PUNJAB STATE TRANSMISSION CORPORATION LIMITED

Regd Office: PSEB Head Office, The Mall, Patiala-147001.
Office of: Engineer-In-Chief /TS,
3rd Floor, Shakti Sadan buliding, Patiala-147001.
Tele-0175-2303676 email: ce-tl@pstclindia.org FAX-0175-2301536.
Website: www.pstcl.org Corporate identity Number: U40109PB2010SGC033814

E -TENDER SPECIFICATION NO. STQ-5076

SPECIFICATION FOR MANUFACTURING, TESTING AND SUPPLY OF 6 NOS. 160 MVA, 220/66 KV POWER TRANSFORMERS.

DUE DATES & TIME*:*

1) Last Date/time for Downloading of Tender Spec. : 04.09.17 upto 10.30AM
2) Last Date/time for submission of Tenders : 07.09.17 upto 10.30 AM
3) Due Date/time for Opening of Tenders : 07.09.17 at 11.00AM

COST OF SPECIFICATION: Rs. 2500/-
(Rs. Two thousand Five hundred only)

NOTE:

1) **For Main Transformer, tenderers should quote VARIABLE Prices as per IEEMA with base date as first working day of the calendar month, one month prior to the date of tender opening i.e. 01.08.17. However for NIFPES and OPTIONAL Spares, only FIRM Prices should be quoted.**
2) **No benefit of capitalization shall be allowed if any firm quotes losses less than the guaranteed losses. Offer of the firm with losses more than the maximum losses mentioned in the Specification shall be out rightly rejected.**
3) **The bidders shall submit test certificates of the short circuit test, if already done on the offered design and rating. Otherwise short circuit (S.C.) test shall be carried out on one of the units free of cost.**
4) **Charges of all the tests (i.e. Stage tests, Routine tests, Type tests & Special tests) shall be deemed to have been included in the quoted prices. No separate charges shall be given for the tests. Offers of the firms who quote separate charges for the tests shall be rejected.**
5) Cost of specification and EMD/PEMD certificate may be furnished in separate envelopes upto the last date/time of bid downloading in the office of Dy.CE/TS(D), Shakti Sadan, PSTCL, Patiala, failing which bids of the firms will not be opened.

..Contd….

6) Please note that the tenders against this tender enquiry are being invited through e-tendering mode. **Submission of Manual tenders in any case shall not be accepted.**

7) The prospective bidders are requested to get their digital signatures well in time for participation in the tender as no request for extension on this account will be entertained.

8) The details regarding e-tendering process may be seen on https://pstcl.nprocure.com or prospective bidders may contact M/s (n)Code Solutions at their toll free no. 1800-233-1010. It may be noted that no hard copy of the specification will be issued by this office and the specification can only be downloaded from the above mentioned website.

Dy. Chief Engineer/TS (D),
PSTCL, Patiala.

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PUNJAB STATE TRANSMISSION CORP. LTD.
(Regd. Office: The MALL, Patiala
Notice Inviting Tender

Type of tender	Open tender
Name & complete address of office giving tender	EIC/TS, 3rd Floor, Shakti Sadan, PSTCL, Patiala.
Tender Specification	**STQ-5076**
Scope of Work	**DESIGN, MANUFACTURE, TESTING & SUPPLY of 6 nos. 160MVA 220/66KV Power Transformers.**
Last date/time of downloading from website https://pstcl.nprocure.com	04.09.17 upto 10.30AM
Last date/time for bid submission	07.09.17 upto 10.30AM
Date/time for opening of bids	07.09.17 upto 11.00AM
Cost of specification	Rs. 2500/-
Mode of payment	As Per Specification

"Tender specification can only be downloaded from website https://pstcl.nprocure.com. Details regarding E-Tendering are available on website www.pstcl.in. All the prospective bidders are requested to get their digital signatures, register themselves on the web site https://pstcl.nprocure.com and get conversant with the process of on line submission of tenders well in time so as to submit the tender by the due deadline. No request for extension in the due date of tender opening on the above grounds shall be entertained."

CHECK LIST OF DOCUMENTS

It is mandatory for the bidders to submit/upload/fill online the following documents else the bid shall be considered unresponsive and hence rejected :

Sr. No.	DETAILS	PART	REMARKS
1.	Cost of Specification	**Part-I**	Submit original DD/ valid PEMD certificate in separate envelopes in the o/o CE/TS before the last date & time of bid submission and Fill up the DD/PEMD details on line.
2.	EMD / PEMD		
3.	Annexure–C (Schedule of Guaranteed data and other technical Particulars)	**Part-II**	FILL ONLINE / UPLOAD SCANNED COPIES AS THE CASE MAY BE
4	SECTION-IV(Schedule of Commercial Deviations)		
5.	SECTION-V(Schedule of Technical Deviations)		
6.	SECTION-VI(Schedule of Past Supplies)		
7	SECTION-X(List of Directors & Turnover)		
8	Type Test Certificate(of Short Circuit Test, If already done on offered design & rating)		
9.	Undertaking for Non-payment of commission		
10.	Copies of PO/Performance certificates issued by SEBs/Govt. Utilities as per specification		
11.	UNPRICED BID		
12.	Any other supporting documents		
13.	SECTION-X (Undertaking for order performance)	**Part-II**	Submit Original after opening of Part-III
14.	SECTION-XI(Proforma for Work Appraisal)	--do--	FILL ONLINE
15.	SECTION-III (Schedule of Quoted Prices)	**Part-III**	FILL ON-LINE

SECTION-I
GENERAL TERMS AND CONDITIONS
AND
GENERAL INSTRUCTIONS TO THE TENDERERS

1.0 GENERAL INSTRUCTIONS TO BE OBSERVED BY THE TENDERERS

1.01 GENERAL:

The following instructions must be carefully observed by all the Tenderers. Offer/Tender not strictly in accordance with these instructions will be liable to be rejected:

i) The tenders must be complete in all respects. The following points should be carefully be studied in order to ensure submission of a complete and comprehensive tender. Failure to comply with any of these instructions or to offer brief explanation for non-compliance is likely to render effective comparison of the tender as a whole, impossible and may lead to rejection of an other-wise competitively lowest offer.

ii) Telegraphic quotations will not be accepted.

iii) Offers/tenders should positively be uploaded before the stipulated time and date prescribed for their receipt. Those received late will not be considered/opened at all.

iv) The Demand Draft/Cash receipt & other information concerning "Earnest Money" as per clause 2.02 shall be furnished in separately sealed envelope super scribed Earnest Money with the name of tendering firm. The firm having permanent security deposit of Rs.10.00 lac (Rs Ten Lacs) with the CHIEF ENGINEER/TS, PSTCL, PATIALA shall give complete details of the deposit in the envelope meant for Earnest Money. The Money in separate cover shall be received in the office of Chief Engineer/TS, TS Design, 1st Floor, Shakti Sadan, PSTCL, Patiala-147001 up to 11:30 A.M. on the due date. While opening the tender the envelope containing Earnest Money will be opened first and if the Earnest Money is found to be in accordance with the terms of specification only then the main tender will be opened, any tender /tenders without EMD or EMD received late shall also not be opened.

v) Offers/tenders will be opened on the date and time prescribed in the N.I.T. / Enquiry in the presence of authorized representatives of Tenderers, who actually submitted/uploaded the tender, If they present themselves at the time of opening of tenders. In case the date of opening of tender falls on a holiday or holiday is subsequently declared on that date, the tenders will be opened on the next working day following the holiday.

vi) The Purchaser reserves the right to modify the "Schedule of requirements", Technical particulars and the specifications at any time and to place the order as a whole or in parts, and to reject any or all the tenders received without assigning any reason. He will not be responsible for and will not pay for expenses or losses that may be incurred by Tenderer in the preparation of the tenders.

vii) The material offered should be strictly according to the specifications laid down in the Enquiry. The quotations should also indicate the make of the manufacturer, brand and company and accompanied with other descriptions, literature and sample, if any, at Tenderer's own cost.

viii) No conditional offers shall be acceptable.

ix) It has been decided by the PSTCL to accept Permanent Earnest Money of Rs.10.00 lac (Rs Ten Lacs) for Chief Engineer/TS, PSTCL, Patiala.

x) All clauses regarding ED, CST, VAT etc. mentioned in the specification may be considered as not applicable as GST has subsumed these taxes w.e.f. 01.07.17.

1.02 PREPARATION OF TENDER:

The tender shall be prepared in formal manner with all prices stated both in words and figures.

1.03 SUBMISSION OF TENDERS:

(a) The tender should be submitted strictly as per NIT/ Tender specification complete in all respects. Alternate suggestions conforming to some British, American or other internationally recognized standards or practice, if any, must be clearly detailed out, explained and justified. These variations should be detailed out clause-wise in the same chronological order as given in this specification. No post tender development will be allowed regarding any change in terms of prices or technical specification.

THREE PART BIDS

Tender shall be submitted in three parts i.e. Part-I, Part-II and Part-III. The following procedure will be adopted for the opening of the tenders:-

Part-I Earnest Money:

The first part will consist of earnest money deposit in the form of demand draft in favour of AO/CPC, PSTCL, Patiala. In case of permanent EMD, the envelope must contain certificate to this effect as per clause 2.02 ii (b)

Part-II Commercial bids/Technical:

The second part will consist of technical specification, schedule of delivery and all other terms & conditions except the rates. All commercial terms including discount if any, ED, CST, Punjab Sale tax etc. should be specified in part-II of the bid, so that any ambiguities relating to general terms & conditions and technical details can be sorted out before the opening of Part-III i.e. price bid.

Part-III Price Bids:

a) The third part will consist of the rates quoted for each item as well as other related terms like freight, insurance, excise duty, CST etc. No correspondence/clarification shall be entertained after the opening of part-III.

Firstly the envelope marked part-I (Earnest money) shall be opened first and if earnest money is found to be as per the requirements of the spec. only then the Part-II shall be opened . The bids without earnest money shall be out rightly rejected.

b) After opening Part-II of the bids (Technical/Commercial), the bids will be evaluated by PSTCL. The third part of the bids (Price Bids) shall be opened in case of only those firms whose Part-II of the bids after evaluation is found to be conforming to the specification. The date and time for opening Part-III of the bids will be intimated to the qualifying firms. The price bids (Part-III) will be opened in the presence of representatives of the qualifying bidders who choose to attend.

c) If some new firm submits tender which has never supplied the tendered item to PSTCL. earlier, its works appraisal shall be carried out before opening of the Part-III "Price Bid" to ascertain whether the offer of the firm is technically/Commercially acceptable or not.

Note: - ***The offer of the firms is liable to be rejected in case works appraisal fee is not received along with tender. For the works appraisal, new firm shall have to deposit following charges along with tender itself in shape of DD In the name of AO/CPC, PSTCL, Patiala.***

a) Rs. 50,000/- for the firms located outside Punjab.

b) ***Rs. 25,000/- for the firms located within Punjab.***

Note: - The above charges are non-refundable, and works appraisal of the firm does not entitle the firm for placement of order.

1.04 VALIDITY:

The tender should be unconditionally valid for at least 120 days from the date of opening and any withdrawal or modification of the offer shall not be permitted after opening of Part-III of tender.

