties would but for this provision have effect of so relieving us.

**6.** We, ..... Bank lastly undertake not to revoke this guarantee during its currency except with the previous consent of the JUSNL in writing.

Date the ..... day of .....

For ..... Bank.

**FOR 'PAYMENT'**  
**FORM OF GUARANTEE BOND**  
**(TO BE USED BY NATIONALISED BANKS)**

THIS DEED OF GUARANTEE IS MADE THIS ..... day to ..... between ..... (Name of the Bank) and its ..... Constitution with detailed address including its head office (hereinafter called “the Bank”, which expression shall, where the context so admits include its successor and permitted assign) of the one part and the **JHARKHAND URJA SANCHARAN NIGAM LIMITED** being the JUSNL constituted under section – 5 read with section – 12 of the Electricity (Supply) Act, 1948 (Act. No. LIV of 1948) having its head office at H.E.C., Engineering Building, Dhurwa, Ranchi (hereinafter called “The JUSNL” which expression shall, where the context so admits include its successor and permitted assign) of the other part.

**1. WHERE AS** ..... (Name of the contractor or supplier if Govt.) being a company registered under the Indian Companies Act having its registered office at ..... (Name of the contractor or supplier, if a partnership firm) bearing registration no. .... of the year ..... with the registration of firms at ..... and having its registered office at (Name of contractor or supplier if individual ..... Fathers name ..... resident of ..... P.S. .... District ..... and having his principal place of business at ..... (hereinafter called “The said contractor (S)/ the said supplier (S) entered into an agreement no. .... dated ..... with the JUSNL for Rs. .... (Hereinafter called “the said agreement”) has been placed an Order No. .... dated ..... for the supply of ..... to the JUSNL (here in after called “The said purchase order”).

**2. WHEREAS**, in accordance with clause ..... of the said agreement/ the said purchase order, the said contractor (S) said supplier (S) in required to deposit with the JUSNL Rs. .... only as cash security for the due performance of the terms and conditions of the said agreement/ the said purchase order.

**AND WHEREAS**, in accordance with clause ..... of the said agreement/ the said purchase order, the Bank have at the request of the said contractor (S)/ the said supplier (S) agreed to give their guarantee and the JUSNL has agreed to accept the said Bank Guarantee for the aforesaid sum.

**NOW THESE PRESENT WITNESSETH AS FOLLOWS: -**

In consideration of the JUSNL having agreed to exempt the said contractor (S)/ the said supplier (S) of Rs. .... as per terms and conditions mentioned in the said agreement/ the said purchase order, on production of bank guarantee for Rs. .... (Rs. .... only) we, ..... Bank limited do hereby undertake to pay to the JUSNL an amount not exceeding Rs. .... Against any loss or damage or non-payment caused to or suffered on would be caused to or suffered or would be caused to or suffered by the JUSNL by reason of any breach by the said contractor (S)/ the said supplier (S) of any of the terms and conditions contained in the said agreement/ the said purchase order.

**2.** We ..... Bank do hereby undertake to pay the amount due and payable under this guarantee without any demurrage, merely on a demand from the JUSNL stating that amount claimed is due to way of loss of damage caused to or would be caused to or suffered by the JUSNL by reason of any breach of the said contractor (S)/ the said supplier (S) of any of the terms and conditions contained in the said agreement/ the said purchase order or by reason of the said contractor's (S) the said supplier's failure to perform the said agreement/ the said purchase order. Any such demand on the bank shall be inclusive as regards the amount due and payable by the Bank under the guarantee. However, our liability under this guarantee shall be restricted to amount not exceeding Rs. ....

**3.** We, ..... Bank further agree that the guarantee here in contained remain in full force and effect during the period that would be taken for the performance of the said agreement/ the said purchase order and that it shall continue to be enforceable till all the dues or the JUSNL under or by virtue of the said agreement/ the said purchase order have been fully paid and its claims satisfied or discharged or till the JUSNL certified that the terms and conditions of the said agreement/ the said purchase order are fully and properly carried out by the said contractor (S)/ the said supplier (S) and accordingly discharges the guarantee. Unless demand or claim under this guarantee is made on us in writing on/ before ..... We shall be discharged from all liability under this guarantee there after.