2.00 GENERAL TERMS & CONDITIONS:

2.01 PRICES:

i) The unit rates should be quoted F.O.R. Destination at any Railway Station in Punjab/Punjab State Transmission Corporation Ltd**.** Railway siding, where-ever existing or delivery at PSTCL's stores, through road transportation which will be treated at par with F.O.R. Destination. The breakup of the **F.O.R.** destination price should be given as under:-

a) The price of the material inclusive of packing and forwarding, part of production cost.

b) Packing cost not forming part of production cost, handling, cartage etc. freight charges and transit risk insurance covered in F.O.R. destination price.

ii) All taxes and duties livable on price of finished goods as per sub-clause (i)(a) shall be paid extra and the same should be shown separately as prevalent on the date of opening of tender, to be

paid at the rate as may be actually prevalent at the time of supply, otherwise these elements shall be deemed to be included in the quoted prices and will not be paid extra. No taxes & duties will be payable on the element of cost quoted under sub-clause (i) (b).

iii) In case of rates ex-works/ex-godown and for imported material, freight charges, transit risk insurance, handling and clearance charges, F.O.B. and C.I.F., commission of clearing agents at Ports, should also be indicated separately.

iv) Only Variable prices to be quoted as per prevailing applicable IEEMA Formula which at present is as under:-

$$P = \frac{Po}{100}(10 + 29\ \frac{C}{Co} + 27\frac{ES}{ESo} + \ 7\frac{IS}{ISo} + \ 5\frac{IM}{IMo} + 7\frac{TO}{TOo} + \ 15\frac{W}{Wo})$$

The price variation on the base price of component elements as prevailing on the first working day of the calendar month one month prior to the date of tender opening, should form the basis for quoting variable rates. However, price adjustment shall be made on corresponding rates of variable elements prevailing on the first working day of one month before early delivery or date of contractual delivery whichever is advantageous to Board. In case of delayed delivery the purchaser reserves the right to make payments for price variation on the basis of price computed according to the contractual delivery date or the actual delivery date whichever is advantageous to the purchaser where-ever the prices of raw material are controlled by the Government the basis shall be Government Notification from time to time and in the remaining case the certificate given by Chartered Accountants

iv) The rates quoted F.O.R. destination or ex-works should be given in both figures and words.

v) The prices tendered shall be such as to cover all the material destroyed under tests and no extra payment will be made for the material so destroyed.

Note :-

a) If the any firms intends to supply the material/equipment from different works, then the unit FOR rates should be the same for all the works so that there is only one merit position irrespective of location of works. The offer of the firm with different FOR rates for different works shall be rejected.

b) ***There should be only one option relating to technical/commercial specification, so that FOR Destination rate is one. Any offer with multiple options shall be rejected.***

2.02 EARNEST MONEY:

i) The Tenderers shall be required to submit Earnest Money at the following rates in the form of Punjab State Transmission Corporation Ltd. Cash Receipt/Bank Draft in favour **AO/CPC, PSTCL** payable at Patiala exclusively for CE/TS, along with the tender:

Full E.M.D Rs 10,00,000/-

a) Tender valuing up to Rs.50, 000/-	Nil
b) Tender valuing above Rs.50,000/-	@ 2% of tendered value rounded off to multiple of Rs.10/- on the higher side subject to minimum of Rs.5000/-and maximum of Rs.10.00 lac. In case of three part bids, a fixed amount of earnest money worked out @ 2 % may be got deposited from the prospective bidders depending upon the estimation done by the organizations of the PSTCL.

ii) The following shall be exempted from depositing Earnest Money:-

a) Suppliers having permanent Earnest Money of deposit Rs.10.00 Lac with the CE/TS PSTCL in respect of Chief Engineer/TS: - A certificate to this effect issued by the concerned Accounts Officer of the during three months immediately preceding the due date of tender opening and showing the Serial Number/Account Number allotted in the Permanent Earnest Money Deposit Register shall be submitted by the Tenderers in the envelope for Earnest Money.

b) Sole Manufacturers/Suppliers of Proprietary items.

iii) Earnest money may be accepted in the form of Bank Guarantee valid up to four months after the validity date of tenders as per NIT/Tender specification in the case of Public Sector Undertakings partly owned by Punjab Government/Central Govt. /other State Governments.

iv) a) In case of tenders not accompanied by full amount of Earnest Money for the items tendered but not less than 25% of the entire amount due, the order/contract shall be awarded only for part of material/equipment services limited to a value corresponding to the actual amount of Earnest Money submitted with the tenders provided the placing of such part order is otherwise feasible and is in the interest of the PSTCL, otherwise such tenders shall be ignored.

b) The amount due as referred in (iv) a shall be calculated @ 2% of the tender value and shall not be taken as Rs. 10 lac i.e. Maximum amount payable as EMD. Therefore, 25% of the earnest money shall thus be worked out on the basis of entire amount so calculated, which shall of course be subject to maximum of Rs. 10.00 lac and minimum of Rs. 5,000/-.

v) Earnest Money shall be forfeited in case of withdrawal/ modification of an offer within the validity period as required in the NIT/Tender Specification after opening of Tenders.

vi) In case of successful tenderers, Earnest Money shall be converted as security deposit and shortfall if any shall be got deposited for faithful execution of purchase order/contract.

vii) In case of tenders not accepted, the earnest money shall be refunded within 30 days of the award of order/contract to successful tenderers.

2.03 <u>SALES TAX</u>:

a) **<u>Value Added Tax:</u>**

The VAT as applicable if inclusive in prices shall be paid against documentary proof on submission of following certificates:-

i) Certified that the transaction on which tax has been claimed has been/will be included in the return submitted/to be submitted to the Sales tax authorities for the assessment of the tax and the amount claimed from the PSTCL has been/shall be paid for the Sales Tax Authorities.

ii) Certified that the goods on which tax has been charged have not been exempted under the rules made there-under and charges on account of the Sales tax on these goods are correct under the provisions of the relevant act or rules made there-under.

iii) Certified that we shall indemnify the PSTCL in case it is found at a later stage, that wrong or incorrect payment had been made on account of tax paid by us.

iv) Certified that we are registered dealer & our Regn. no. is _____.

b) CENTRAL SALES TAX:

The Punjab State Transmission Corporation Ltd., Patiala (PSTCL) has come into existence w.e.f. 16.04.2010. The process for getting PSTCL registered as a dealer under the Central Sales Tax act has been initiated.

When the Central Sales Tax is to be paid by the PSTCL., a declaration Certificate in form-'C' will be issued by the AO/CPC, PSTCL, Patiala on receipt of material. When the tax is to be paid by the Supplier a declaration certificate in form-'C' will be issued by the AO/CPC, PSTCL, Patiala, subject to submission of the following certificates:-

i) Certified that the transaction on which tax has been claimed has been/will be included in the return submitted/to be submitted to the Sales Tax Authorities for the assessment of the Sales Tax and the amount claimed from the PSTCL has been/shall be paid to the Sales Tax Authorities.

ii) Certified that the goods, on which Sales Tax has been charged have not been exempted under Central Sales Tax Act or the Rules made there-under and the charges on account of the Sales Tax on these goods are correct under the provisions of the relevant Act or rules made there under.

iii) Certified that we shall indemnify the PSTCL in case it is found at a later stage, that wrong or incorrect payment had been made on account of the Sales Tax paid by us.

iv) Certified that we are registered dealer under the Central/State Sales Tax act and our Registration No. is_____

v) Certified that payment has been made under protest. The bills for the Sales Tax and insurance charges, if any, should be submitted separately. A declaration certificate in form 'C' will be issued by AO/CPC, PSTCL, PATIALA for all supplies received during a particular accounting year.

The firms indicating NIL or concessional rate of CST/ST in their tenders will have to absorb the CST/ST up to full rate applicable at the time of tendering. The firms which do not agree to this stipulation or indicate C.S.T. as extra without indicating applicable rate shall be loaded with maximum rate.

2.04 EXCISE DUTY:

If applicable will be paid at full rates prevailing during the scheduled delivery period subject to the production of the following certificates by the Manager/Senior Administrative Officer of the firm:

i) Certified that the transaction on which the Central Excise Duty has been claimed has been/shall be included in the return submitted/to be submitted to the Central Excise Authorities and amount claimed from the PSTCL has been/shall be paid to the Central Excise Authorities.

ii) Certified that the goods on which Excise Duty has been charged have not been exempted under Central Excise Duty rules and that the Central Excise charged on these goods is not more than what is payable under the provision of relevant Act or rules made there under.

iii) Certified that we shall indemnify the PSTCL**.** in case it is found at a later stage that wrong or incorrect payment has been received on account of Excise Duty. The benefit/credit of the CED under MODVAT Scheme duly authenticated by the authorities/representatives of the Central Excise Deptt. shall be allowed to

the Purchaser in the invoice of concerned equipment. In case Central Excise staff refuses to issue a separate gate pass indicating the excise duty claimed from you, the original invoices raised for the supply of the equipment will bear a certificate from the Central Excise staff to the fact that Excise Duty has been charged from you and the amount so charged will be indicated.

Note: - The firm indicating NIL or concessional rate of E.D in their tender will have to absorb E.D. up to the final rate applicable at the time of tendering. The firms which do not agree to this stipulation or indicate E.D. as extra without indicating the applicable rate be loaded with maximum rate of excise duty.

2.05 OCTROI CHARGES:

Octroi charges shall be paid extra on actual basis as applicable.

2.06 INSURANCE:

i) The rates are required to be quoted on F.O.R. destination basis and it is the responsibility of the Supplier to deliver the goods in sound condition F.O.R. destination and for that purpose the Supplier may at his option insure the material against all risks at his own cost during transit for full delivered value of the material up to destination. All works in connection with making and settling of claims, if any, with Railway Authorities and/or Insurance Company shall be carried out by the Contractor for which no extra payment shall be made by the PSTCL. However, necessary assistance required in connection with making and settling of such claims, if any, shall be provided by the consignees.

ii) All damages and/or shortages during transit as covered by the Insurance shall be made good immediately on receipt of such information from the consignees without waiting for settlement of claims. However, in case of apparent damages/shortages the con- signees shall obtain the loss/damage certificate from the Railway Authorities and send the same to the Contractor within a period of thirty days from the date of receipt of material. A certificate shall be submitted by the Suppliers/Contractors with each bill to the effect that the material has been duly insured.

iii) The consignees shall report losses and damages to the firm within 30 days of the arrival of the equipment at the site. It will, however, be Supplier's responsibility to prefer timely claims on the insurance under-writers and to arrange replacement thereof to the consignees.

iv) The Suppliers shall be wholly responsible for the loss, shortages, damages etc. during transit. Such shortages and damages etc. will have to be replaced/repaired by the Supplier/Contractor free of cost immediately without waiting for maturing of the Supplier's/Contractor's claims with the Road transport/Railway Authorities.

v) In case replacement/repair of defective material is not carried out within six months of intimation of damages, Supplier shall have to pay interest at the rate of 12% per annum on the advance payments made by the Punjab State Transmission Corporation Ltd. from the date of the payment up to the date of its re-commissioning of the equipment after replacement/repair or to the date the default is made good.

2.07 DELIVERY SCHEDULE:

The offer should clearly indicate monthly/quarterly schedule of deliveries, date of commencement and completion of supply against that indicated in the

Notice Inviting Tender/ Specification which should normally cover period for entire job of manufacture, testing, inspection and supply after acceptance and shall be reckoned from the date of dispatch in case of rail transport and Receipted Challan/Goods Receipt in case of road transportation by Goods Carriers. The Purchase Orders shall be placed strictly on the above understanding. Ex-stock and quicker deliveries may be sometimes preferred.

2.08 CONTRACT:

The detailed order issued in accordance with agreed terms and conditions and accepted/acknowledged by the firm shall itself form valid contract along with subsequent amendment, if any, and shall be construed and operated as such in terms of Indian Contract Act-1872 as amended up to date.

It will be obligatory on the part of the successful Tenderer to execute within 30 days of the receipt of detailed order, a legal contract agreement on non-judicial stamp paper of the appropriate value. The detailed Purchase Order so issued shall be termed Purchase Order-Cum-Contract Agreement. The contract shall be made in duplicate and one copy will be retained by each party.

2.09 SECURITY DEPOSIT:

i) The successful Tenderers shall be required to submit security deposit for faithful execution of the Purchase Order/Contract of value exceeding Rs.50,000/- at the rate of two percent(2%) of order value rounded off to a multiple of Rs.10/- on the higher side.

ii) Ordinarily the Earnest Money received with tenders shall be converted into Security Deposit. If the amount of Earnest Money received with tender is more than the amount of security deposit required for the Purchase Order/Contract, the balance shall be refunded and in case of shortfall the Contractor/Supplier shall be required to deposit the additional amount.

iii) The Tenderers having permanent deposit of Rs. 10.00 lac with CE/TS and hence exempted from depositing Earnest Money with Tenders, shall also be required to submit Security Deposit of 2% of order value in the form of Bank Guarantee within 30 days from the award of Order/Contract.

iv) The following shall be exempted from depositing security against Orders/Contracts given to them:

a) Manufacturers/Suppliers of Proprietary items.

v) On faithful execution of Purchase Order/Contract in all respects, including warranty period, if any, the security deposit of the Contractor/Supplier shall be released by the Contracting/Purchasing Agency.

vi) In the event of default on the part of the Contractor/Supplier in the faithful execution of Purchase Order/Contract his security deposit shall be forfeited by an order of the contracting/purchasing agencies. The forfeiture of Security Deposit shall be without prejudice to any other rights arising or accruing to the PSTCL under relevant provisions of the Purchase Order/Contract, like penalty/damages for delay in delivery including suspension of business dealings with PSTCL for specific period.

2.10 INTIMATION TO THE AO/CPC, PSTCL AND CONSIGNEES:

The Supplier will have to intimate the probable date of dispatch 15 days in advance followed by telegraphic advance intimation regarding the actual date of R.R./LR to AO/CPC, PSTCL, PATIALA to enable him to arrange payment, failing which demurrage, wharf age etc. will be to Supplier's account. A copy of such intimation should be sent to the consignee and Chief Engineer/TS, 3rd Floor, Shakti Sadan, PSTCL, Patiala-147001 also for reference, immediately.

2.11 INFORMATION REGARDING LIST OF THE BANKERS, THE PURCHASER DEALS WITH:

The Punjab State Transmission Corporation Ltd. deals with the following Bank at Patiala:

i) State Bank of Patiala, The Mall, Patiala

a) The Railway Receipt/Goods Receipt and invoices etc. should be sent to the authorities to be specified in the Purchase Order.

b) Any demurrage occurring as a result of sending Railway Receipts/Goods Receipts through a Bank other than the one with which the accounts of the Purchaser are operated will be to the account of the Supplier/Contractor.

c) No goods will be accepted by the consignees unless accompanied by priced challans or invoices.

2.12 TERMS OF PAYMENT:

100% of the contract value pro-rata for each consignment of operationally complete equipment dispatched after approval of inspecting Authority/Test Certificates etc. along with 100% GST and other statutory levies as per contract shall be paid within 45 days against receipted challans subject to furnishing a Bank Guarantee of 5% of the amount valid for a period of three months after receipt of the material/equipment in good condition against that consignment. ***The payment shall be made through RTGS. For this purpose, following details/documents may be provided to AO/CPC(T), PSTCL, Patiala while entering contract agreement:-***

i) Name and address of the beneficiary
ii) Name and address of the bank
iii) Account No. of the beneficiary
iv) IFSC code
v) Cancelled cheque

2.13 FORCE MAJEURE:

During the pendency of the Contract/Purchase Order, if the performance in whole/part by either party or any obligation there under, is prevented/delayed by causes arising out of any war, hostility, civil commotion, acts of the public enemy, sabotage, fire, floods, explosions, epidemics or non-availability of Government controlled raw material under Orders/Instructions of Central/State Government regulations, strikes, lockouts, embargo, acts of Civil/Military authorities or any other causes beyond their reasonable control, neither of the two parties shall be made

liable for loss or damages due to delay or failure to perform the contract during the currency of Force Majeure conditions, provided that the happening is notified in writing (with documentary proof) within 30 days from the date of the occurrence. The supplies shall be resumed under the contract as soon as practicable after the happening (event) ceases to exist.

2.14 PENALTY/DAMAGES FOR DELAY IN DELIVERY:

If the supplier fails to deliver the material/equipment within the stipulated delivery period of the Purchase Order/Contract, the same is liable to be rejected and if accepted, the supplier shall be liable to pay as penalty charges, a sum of 0.5% (half of one percent) of the cost of undelivered supply/incomplete equipment per week of delay or part thereof, not exceeding maximum limit of 10% of the cost of complete unit of undelivered equipment so delayed. There will be a slack of one month that will not entail any penalty and will not involve any additional financial implication. Delay beyond slack period will attract penalty for the period of delay including slack period. However there will be no penalty/liquidated, damages in respect of purchase of proprietary items."

2.15 NEGLIGENCE AND DEFAULT:

In case of negligence on the part of Supplier/Contractor to execute the order/contract with due diligence and expedition and to comply with any reasonable orders given in writing by the Purchaser in connection with the Purchase Order/Contract or any contravention in the provisions of the Purchase Order/Contract, the Purchaser may give 21 days notice in writing to the Supplier/Contractor to make good the failure or neglect or contravention and if the Supplier/Contractor fails to comply with the notice within time considered to be reasonable by the Purchaser, the purchaser may black list or suspend business dealings with the supplier/contractor apart from forfeiture of security etc.

2.16 WARRANTY:

The Supplier/Contractor shall be responsible to replace free of cost with no transportation and insurance expenses to the Purchaser up to the destination of material/equipment, the whole or any part of the material, which under normal and proper use and maintenance proves defective in material or workmanship within **24 months from the date of commissioning or 30 months from the date of dispatch whichever expires earlier**, provided the Purchaser gives prompt written notice of such defects to the Supplier/Contractor. Such replacement shall be affected by the Supplier/Contractor within a reasonable time not exceeding six months of the intimation of defects. Supplier's/Contractor's responsibility arising out of supply of material or its use whether on warranties or otherwise shall not in any case exceed the cost of correcting the defects or replacing the defective part/material and upon the expiry of the warranty period stipulated above, all such liabilities shall terminate. However this clause shall not be applicable in case of metal halide lamp. The above provision shall equally apply to the material so replaced/repaired by the Supplier/Contractor under this clause in case the same is again found to be defective within 12 months of its replacement/repair. In case the replacement/repair of defective material is not carried out within six months of intimation of defects, the Supplier/Contractor shall have to pay interest @ 12% per annum on the value of each

complete operational unit of equipment beginning from the date of its becoming defective up to date of its recommissioning after replacement/repair.

2.17 INSPECTION OF EQUIPMENT:

a) The PSTCL shall inspect, examine and test the equipment/material through its official(s) and/or through an out-side agency nominated by PSTCL at the manufacturer's/Supplier's works, during or after the manufacture of goods prior to dispatch, on receipt of a clear notice of minimum two weeks in advance, to be reckoned from the date of receipt by the Purchaser. The Supplier/Contractor shall provide all facilities as may be required to carry out the tests in accordance with approved standards, free of cost.

b) CE/TS shall get stage inspection carried out at random at supplier works.

c) The random testing of material in the stores irrespective of the fact whether or not it was it was inspected before dispatch shall be carried out by PSTCL and in case of any failure the entire lot shall be rejected at the risk & cost of the supplier.

2.18 INTERCHANGEABILITY:

Corresponding parts of a plant / equipment shall be made to gauge or jig and shall be inter-changeable in every respect.

2.19 TRAINING FACILITIES:

The successful tenderer will be required to impart training to up to 2 Engineers and two technicians so as to fully acquaint them with Design, Testing and commissioning, including fault detection of protection schemes covered in this tender, if so desired by the Purchaser. The period of training shall be mutually agreed upon and all expenses shall be borne by the Purchaser.

2.20 CANCELLATION:

The Purchaser reserves the right to cancel the Purchase order as a whole or in part at any time or in the event of default on the part of the Supplier prior to the receipt of intimation regarding taking in hand of the manufacture of material against the Purchase Order/dispatch of material to the consignee.

2.21 RAW MATERIAL:

The raw material to be used in the manufacture of the goods/equipment to be supplied against Purchase Order/Contract shall be of the best quality of its kind obtainable in the market. The Supplier shall be solely responsible for the procurement of raw material required for the purpose.

2.22 MATERIAL & WORKMANSHIP:

All the materials used in the manufacture of equipment shall be of the best quality obtainable of their respective kinds and whole of the work shall be of the highest class, well finished and of approved design and make.

2.23 CHANGES:

No variation or modification or waiver of any of the terms and provisions shall be deemed valid unless mutually agreed upon in writing by both the Purchaser and the Supplier.

2.24 PACKING:

All material should be suitably packed for transportation direct to the consignee and the Supplier shall be responsible for all damages/losses due to improper packing. All boxes shall be marked with the signs indicating up and down sides of

the boxes and also unpacking instructions considered necessary by the Supplier. The contents of boxes shall have place marks corresponding to the number in the packing lists to enable easy identification. The prices quoted by the Tenderers shall be deemed to include the cost of packing.

2.25 TEST CERTIFICATES AND INSTRUCTION BOOK:

The Supplier/Contractor shall be required to furnish to the Purchaser's office/consignees, where-ever necessary, the following documents along with the consignment:

i) Printed pamphlets & catalogues : 5 copies of each per Transformer

ii) Instruction Books. :

iii) Drawings. :

iv) Any other relevant information :

(to be incorporated at the time of placing the Purchase Order)

In case the goods have not been inspected/tested at the manufacturer's works by the representative of the PSTCL, the Supplier/Contractor shall furnish the following certificates along with consignment for facility of the consignees:-

a) Type Test Certificates

b) Routine Test Certificates

2.26 CONSTITUTION, EXPERIENCE AND FINANCIAL STANDING:

The Tenderers should invariably supply the following information with the tenders:

a) Constitution and composition of the firms:

i) If a joint stock company, copy of its Memorandum and Articles of Association and other particulars.

ii) If partnership, a copy of the partnership deed, particulars of partners.

iii) If a proprietary concern, the standing of the proprietor and if registered with the Registrar of Companies/Firms, their registration No.

b) In case of authorized representative:

i) Name & particulars of manufacturers.

ii) Certified copy of the Instrument of Authorization of the Supplier/Manufacturers.

c) Experience and standing in the market.

d) Particulars of Purchase Orders/Contracts executed with this PSTCL (Formerly PSEB) and other Boards/Government Department as per "Performance Schedule" attached herewith as `Annexure-D'.

e) Financial Position:

i) Balance sheet for the last three years including Trading, Manufacturing, Profit and Loss Account.

ii) Bank references.