**4.** We, ..... Bank further agree with the JUSNL that the JUSNL shall have the fullest liberty without our consent and without affecting in any manner our obligations hereunder to vary any of the terms and conditions of the said agreement/ the said purchase order or to extend time of performance by the said contractor (S)/ the said supplier (S) from time to time or to postpone for anytime or from time to time, any of the powers exercisable by the JUSNL against the said contractor (S)/ the said supplier (S) and to forbear or enforce any of the terms and conditions relating to the said agreement/ the said purchase order and we shall not be relieved from our liability by reason of any such variation, or extension being granted to the said contractor (S)/ the said supplier (S) or for any forbearance act or omission on the part of the JUSNL



or any indulgence by the JUSNL to the said contractor (S)/ the said supplier (S) or by any such matter or thing what so ever which under the law relating to supplies would but for this provision have effect of so relieving us.

5. We, ..... Bank lastly undertake not to revoke this guarantee during its currency without the previous consent of the JUSNL in writing.

Date the ..... day of .....

For ..... Bank.

**INSURANCE PROFORMA**

The Chief Claims Officer,  
JHARKHAND URJA SANCHARAN NIGAM LIMITED,  
H.E.C., Engineering Building,  
Dhurwa, Ranchi

Dear Sir,

As per terms of the following Purchase Order we have to advise you to please arrange insurance of the following consignment under the JUSNL's Open Marine Policy.

Purchase Order No. .... Dated ..... and address of the Officer placing the order .....

Full description of goods .....

Invoice value (rounded to nearest rupees/ kg. ....

..... (in words)

Rupees ..... a printed copy of the invoice to be enclosed)

Name and Address of consignee .....

Name and Address for Consignor .....

Mode of transit ...../ Rail/ Truck.

6. L.R./ R.R. No. .... dated .....

7. From Station ..... to Station .....

8. Description of packing .....

9. Endorsement on R/R by Railway or other carrier regarding condition of packing at the time of dispatch .....

Yours faithfully

Signature

Full Address of Supplier

Place: - .....

Date: - .....

1. Copy to consignee with R/R
2. Copy to Accounts officer with the Bill.

**FORM FOR EARNEST MONEY DEPOSIT**

(To be issued by Nationalized Banks)

Whereas .....(Name of Bidder) (hereinafter called “the Bidder”) has submitted his bid dated.....(date) for the construction / supply of.....(name of contract) (hereinafter called “the Bid”) against NIT No ...../PR/JUSNL/.... Know all People by these presents that We.....(name of the Bank) of .....(name of country) having our registered office at .....(hereinafter called “the Bank”) are bound unto.....Accounts Officer, JUSNL, Ranchi (hereinafter called “the purchaser) the sum of Rs.....\* for which well and truly to be made to the said Purchaser the Bank binds itself, his 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 after Bid opening the Bidder withdraws his Bid during the period of bid validity specified in the Bid,  
Or
2. If the Bidder having been notified of the acceptance of his Bid by the Purchaser the period of Bid validity,
  - a) fails or refuses to execute the Form of Agreement in accordance with the Instructions to Bidders, if required,  
or
  - b) fails or refuses to furnish the Performance Security, in accordance with the instructions to Bidders,  
or
  - c) does not accept the correction of the Bid Price pursuant to relevant clause of the bid.

We undertake to pay the Purchaser up to the above amount upon receipt of his first written demand, without the Purchaser having to substantiate his demand, provided

that in his demand the Purchaser will note the amount claimed by him is due to him owing to the occurrence of one or any of the three conditions, specifying the occurred condition or conditions.

This guarantee will remain in force up to and including the date .....\*\* months after the deadline for submission of Bids as such deadline is stated in the instruction to Bidders or as it may be executed by the Purchaser, notice of which extension(s) to the Bank not later than the above date.

We, .....bank lastly undertake not to revoke this guarantee during its currency except with the previous consent of the JUSNL in writing.

Date the .....day of .....20

For .....Bank

Signature of the Bank.....

Witness.....Seal.....

(Signature, name and address).....  
.....  
.....

- \* The Bidder should insert the amount of the guarantee in words and figures denominated in Indian Rupees. This figure should be the same as shown in relevant clause of the Bidding Document.
- \*\* .....Months after the end of the validity period of the Bid. Date should mentioned by the Purchaser in relevant clauses of the Bidding Document.