2.27 DESPATCH INSTRUCTIONS:

The material shall be required to be dispatched as per the dispatch instructions issued by the Purchaser.

2.28 EXTENSION IN DELIVERY PERIOD:

Any genuine delay in approval of technical details, drawings, issuance of amendment of Purchase Order, conducting inspection and approval of Inspection Test Reports/Test Certificates for allowing dispatches etc., will count towards extension of the delivery period by corresponding period other than admissible under Force-Majeure conditions, if any, substantiated by the Supplier and duly accepted by the Purchaser. No Extension in delivery shall be granted in case of delay in payment. However, for delayed payments beyond stipulated period as per terms of payment clause, compensation shall be credited @ 0.5% of the payment so delayed per month or part thereof to be adjusted against penalties levied or to be levied subject to a maximum of penalty leviable due to delay in deliveries under the contract.

2.29 CIVIL SUIT/JURISDICTION:

All legal & Arbitration proceedings in connection with the Purchase Order/Contract shall be subject to the territorial jurisdiction of the local Civil Courts at Patiala only.

2.30 UNDERTAKING:

All the Tenderers are required to give the following undertakings on their letter head with the tender documents:

i) That they would not pay any commission etc. or engage any commission agent for dealing with PSTCL in any matter including purchase of equipment etc
ii) That no officer/official of the PSTCL will deal with any person who claims to be a commission agent or liaison agent of any company and that the officers/officials of the PSTCL. must deal only with persons directly employed by the Suppliers.

2.31 PLACE(S) OF MANUFACTURE:

The equipment shall be brand new. The tenderer shall state the make, place(s) of manufacture as well as the places of testing and inspection of the equipment offered in his tender. It shall also be stated whether the equipment offered carries ISI: certification mark or not. The material carrying ISI mark will be preferred.

2.32 SPECIAL INSTRUCTIONS:

i) Incomplete tenders not submitted on the lines indicated above are liable to be rejected without correspondence.
ii) Request for extending the due date of tenders will be ignored.
iii) The tenders from the direct manufacturers or their sole selling agents only will be considered.
iv) No printed general conditions of Sale attached with the tender shall be accepted.
v) Tenders shall be accepted only from those firms or their authorized agents who purchase a copy of this tender specification.
vi) Only indigenous offers or such offers in which no import license is required would be considered.
vii) Comments if any, on the clauses contained in the 'General Terms And Conditions' as well as in the Technical Specification should be offered, while submitting tenders, otherwise it will be presumed that all clauses stipulated therein are acceptable.

viii) The tender must be accompanied by detailed and fully dimensioned drawings of the equipment, technical particulars and detailed literature.

ix) Purchaser reserves the right to modify the schedule of requirement, technical particulars and the specifications at any time to place the order as a whole or in parts and to reject any or all the tenders received without assigning any reason. He will not be responsible for and will not pay for the expenses or losses that may be incurred by the tenderer in the preparation of the tenders.

x) The material offered should be strictly according to the spec. laid down in this specification. The quotation should also indicate the make of the manufacturer, brand and company and should be accompanied with other technical literature, drawings etc. as required in the succeeding parts of this spec. at the cost of the supplier.

2.33 ARBITRATION:

a) If at any time any question, dispute or difference, what so-ever, shall arise between the Purchaser/PSTCL and the Contractor/Supplier, upon or in relation to, or in connection with the Purchase Order/Contract, either party may forthwith give to the other, notice in writing of the existence of such question, dispute or difference and the same shall be referred for sole arbitration by a nominee of the Purchaser/PSTCL, who shall give a reasoned/speaking awards. The award of the Sole Arbitrator shall be final and binding on the parties under the provision of the Indian Arbitration Act, 1996 and the rules there under. Any statutory amendment, modification or re-enactment thereof for the time being inforce, shall be deemed to apply to and be incorporated in the Contract/Purchase Order. It will not be objectionable if the Sole Arbitrator is an officer of the PSTCL and he has expressed his views on all or any of the matters in question of dispute or difference.

b) Upon every or any such reference, the cost of and incidental to the reference and award respectively shall be in the discretion of the Sole Arbitrator so appointed who may determine the amount thereof or direct the same to be taxed as between Solicitor and Client or as between party and party and shall direct by whom and to whom and in what manner the same is to be 'borne and paid.

c) The work under the Contract shall, if reasonably possible, continue during the arbitration proceedings and no payment due or payable by the Purchaser/PSTCL shall be with-held on account of such proceedings.

2.34 REQUIREMENT:

The quantity mentioned in this Specification can be increased or decreased at the time of actually placing the order.

2.35 ORDER PREFERENCE:

The PSTCL would allow an order preference to such tenderers whose works are situated within the State of Punjab as per the procedure laid down as under:-

a) The rate of Punjab firms would be de-escalated by 15% for all the units. For Punjab based firms up to 20% of the total quantity can be reserved provided they fall in the consideration zone after application of price differential. For this purpose the merit position of the Punjab firms shall be prepared separately, however, where the, Punjab firms qualify amongst the lowest

bidders on their own quoted rates, they shall form part of the original quoted list for the purposes of placing orders.

b) The zone of consideration for placing of purchase order/contract would thereafter be demarcated taking into account the quantity of material required as per NIT and the quantities offered by the different tenderers.

c) The purchase on the Punjab firm claiming order preference and falling within this Zone would placed on the lowest rate of a firm not claiming order preference within the Zone of consideration or on the concerned Punjab firm's own quoted rate whichever may be lower.

d) In the event of zone of consideration ending at the deescalated rate tendered by a firm claiming order preference, the rate to be allowed to such firms shall be the next quoted rate by the firm not claiming order preference or the concerned firm's own quoted rate, whichever may be lower.

e) The Punjab based firms claiming order preference shall be required to furnish an undertaking in prescribed form (Annexure-D) on a non-judicial stamp papers of appropriate value to the effect that they shall execute the order if placed on them under 'Order preference' as per tender specification. Such undertaking should be submitted by the Punjab based tendering firms latest by the close of the day of opening of tenders. In case, no such undertaking is furnished by the Punjab based firms who are otherwise eligible for claiming 'Order Preference' as per the tender specification ,their tender shall not be considered for placement of any order under Order Preference. In the event of refusal by the Punjab based firms to execute the purchase order/contract at their quoted rates or offers made under Order Preference as per 'c' and 'd' above as the case may be after having furnished the above undertaking, their Earnest Money shall be forfeited apart from initiating further administrative action, such as suspending business dealings, blacklisting etc.

2.36 <u>QUALIFICATION REQUIREMENT</u>:

"To be technically suitable the bidders should have minimum of 5 years experience (to be counted from the date of having obtained the order) of design, manufacture and supply of 100 *MVA or above with primary voltage 220KV or above, secondary voltage 66 KV or above, Power/system T/F (and not AUTO T/F)* to Electricity Boards/ Other utilities and they should *submit performance certificate for satisfactory operation of the same for at least three years* as on date of opening of tender."

Though no firm will be refused tender documents but pre-qualification & technical qualification conditions will be clubbed together and shall be considered for the purpose of technical qualification.

2.37 <u>FAKE INSPECTION CALL</u>:-

If the firm does not get the material inspected when the inspecting officer(s) visit their works after receipt of inspection call on one pretext or the other, it will have to bear TA/DA for the journey performed by such inspecting officer(s) which shall be Rs.15000/-(outside Punjab) & Rs.5000/-(within Punjab) per visit of Inspecting officer(s). Beside the recovery against each fake call, a

letter of warning shall be issued and it shall be Rs.15000/- & Rs.5000/- per visit of Inspecting officer(s) respectively in case the material fails during inspection.

2.38 GST :-

PSTCL is registered centrally in the state under GSTIN 03AAFCP4714J1ZK.

i) GST as applicable, will be paid as per prevailing provisions of GST Act, & Laws against submission of documentary proof at rate (s) prevailing during the contracted delivery period on the basis of actual. The following certificates shall have to be furnished along with invoice-cum- gate pass duly signed by the authorized agent/signatory. The first invoice should accompany the specimen signatures of the authorized signatory duly attested by the Managing Director of the factory with a copy of orders regarding his appointment as authorized signatory.

-Certified that the transaction on which the GST is claimed has been/shall be included in the return submitted / to be submitted to the GST Authorities and the amount claimed from the Punjab State Transmission Corporation Ltd., has been / shall be paid to the GST Authorities.

-Certified that the Goods on which GST has been charged have not been exempted under GST Act or rule made there under and that the GST charged on these Goods is not more than what is payable under the provisions of relevant act.

-Certified that we shall indemnify the Punjab State Transmission Corporation Ltd., in case, it is found, at a later stage that wrong or incorrect payment had been received on account of GST; the same will be refunded.

-Certified that we are registered dealer under the GST Act and our Registration No. is _____.

ii) In case the GST is applicable and is required to be paid extra as referred to Para-(i) above, the tendered should clearly indicate HSN code of item along with present rate (in percentage) applicable to their company.

iii) The maximum rate (in percentage) up-to which the GST may become leviable/payable under the prevailing Rules & Regulation applicable to their company, should also be clearly indicated in their tender.

iv) In the case the GST is applicable /payable, necessary certificate of GST claimed / GST Gate Pass duly authenticated by the authorized representative of GST Authorities, shall however, be furnished by the supplier along with each consignment. The supplier should, therefore , clearly indicate in their tender that whether such GST Gate Passes/Certificate shall be furnished by them or not.

NOTE: The firm indicating nil or concessional rate of GST in their tenders (if any) will have to absorb GST up to the full rate applicable at the time of tendering.

v) FURTHER any loss due to non-availability of ITC or levy of penalty/interest payable by PSTCL on account of non-filling of return or non- compliance or any miss-statement given under the provisions of GST ACT by the firms shall be recoverable from them.

SECTION-II

TECHNICAL SPECIFICATION

1. SCOPE:

1.1 This specification covers the design, manufacturing, testing, assembly at manufacturer's works before despatch, supply and delivery F.O.R destination of power transformers for various substations of PSTCL as given in the `Schedule of Requirements`(Annexure-D) of Section-II.

1.2 **ERECTION & COMMISSIONING**

The erection/commissioning of transformers shall be carried out departmentally. However, complete supervision required during erection and commissioning shall be provided by the Contractor, **free of cost.** The cost of such services and assistance provided by the Purchaser with regard to erection and commissioning of the equipment shall be deemed to have been included in the quoted prices.

1.3 All drawings, schedules and annexure appended to this specification shall form part of the specification and supplement the requirements specified. The equipment/ materials offered by the Bidder shall be complete in all respects and whether called for specifically or not, all accessories, hardware and services required for normal satisfactory operation of the system shall be deemed to be included in the Contractor's scope and cost of these shall be deemed to be included in unit rates quoted. Also, design and manufacture shall be such that equipment / accessories of the same type and rating would be interchangeable.

1.4 Specific reference in this specification and documents to any material by trade name, make or catalogue number shall be construed as establishing standard of quality and performance and not as limiting competition. Also all equipment/accessories offered shall be of proven design and manufacture. The make of all accessories and hardware shall be subject to Purchaser's approval.

1.5 Bidder should have adequate experience with the type of cooling being offered on similar voltage class and ratings of transformers. Bidders should submit a list of transformers supplied with the type of cooling, alongwith its detailed oil flow and/or valve arrangement and experience of the same.

2.0 CODES & STANDARDS

2.1 All standards, specifications and codes of practice referred to herein shall be the latest editions including all applicable official amendments & revisions as on date of opening of bid. The following standards & codes shall be applicable: -

IS: 5	Colour for ready mix paints
IS: 325	Three phase induction motors
IS: 335	New insulating oils for transformer [Test Procedure] BS-148 & IEC-296
IS-13155 (1991)	Method of Test for Carbon Type(PNA) Analysis of Mineral Oils by Infra Red Spectrophotometer.
IS: 375	Marking & arrangement of swgr. bus bars main connections and auxiliary wiring.
IS:1367	Hot dip galvanized coolings on threaded fasteners
IS:1866	Code of practice for maintenance of insulation oil.
IS:2026 & IEC-76	Specification for power transformers. with latest amendments
IS:2099	Bushing for alternating voltages above 1000V
IS:2147	Degree of protection provided by enclosures for low voltage switchgear & control gear
IS:2705	Current transformers
IS:3347	Dimensions of porcelain transformer bushings for use in lightly polluted atmosphere
IS:3637	Gas operated relays
IS:3639	Fittings & accessories for power transformers.
IS:6272	Industrial cooling fans
IS:6600 & IEC-60076-7	Guide for loading of oil immersed transformers
IS:8468	On load tap changer

&
IEC-214

IS:8478 On load tap changers application guide

IS:8603 Dimensions for porcelain transformer bushings for use in heavily polluted atmosphere(36KV class).Dimensions for oil filled porcelain
transformer bushings for use in medium polluted atmospheres.

IS:9434 Guide for sampling and analysis of free and dissolved gas in oil filled equipment.

IS:10028 Code of practice for selection, installation and maintenance of transformers.

IS:12676 Dimensions for OIP insulated condenser bushings.

IEEE:32 IEEE standard requirement terminology and test procedure for neutral grounding device.

CBIP Manual on transformers.

ASTM-876M American society for testing material for CRGO
&
IS3024

2.2 Equipment complying with other internationally accepted standards such as IEC, BS,USA, VDE etc. will also be considered if they ensure performance and constructional features equivalent or superior to standards listed above. In such a case the Bidder shall clearly indicate the standards adopted, furnish a copy in English of the latest revision of standard along with copies of all official amendments and revisions in force as on date of opening of bid and shall clearly bring out the salient features for comparison.

3. Design and Construction:

3.1 The transformers shall be 3-phase oil immersed type, with core type of construction, type of cooling as per `Schedule of Requirements', with external heat exchangers and shall be suitable for outdoor service as step down transformer, adequate Ceramic Ball/ spacers shall be provided in the core/winding for circulation of oil so as to ensure proper cooling. All apparatus shall be designed to ensure satisfactory operation under such sudden variation of load and voltage as may be met with under working conditions on

the system including those due to short circuits. To minimize the eddy current losses in the windings, CTC shall be used if necessary and wherever required, similarly for minimizing the stray losses magnetic shield in yoke, magnetic shunts in tank walls, bushing turrets, clamps, flitch plates etc. shall be provided if required. Manufacturer shall indicate the design value of eddy current loss, stray losses as a %age of load losses in the design.

3.2 All materials used in the manufacture of the transformers shall be of the best quality of their respective kind obtainable in the market and shall conform to standards as per Clause 2 above. The design of transformer and properties of the material used should be such so as to reduce to minimum, the risk of development of acidity in the oil.

3.3 Corresponding parts, liable for replacement shall be interchangeable.

3.4 All outdoor apparatus, including bushing insulators with their mountings shall be designed so as to avoid pockets in which water can collect. Means shall be provided for easy lubrication of all bearings and where necessary of any mechanism or moving part that is not oil immersed.

4. SERVICE CONDITIONS:

A) **REFERENCE AMBIENT TEMPERATURES**

The reference ambient temperatures for which the transformers are to be designed are as under:-

i.	Maximum ambient air temp	50 degree C
ii.	Maximum daily average ambient temp	40 degree C
iii.	Maximum yearly weighted average ambient temp	40 degree C
iv	Minimum ambient air temperature	(-)5 degree C
v	Cooling medium shall be AIR	

(B) **CLIMATIC CONDITIONS**:

i.	Maximum relative humidity.....	100%
ii.	Yearly Average number of thunder storms	varies from 30 to 50 at different places
iii.	Average no. of rainy days per annum ...	60 days.
iv	Fog:	The atmosphere is subject to fog for two months in winter.
v	Number of months during which Number of months during which	3 months.

vi.	Dust storms occur at frequent intervals.	
vii	Average annual rainfall	60 cms.
viii	Maximum wind pressure	150 kg/sq.m.

(C) **ALTITUDE**

Altitude above M.S.level not exceeding 1000 mtrs.

5. LIMITS OF TEMPERATURE RISE:

(a) With the above service conditions, given in clause-4 each transformer shall be capable of operating continuously on any tap at their normal rating without exceeding following temperature rises, over maximum ambient temperature of 50 Deg.C:

i) 35 deg.C in oil by thermometer

ii) 45 deg.C in winding by resistance

iii) Temp. of hot spot in winding not to exceed 95 deg.C, when calculated over maximum annual weighted average temp. of 40 deg.C.

(b) The limits of temperature rise mentioned above and overload capacity as per IEC-354(1993) will have to be satisfied by the manufacturer by carrying out the heat run test at the lowest negative tap. This test shall be carried out by feeding the following losses:-

(Max.Guaranteed NO Load Loss + Max. Guaranteed Load Losses at Tap No.1,5,17 or Max. Losses measured at any tap) X 1.1

6. OVER LOAD CAPACITY & CONTINUOUS RATING:

(a) The safe over load capacity of the transformer and the duration of over load for each type of cooling (ONAN/ONAF/OFAF) under maximum temperature conditions(clause 4 above)without any damage to the winding or harmful effects on the insulation shall be clearly stated in the tender, which must be as per IEC- 354(1993) - Guide for Loading of Oil Immersed Transformers, suitable for climatic conditions given in Clause-4 above.

(b) The transformer may be operated without injurious heating at any particular tapping at the rated KVA provided that the voltage does not vary by more then $\pm$10% of the voltage corresponding to that tapping. Transformer shall be able to withstand for 30 Minutes after achieving steady state at full load rating without injurious heating to winding/insulation etc. under auxiliary supply failure condition, with Hot Spot Temp. not exceeding 130 Deg.,taking the Ambient Temp.of 50 Deg.C.

7. TAPPING:

The tapping range shall be as given in the `Schedule of Requirements'. All the transformers should be provided with the On Load Tap Changers having local manual and electric control, as well as group electrical remote control from the Remote Tap Change Control (RTCC) panel. These tappings may be used to get 10% over voltage on low voltage side at no load. When under this condition, the high voltage side experience an over voltage, the tapping shall be changed so that the continuous over excitation is limited to 10% only.

8. CORE

i) The transformer should be so designed that the working flux density should not exceed 1.57 Tesla at normal voltage, frequency and ratio.

ii) Tenders with higher flux density than specified shall not be considered.

iii) The core shall be built up with thin laminations of high grade, non-ageing, low loss, high permeability, cold rolled super grain oriented silicon steel, known as HIBI- MOH or superior grade CRGO steels of ***0.27 mm (nominal)*** or low lamination thickness especially suitable for transformer core.

iv) (a) After being sheared, the laminations shall be treated to remove all burrs. They shall be coated with a baked enamel insulation coating. The insulation shall be inert to the action of hot transformer oil and shall be perfectly adhesive. Paper and varnish insulation shall not be accepted. Particulars of proposed insulation shall be stated in the tender. Laminations shall be checked for burrs during stage inspection.

(b)(1)Bidder should have in house Core cutting facility for proper monitoring & control on quality and also to avoid any possibility of mixing of prime material with defective/second grade material. The purchaser may witness the core-cutting operation. In case the in-house core cutting facility for core cutting is not available, then the same shall be carried out in the presence of the representative of PSTCL.

(2) Inspection call notice for the purchase should be accompanied with the following documents, as applicable, as a proof towards use of Prime Core material:-

(a) Invoice of supplier
(b) Mills Test Certificates.
(c) Packing list.
(d) Bill of lading.
(e) Bill of entry certificates by customs.

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

v) The core shall be rigidly clamped to ensure adequate mechanical strength and to prevent vibrations during operation. The clamping structure shall be so constructed that the eddy currents will be minimum. Bolted type core construction shall not be accepted.

vi) ***Construction of the core shall be such that number of steps in the limb and yoke shall be same to minimize the effect of cross fluxing and better mechanical strength. Minimum number of steps per half section of limb/yoke shall be 15 Nos. Flux density at any cross section of limb & yoke shall not exceed 1.57 Tesla at normal voltage, frequency and ratio.***

vii) The core shall be provided with lugs suitable for lifting the complete core and coil assembly of transformer. The core and coils shall be so fixed in the tank that its shifting will not occur when the transformer is moved or when a short circuit occurs.

viii) The design of magnetic circuit shall be such as to avoid static discharges, development of short circuit paths within itself or to the earthing clamping structure and the production of flux components at right angles to the plane of the lamination which may cause local heating.

ix) Every care shall be exercised in the selection, treatment and handling of core steel to ensure that the laminations are flat and that finally assembled core is free from distortions.

x) The supporting frame work of the core shall be so designed as to avoid the presence of pockets which would prevent complete emptying of the tank through the drain valve or cause trapping of air during filling.

xi) Oil ducts, where necessary should be formed across the plane of the lamination and be given a suitable slope to assist oil circulation. The overall design of core and winding should be such that free flow of oil is not obstructed.

xii) The frame work and clamping arrangement shall be earthed by connecting to the tank body through a copper strip. Flitch plate area not to be counted in the net core area.

xiii) The insulation of core to clamp plates shall be able to withstand a voltage of 2 KV RMS for one (1) minute.

xiv) Cores and windings shall be capable of withstanding shocks during transport, installation, service and adequate provision shall be made to prevent movement of core and winding relative to tank during these conditions.

xv) All steel sections used for supporting the core shall be thoroughly sand blasted after cutting, drilling and welding.

xvi) CRGO used shall be strictly as per approved Vendor List.

xvii) The tenderers should indicate the maximum flux density allowable continuously, as well as for time intervals of 1 minute and 5 secs. and the limit of flux density at which core material used by them saturates.

xviii) The name of the core material must be mentioned in the tender. The successful tenderer shall be required to furnish magnetization curves of the core material/design calculations and such other data/documents deemed fit by the Purchaser for being satisfied that flux density is as desired.

xix) Purchaser shall inspect the built-up core for verification of flux density for which all facilities shall be provided. The purchaser shall inspect/test the core material for various tests as per relevant IEC/IS to ensure quality. Core may also be inspected during horizontal assembly, built-up assembly.

NOTES:

i) The above flux density has been specified to meet with the over fluxing of the core due to temporary over voltage of the order of 31% for 1 min., 44% for 5 secs. that may appear in abnormal conditions such as those following sudden loss of large loads.

ii) The design of limb and yoke shall be so coordinated that there is no cross fluxing at the joints.

9. WINDING

a) i) The conductor used for the winding shall consist of solid drawn high conductivity electrolytic grade copper free from scale and burrs best suited to the requirements.

ii) In case of copper strip, the corners shall be rounded off to eliminate risk of injury to internal insulation during winding & other operations. Strip conductor wound on edge should have width exceeding six times its thickness.

iii) All permanent current carrying joints in the windings and leads shall be welded or brazed. Preference shall be given to a winding with a continuous conductor. The windings shall be pre-shrunk during manufacture so that it is extremely unlikely that any further shrinkage takes place in service. Provision shall be made so that in the event such a shrinkage does occur, it will be possible to take up this shrinkage by means of adjustable clamping screws and end rings. The voltage between adjacent coils shall be kept as low as consistent with good design.

iv) The windings shall be so designed that all coil assemblies of identical voltage ratings shall be interchangeable and field repairs to the windings can be made readily without special equipment.

v) The coils shall be supported between adjacent sections by insulation used in the assembly of the windings and shall be arranged to ensure free circulation of the oil and to reduce hot spots in the windings.

vi) All threaded connections shall be provided with locking facilities. All leads from the winding to the terminal board and bushings shall be rigidly supported to prevent injury from vibration. Guide tubes shall be used where ever practicable.

vii) The winding shall be designed to reduce to a minimum the out of balance forces in the transformer at all voltage ratios.

viii) The windings shall be clamped securely in place so that they will not be displaced or deformed during short circuits. The assembled core and winding shall be dried and suitably impregnated before removal from the treating tanks.

ix) The insulation of the coils shall be treated suitably to develop full electrical strength of the windings and for this hot oil vacuum impregnation process shall be used for improving the electrical and Thermal properties of insulating paper.

x) All materials used in the insulation and assembly of the winding shall be insoluble, non-catalytic and chemically inactive in the hot transformer oil and shall not soften or otherwise be adversely affected under the operating conditions.

xi) CTC conductor shall be used in order to minimize eddy currents and equalize the distribution of currents and temperature along the winding if necessary and wherever required.

xii) Windings shall preferably be made in dust proof condition atmosphere.

xiii) Tappings shall be so arranged as to preserve the magnetic balance of transformer at all voltage ratios. Tapping winding shall be provided separately from the main HV winding.

xiv) Coil assembly and insulating spacers shall be so arranged as to ensure free circulation of oil and to reduce the hot spot of the winding.

xv) The insulation of transformer windings and connections shall be free from insulating compounds which are liable to soften, ooze out, shrink or collapse and be non-catalytic and chemically inert in transformer oil during service.

9 (b**) REINFORCED INSULATION:**

At each end of each winding an electrostatic shield shall be provided in conjunction with the reinforced end turn insulation so as to increase the ratio of the electrostatic capacity between turns as compared with the electrostatic capacity of the high voltage winding to earth and to the low voltage winding. The end turn reinforced insulation shall be applied to both the insulation between discs and that between the individual turns of the disc.

9 (c) **CURRENT DENSITY**:

The transformer shall be so designed that the current density of all the windings and the regulating winding at the lowest tap should not exceed 250 A/cm.Sq.

10. INSULATION LEVELS:

10.1 The insulating material to be used shall be of Class-"A" as specified in the latest edition of IS: 1271.

10.2 The dielectric strength of winding insulation and of the bushings shall conform to values given in IS: 2026/1981 Part- III amended upto date except for the changes made in this specification.

10.3 The following impulse test and power frequency test voltage must be offered:-

Rated system voltage (KV)	Highest system Voltage (KV)	1.2/50 Us Positive impulse with stand Voltage of line end (KV peak)	One minute withstand line end (KV)	PF voltage neutral end (KV)
11	12	95	38	38
33	36	170	70	70
66	72.5	325	140	38
132	145	650	230	38
220	245	1050	460	38

The provision of note under clause 5.4 IS:2026 (Part-III)-1981 should be kept in view while offering this parameter. The star connected windings of the transformers shall have graded insulation category for system voltage 66KV and above.

All windings for system voltage lower than 66KV shall have uniform insulation.

Short circuit strength and provision of separate tapping coil or regulation :-

Transformers shall be designed and constructed to withstand without damage the thermal and dynamic effects on external short circuits for 5 seconds under conditions Specified in IS: 2026 (Part-I)-1977.

The transformers shall be provided with separate tapping coil to limit the short circuit forces.

The bidders shall submit test certificates of the short circuit test, if already done on the offered design and rating. Otherwise short circuit (S.C.) test shall be carried out on one of the units free of cost. The Purchaser also reserves the right to get any additional transformer short circuit tested, but charges for the same shall be limited to payment made to CPRI plus transportation charges by road. However, no charges shall be paid by the purchaser, if transformer fails during S.C. test.

Manufacturers shall supply calculations for Thermal & Dynamic withstand capacity of the transformer as per their design alongwith the tenders.

11. **FREQUENCY AND SYSTEM VOLTAGE**:

The transformers shall be suitable for continuous operation with a frequency variation of 3% from normal cycles per second without exceeding the specified temperature rise.

12. **PARALLEL OPERATION**:

The transformers listed in the `Schedule of Requirements' shall be capable of satisfactory parallel operation with each other, if connected between the high voltage and low voltage bus-bar.

In addition the transformers as mentioned in the `Schedule of Requirements' shall be capable of satisfactory parallel operation with the existing transformers ***of 100MVA or 160 MVA of similar rating/make and of any other make.***

13. **IMPORTANT TECHNICAL PARTICULARS:**

Important technical particulars of the transformers to be guaranteed by the tenderers shall be as per Annexure-A enclosed.

14. **TOLERANCES:**

Various tolerances on technical parameter shall be as under:-

I. Impedance:

Maximum tolerance allowed on impedances at normal tap shall be not more than (+/-) 5% & at all other taps including extreme taps shall not be more than (+/-) ***10%***.

II. Losses:

No positive tolerance shall be allowed on guaranteed No Load Losses, Load Losses and Auxiliary Losses individually.

III. Temperature Rise Test:

No positive tolerance shall be allowed on Temp. Rise of Oil, Windings, Winding Temp. Gradients & Hot Spot Temp. than the Guaranteed Values.

IV. Weights:

No negative tolerance shall be allowed on Weight of Copper, Weight of CRGO & Weight of Oil etc.

V. Overload Condition :

Transformer shall be tested for over-load conditions as specified in IEC-354/1993,which shall be read with IEC-76/1993 with latest amendments.

VI. LOSSES:-

The T/F losses are as under:-

a) No Load Loss	***67 KW (maximum)***
b) Load Loss(at full load at 75^0C)	***258 KW (maximum)***
c) Auxiliary Losses	***8.0 KW (maximum)***

However, for the purpose of arriving at comparable prices, no benefit of capitalization shall be allowed if any firm quotes losses less than the guaranteed losses. Offer of the firm with losses more than above mentioned shall be out rightly rejected.

Note: - ***For calculation purpose during tendering process:***

(i) ***Building Factor shall be taken 1.1 or actual whichever is higher.***

(ii) ***Stray Losses shall be taken as 20% of the total I^2R losses at 75^0C or actual whichever is higher.***

15. **COOLING:**

Each transformer shall be provided with ONAN/ONAF/OFAF type of cooling as specified under the `Schedule of Requirements'. The ONAN Cooling of the transformers shall be by natural circulation of air while the circulation of oil shall be effected by natural convection, the maximum oil flow being assumed by a method whereby the return flow of cooled oil is made to enter the tank on a level with the bottom of the hot columns of oil thus, avoiding centre heads of cold oil at the bottom of the tank.

Out flow shall be arranged to coincide as nearly as possible with the hot oil level at the top of the tank so that the total available difference will be fully employed in circulation of the oil round the shortest possible paths.

The windings of the transformer shall be designed to deliver continuously rated MVA with OFAF cooling. Each transformer shall be provided with two completely independent groups of cooler banks(each of 50% capacity)with their structures, suitable for mounting on a flat concrete base, held by grouting bolts in the foundations. The necessary details and number of foundation holding down bolts, washers, nuts, plates and other fixtures required for above shall be furnished in the tender. Each group of coolers shall essentially consist of one oil pump and one set of cooler fans. In addition, each group of coolers shall be provided with one standby oil pump complete with motors and one standby cooler fan. Each pump shall be fitted with flow indicator.

The standby cooler fan/oil pump shall be switched 'ON' automatically in case of failure of any one of the cooler fans/oil pump in that group of coolers.

The transformer shall be capable of delivering the rated output continuously with two groups or coolers mentioned above in service without exceeding the specified temperature rise. The transformer shall be capable of delivering its rated MVA 30 minutes with loss of all cooling equipment while the transformer is carrying full load, without crossing the temp. rise limits.

All the fans in the two groups of coolers shall be arranged to start automatically when the winding temperature exceeds a preset adjustable temperature to be specified by the supplier, the two pumps in two groups of coolers, shall be arranged to start automatically when the winding temperature exceeds to higher preset adjustable temperature to be specified by the supplier.

The supply controls and piping of each group of coolers shall be completely independent of those of other group so that either group of coolers can be taken out of service for maintenance with the transformer and the other group of coolers in service. Coolers shall be designed to withstand the pressure conditions specified for the tank and shall be designed so as to be accessible for cleaning and painting to prevent accumulation of water on the outer surfaces.

The connection pipe between the tank and the cooler units shall be connected by machined steel flanges welded to the cooler units and the tank and provided with gaskets to ensure no leakage what-so-ever. At each cooler unit connection, there shall be provision on the tank, an indicating shut-off valve which can be fastened in either open or close positions. Separate oil tight blank flange shall be provided for each tank connection for use when the cooler unit is detached. In

addition to above, each cooler bank shall also be provided with the following:-

i) A drain valve 25 mm at lowest point.
ii) A thermometer pocket fitted with a captive screwed cap on the inlet and outlet oil branches.
iii) A filter valve at the top and bottom.
iv) Air release plug 15 mm.
v) Inlet/Outlet pipe for T/F tank for radiator shall be tapped from opposite side of the tank for better circulation.
vi) Pipes with circular bends/elbows shall only be used. A suitable expansion piece shall be provided in each oil pipe connection between the transformer and the separately mounted oil coolers.

Provision shall be made in each cooler bank header for installing 2 No. Radiators on each side, if required. The power supply available for the cooling system shall be 415 Volts, 3 Phase - 4 Wire. All the mechanism should be designed accordingly.

<u>Note:</u>- Radiators may be tank mounted or separate cooler bank may be provided by the manufacturer but overall weight on the T/F plinth/foundation should not exceed 250 MT.

16. **OIL PUMPS**

Each forced oil cooler bank shall be provided with a motor driven oil pump of the submerged motor type and of adequate capacity with One No. pump of equal capacity as standby. It shall be possible to remove the pump and motor from the oil circuit without having to lower the level of oil in the transformer of coolers and without having to disturb the pump foundation fixing shut off valves shall be provided on both sides of the pumps. Maximum capacity of oil flow shall be 800 LPM per pump. Oil pump assembly shall be capable of dealing with the maximum output of transformer and total head which may occur in service and with the varying head due to changes in the viscosity of oil. Pump shall have open type impeller to permit oil circulation when pump is idle. Oil pumps should be capable of withstanding high temperature of oil. Each pump assembly shall be furnished with oil flow indicator with alarm contacts to indicate normal pump operation & direction of oil flow. Non return of oil valves will also be provided.

17. **AIR BLAST TYPE OF COOLING:**

i) The transformers shall be equipped with a cooling system so as to provide a completely independent air blast type of cooling for the transformers as required in the `Schedule of Requirements'. **The cooler banks shall have the flexibility of erection on either side (left or Right) of the main body of the transformer.**

ii) Each cooler unit shall be designed for detaching from the transformer without disturbing the oil in the transformer tank. Coolers shall be designed to withstand pressure conditions specified for the tank.

iii) Coolers shall be designed so as to be accessible for cleaning & painting and to prevent accumulation of water on the outer surfaces, to completely drain oil into the tank and to ensure against formation of gas pockets when the tank is being filled.

iv) Coolers units shall be connected to the tank through machined steel flanges welded to the cooler units and to the tank and provided with gaskets. The flanges shall be provided with grooves to avoid slippage of gaskets during tightening. At each cooler unit connection, there shall be provision on the tank for an indicating shut off valve which can be fastened in either open or closed position, a separate oil tight blank flange shall be provided for each cooler unit. It shall have a lifting eye, a 19mm oil drain plug at the bottom and 19mm air vent plug at the top.

v) Fans or blowers for air blast cooling shall be so mounted as to ensure that no damage to the coolers can arise from vibration of the fans. Fans shall be mounted on independent foundations below the radiators. Galvanized wire mesh screens shall be fitted to prevent accidental contact with the blades, the mesh being not greater than 25mm.

vi) The radiators shall be equally distributed on either side of transformers.

vii) The maximum dimensions of the transformer should be such that the same can be accommodated without any interference within a clear bay width of 7 meters in the case of 66KV class of transformers and 9.4 meters in case of 132KV class transformers and 13.5 m X 10.0 meters in case of 220KV Class Transformers. The T/F to got in a rectangle of size as per enclosed sketch at Part-II(Section-X).

18. **AIR BLOWERS:**

Air blowers(GEC/ALSTOM make only) shall be mounted on separate brackets(i.e. not on radiators) and shall be suitable for continuous outdoor operation and shall start direct on line. Stand-by cooling fans equivalent to 15% of cooling capacity with minimum of 1 fan with each unit shall be supplied.

Suitable painted wire-mesh guards with mesh not greater than 25mm shall be provided to prevent accidental contact with the blades.

19. COOLER CONTROL:

Cooler units shall be suitable for operations with a 415 volts, 3-phase, 50 cycles power supply. Control equipment for fan motors shall be mounted in a Marshalling Box adjacent to the transformer and shall include necessary three pole electrically operated contractor and with control gear of suitable design both for starting and stopping the motor manually and also automatically from the contacts of the winding temperature indicating device specified in Annexue-A Sr.No.2. Additional terminal for remote manual/electrical control of motors

shall be provided in RTCC Panel. Over load and single phase protection shall be provided but no volt release shall not be fitted. A single phase preventor should be installed on the main supply to cooler circuit so that in case of single phasing all the three phases are put off, thus, preventing single phasing. A single metal clad main isolating switch with H.R.C. fuses shall be provided for the main supply.

The switching in or out of cooling equipment shall be controlled by temperature indicators and there shall be provision for automatic switching in or out at pre-determined temperature level which should be capable of adjustment and setting at will. The cooler control scheme shall be so designed that :-

a) it shall be possible to run all fans, including stand-by fans, on manual
b) there should be provision to change over any fan to stand-by

The tenderer shall specify the loading capacity of the transformers in case of failure of one or more sets of fans. Provisions should be made to avoid hunting of fans.

A complete remote control equipment of coolers and the equipment for remote control of ON Load Tap changer shall be supplied by the tenderer for installation in the control room.

20. INSULATING OIL:

i) The TRANSFORMER Insulating oil used for the Transformer Testing during Manufacturing and inspection by PSTCL at the works of the firm shall be of Napthenic base. The inspector can take a sample and test it for its Naphthenic base characteristics.

ii) Sufficient insulating oil of NAPTHENIC TYPE (made from NAPTHENIC CRUDE) conforming to BS:148/IEC:296 class-1/PSTCL SPEC. shall be supplied for first filling of each transformer.

iii) 5% extra oil of the total quantity of oil shall also be supplied.

iv) Particular attention shall be paid to deliver the oil at site free from moisture and of uniform quality through out in non-returnable epoxy coated steel drums.

v) The quantity of oil for first filling of each transformer shall be stated in tender, alongwith trade mark of the oil to be supplied.

vi) Use of inhibitors in oil shall not be resorted to.

21. SUPRESSION OF HARMONICS:

The transformer shall be designed with particular attention to suppression of harmonic voltages especially the 3rd. and 5th. Percentage of harmonics at normal voltage and at maximum system voltage shall be stated in the tender. Harmonics shall be measured during final testing of the transformer.

22. TANK: (BELL TYPE DESIGN):

The transformer tank and cover shall be oil tight and shall be fabricated from good commercial grade low carbon steel of adequate thickness. The weld procedure and performance shall be in line with

ASME-BPV-9/IS:2062). The tank and the cover shall be of welded construction. All seems shall be welded and where practicable they shall be double welded. The tank shall be designed and constructed for vacuum filling of oil and shall be capable of withstanding without leakage or distortion continuous internal gas pressure of 0.7 atmosphere with oil at operating level. The tank cover(BELL) shall be bolted with the lower position of the tank and the transformer design shall be such that it shall be possible to move the complete transformer unit by skidding in any direction without injury when using plates or rails.

Where the design of the tank is such that the bottom plate will be in direct contact with the surface of the foundations, the minimum bottom plate thickness shall be 20mm or 25mm.

Man-holes with welded flange and bolted covers shall be provided on the tank cover along with one man-hole on side walls. The man holes shall be of sufficient size (Minimum 36" X 20" Size) to afford easy access to the lower ends of bushings, terminals, OLTC etc.

All bolted connections to the tank and connections between sections of the tank shall be provided with suitable flanges, with properly spaced bolts and suitable oil tight gaskets which shall give satisfactory service under operating conditions.

The thickness of M.S. plate for bottom, sides and top of the tank shall be adequate as per CBIP recommendations. The transformer tank alongwith radiators and other accessories shall be tested for vacuum and pressure test as per CBIP recommendations. Special attention shall be given to the methods of making the hot oil tight joints between the tank and cover as well as between the cover and the bushings and all other outlets to ensure that the joints can be remade satisfactorily and with ease with the help of semi-skilled labour. Where compressible gaskets are used, means shall be provided to prevent over compression. Suitable guides shall be provided for positioning the various parts during assembly or dismantlement. Adequate space shall be provided between the cores and windings and the bottom of the tank for collection of any sediment. Lifting eyes or lugs shall be provided on all parts of the transformer requiring independent handling during assembly or dismantlement. In addition the transformer tank shall be provided with lifting lugs and bosses properly secured to the sides of the tank for lifting the transformer by using hydraulic or screw jacks.

The design of the tank, the lifting lugs and bosses shall be such that the complete transformer assembly filled with oil can be lifted with the

use of these lugs without any damages or distortion. All bolts and nuts used in connection with tank and fittings shall be galvanized /cad. Plated(cadmium plated).The tank shall be provided with suitable lugs for the purpose of rounding with a mild steel flat.

The main body including tap changing compartments and radiators and coolers shall be capable of withstanding full vacuum of 760mm of mercury when empty of oil.

In addition, the design of tank, its shape, proportions, weight of material and construction shall be such as to best facilitate oil circulation and to ensure against transmission or magnification of noise or vibration which might be injurious or objectionable.

As far as possible, the transformer tank and its accessories shall be designed without pockets wherein gasses may collect. Where pockets cannot be avoided, pipes shall be provided to vent the gas in to the main explosion pipe. The vent pipes shall have a minimum inside diameter of 15mm except for short branch pipes which may have 6mm minimum inside diameter.

The tank cover shall be provided with three pockets for mercury in glass thermometers and four pockets for the bulbs of oil and winding temperature indicators. Minimum depth of the thermometer pockets shall be 10" from top oil level. Protection shall be provided where necessary, for each capillary tube. The thermometer pockets shall be fitted with a captive screwed top to prevent ingress of water. The pockets shall be located in the position of maximum oil temperature at CMR and it shall be possible to remove the instrument bulbs without lowering the oil in the transformer tank.

In order to have standard design of civil foundations , the following parameters shall be ensured:-

i) Weight on Plinth = ***250MT***(Max.).
ii) No of Jacking pads = 4 Nos. ***or 6 Nos.***
iii) Distance of Jacking pads from Central line (from HV Side) = 2200mm.
iv) Distance of jacking pads from central line as seen from the other/adjacent side = 1300mm
v) No supporting structure on plinth .

Net load on plinth shall be indicated in the foundation drawing .

Each transformer tank shall be fitted with the following valves/plugs with standard screw connections for external piping.

1. One filter cum oil drain valve with plug or blanking flange(size 80mm/100mm) and so placed as to completely drain the oil of the transformer.
2. One no. top filter valve, size 50mm near the top of the tank diagonally opposite to filter cum drain valve.
3. Three robust sampling valves with spouts suitable for taking samples of top, middle and bottom oil. The top and middle sampling values shall be brought down by internal pipe connections. Suitable name plates shall be affixed to the sampling valves. The sampling device shall not be fitted on the filter valve.
4. At least two Nos.15mm air release plugs on top of cover, suitably located.
5. One pressure relief valve to operate at a pressure below the test pressure for the tank.
6. Suitable no. of jacking bolts shall be provided on tank cover, inspection covers including OLTC.
7. Suitable arrangements as detailed out at Section-IX for attaching Nitrogen Injection Fire Prevention System on the T/F.

23. **CONSERVATOR TANK(AIR CELL TYPE):**

i) An oil conservator tank complete with sump, filling hole and drain valve shall be mounted above the radiators and located so as not to obstruct taking of bare connections from the transformer terminals.

ii) The capacity of the conservator tank shall be adequate to meet the requirements of expansion of the total cold oil volume in the T/F and cooling equipment from minimum ambient temperature of minus 5 deg.C. to 115 deg.C.

iii) The minimum indicated oil level shall be, with the feed pipe from main tank cover, under not less than 15 mm depth of oil and the indicated range of oil level shall be from minimum to maximum.

iv) One magnetic type oil level gauge with alarm contacts shall be mounted at a convenient height to be read from ground level. Prismatic oil level gauge shall also be provided.

v) Oil level at 30 deg. C shall be marked on the gauge.

vi) The conservator tank shall have one oil filling hole with cap at the top and drain valve of appropriate size at the bottom. A shut off valve shall be provided at the conservator to cut off oil supply to the transformer.

vii) The conservator tank will be designed in such a way that the same can withstand strong wind pressures by adding adequate stiffeners if necessary.

viii) Each conservator shall be fitted with a double compartment breather with oil seal in which silica gel is the dehydrating agent and designed so that:-

a) The passage of air is through the silica gel.
b) The external atmosphere is not continually in contact with the silica gel.
c) The moisture absorption is indicated by a change in colour of the tinned crystals and can be daily observed from distance.
d) All breathers shall be mounted at approximately 1400mm above ground level.
e) The breather should be made of superior quality see- through material and should consist of two compartments placed in parallel.
f) A suitable heater shall be provided so as to maintain the temperature of the oil at 5 Deg.C above the ambient air temperature.
g) In addition to M.O.G. prismatic type oil gauge shall also be provided.
h) Air cell of Pronal (France) make.

24. **ANTI EARTHQUAKE CLAMPING DEVICE:**

To prevent transformer movement during earthquake, a clamping device shall be provided for fixing the transformer to the foundation. The contractor shall supply necessary bolts for embedding in the concrete. The arrangement shall be such that the transformer can be fixed to or unfastened from these bolts as desired. The fixing of transformer to the foundation shall be designed to withstand seismic events to the extents that a static coefficient of 0.3 g applied in the direction of least resistance to that of loading will not cause the transformer or clamping device as well as bolts to be over stressed.

25 **EARTHING TERMINALS:**

Four earthing pads suitable for connecting 50x8 mm mild steel flat shall be provided at positions close to the two diagonally opposite bottom corners of tank. These grounding terminals shall be suitable for bolted connection. Two earthing terminals shall also be provided each on cooler, marshalling box and any other equipment mounted separately.

26. **UNDER CARRIAGE**:

The transformer shall be supported on a strong structural steel base equipped with forged steel or cast steel, single flanged, bi-directional wheels suitable for moving the transformer completely filled with oil. Jacking pads shall be provided to make it possible to change the direction of wheel through 90 degree when the transformer is lifted on jacks and permit movement of the transformer both in the longitudinal and transverse direction. Track gauge in both longitudinal and transverse direction shall be 1676 mm i.e. the same as that of Indian Broad Gauge Railways. Means shall be provided for locking the swivel movement in position parallel to and at right angles to longitudinal axis of the tank.

Pulling eyes and skids shall be provided to facilitate moving of the transformer and they shall be suitably braced in the vertical direction so that bending does not occur when the pull has a vertical component.

27. **BUSHING INSULATORS AND TERMINALS:**

i) Transformer shall be fitted with bushing insulators as follows:-

a) LV-N bushing : 36KV class, oil communicating type Porcelain bushing of 2000 A rating

b) LV bushing : 72.5KV, ***2000 Amp***. Condenser type bushing.

c) HV bushing : 245KV class, condenser bushing of 1250 A rating

d) HV-N bushing : 52KV class, oil communicating type porcelain bushing of 1250 A rating

ii) Bushings for 66KV and above shall be filled with transformer oil and there shall no be communication with the oil in the transformer. An oil gauge, preferably of prismatic type shall not be provided to indicate that correct level is maintained.

ii) Short time current withstand capability of bushing shall be 31.5 K.A for 3 seconds or more.

iv) The electrical characteristics of bushings shall be in accordance with IS:3347 and IS:2099.

v) These bushings shall be suitable for twin ACSR Zebra conductor connections. All bushings shall be equipped with suitable terminals of approved type and size and all external current carrying surfaces shall be adequately silver plated. All ends as well as all tappings on the windings shall be brought to terminals. In case of connection required outside the tank these shall be brought out to their respective terminals through well insulated bushings which shall be detachable and replaceable without disturbing the internal connections. Bushings which pass through the cover shall be removable without disturbing the transformer cover.

vi) The bushings shall have high factor of safety against leakage to ground and shall be so located as to provide adequate electrical clearances between bushings of various voltages and between bushings and grounded parts.

vii) Bushings of identical voltage shall be interchangeable. The insulating class of the high voltage neutral bushing shall be properly coordinated with the insulation class of neutral of the high voltage winding.

viii) Clamps and fittings made of steel or malleable iron shall be galvanized

ix) Each bushing shall be so co-coordinated with the transformer insulation that all flash-overs will occur outside the tank . All bushings shall have puncture strength greater than dry flash over value.

x) The tenderer is requested to give the guaranteed withstand voltage for the above referred arcing horns and also furnish a calibration curve with different settings of the co-ordination gap to enable the Purchaser to decide the actual gap setting. Tenderer's recommendations are also invited in this respect.

xi) Any stress shield shall be considered as integral part of bushing assembly. For voltages 66KV and above only condenser type bushings shall be accepted.

xii) Oil conservator provided in condenser type bushing shall be capable to take care of expansion of bushing oil upto 115 Deg. C.

28. CENTRE OF GRAVITY:

The Centre of gravity of the assembled transformer shall be low and as near the vertical centre line as possible. The transformer shall be stable with or without oil. If the centre of gravity is eccentric relative to track either with or without oil, its location shall be shown on the outline drawings.

29 JOINTS, GASKETS AND VALVES:

i) All gaskets used for making oil tight joints shall be of proven material such as granulated cork bonded with synthetic rubber. The material used should not deteriorate under the action of hot oil.

ii) Gaskets of M/s TALBROS & M/s Packing & Jointing shall be preferred.

iii) All valves upto and including 100 mm shall be of gun metal or of cast steel. Larger valves may be of gun metal or may have cast iron bodies with gun metal fittings. They shall be of full way type with internal screw and shall open when turned counter clockwise when facing the hand wheel. Means shall be provided for padlocking the valves in the open and closed position. Every valve shall be provided with flanges having machined faces. The drilling of valves flanges shall comply with the requirement of IS:2026/IS:3639.

iv) LEADER/BOMBAY METAL/UDCO/PETSON/PUNJAB MATAL WORKS JALANDHAR /MANIKON AGRA make valves shall be accepted only.

30. CLEANING AND PAINTING:

While in service, the equipment will be subjected to extremely severe exposure to atmosphere, pressure, high humidity and to long periods of high ambient temperature. All corrodible parts and surfaces shall be of such material and shall be provided with such protective finish that no part of the installed equipment is injuriously effected by atmospheric conditions.

The whole of the exposed portion except bright parts shall be thoroughly cleaned by sand/grit blasting and painted with two primary coats of approved rust resisting paint in light admiralty gray colour (shade 631 of IS:5).Inside surface of tank shall be clean, smooth, free from void and of best construction. The nature of coolings to provide inside shall be specified and it shall be ensured that it does not react with T/F Oil or deteriorates its electrical/chemical properties.

Sufficient quantity of paint for one complete coat to be applied at site after erection shall also be supplied alongwith each transformer. Some paint suitable for primary and secondary coats shall also be supplied to cover the damage to paint work which may be experienced during transportation.

31. MARSHALLING BOX;

A sheet steel of minimum 3 mm thickness, vermin proof, well ventilated and weather proof marshalling box of a suitable construction shall be provided for the transformer ancillary apparatus. Wiring upto marshalling box shall be with PVC/SWA, PVC copper cable 1100 volts grade IS certified/marked Ground mounted marshalling box to be provided on LV side of the T/F to make it readily accessible from road side.

The marshalling box shall accommodate the following equipment:

a) Temperature indicators.
b) Control and protection equipment for the local electrical control of tap changer, if the same cannot be accommodated in the motor driving gear housing.
c) Control & Protection equipment for the cooling plant.
d) Terminal boards and gland plates for incoming and out going cables.

All the above equipment except(d) shall be mounted on panels and back of panel wiring shall be used for inter-connection. The temperature indicator shall be so mounted that the dials are not more than 1600 mm from the ground level and the door(s) of the compartment(s) shall be provided with glass window of adequate size.

To prevent internal condensation, an approved type of metal clad heater with thermostat shall be provided, controlled by water tight single pole iron clad rotary switch mounted on outside of the box. The ventilation louvers, suitably padded with felt, shall also be provided.

All incoming cables shall enter the kiosk from the bottom and the gland plate shall not be less than 450mm from the base of the box. The gland plate and associated compartment shall be sealed in suitable manner to prevent the ingress of moisture from the cable trench.

32. CONTROL CONNECTION, INSTRUMENT WIRING, TERMINAL BOARDS & FUSES

All wiring connections, terminal boards, fuses and links shall be suitable for tropical atmosphere. Any wiring liable to be in contact with oil shall have oil resisting insulation. There shall be no possibility of oil entering connection boxes used for cables and wiring when 415 volts connections are taken through junction boxes or marshalling boxes, they shall be adequately screened and 415 volts danger notice must be affixed to the outside of junction boxes or marshalling boxes. All wiring shall be in accordance with relevant ISS. All wiring shall be with stranded copper of 1100 volts grade and size not less than 4.00Sq.mm for CT leads and not less than 2.5 Sq.mm for other connections. All wiring cables shall carry I.S.I. marked/certified.

All wires on panels and all multicore cables shall have ferrules which bear the same number at both ends. The same ferrule number shall not be used on wires in different circuits, on the same panels. Ferrules shall be of white insulating material and shall be provided with glossy finish to prevent adhesion of dirt. They shall be clearly and durably marked in black and shall not be effected by dampness or oil. Wiring shall in general be accommodated on sides of the box and wires for each circuit shall be separately grouped. Back of panel wiring shall be arranged so that access to the connecting stems of relays and other apparatus is not impeded. ALL THE CABLES AND CAPILIARY TUBES OF OTI & WTI ETC. ARE TO BE WIRED PROPERLY ON CABLE TRAYS WITH THE HELP OF SUITABLE CLEATS UPTO THE MARSHALLING BOX. THE CABLE TRAYS SHALL BE KEPT MINIMUM 100 MM AWAY FROM THE TANK BODY TO AVOID EXCESSIVE HEATING OF CABLES/WIRES.

Wires shall not be jointed or tied between terminal points. Wherever possible all circuits in which the voltage exceeds 125 volts, shall be kept physically separated from the remaining wiring. The function of each circuit shall be marked on the associated terminal boards.

Where apparatus is mounted on panels, all metal cases shall be separately earthen by means of copper wire.

No live metal part shall be exposed at the back of terminal boards.

All fuses shall be of cartridge type and fuses and links shall be labeled.

All wiring diagrams for control panels shall preferably be drawn as viewed from the back.

The overall design of wiring shall be such that various wires and ends of the same wire can be traced easily and there is convenience to access the terminations and ferrule number shall be readable with convenience.

33. **DRYING OUT AND ERECTION**:

The transformer shall be dried out by an appropriate method at the manufacturer's works and so arranged for transportation and storage that it may be put into service without further drying out at site. For any subsequent drying which may be necessary at site the manufacturer shall give details of the method recommended for using the same.

The transformer shall be designed to withstand pressure end vacuum tests as specified by CBIP specification for power and distribution transformers.

i) Vacuum of 760 mm of mercury applied to tank & cooling equipment when empty of oil.

ii) Pressure of 1 KG/Cm2 mercury applied to tank & cooling equipment when empty of oil.

iii) Pressure of 5 psi to be applied at conservator on fully assembled transformer when full of oil.

Clear instructions shall be given in the maintenance manual regarding special precautionary measures e.g. strucking up of tap changer barrier or tank cover which must be taken before applying the specified vacuum treatments. The maximum vacuum which the complete transformer filled with oil, can safely withstand without any special precautionary measures being taken shall also be stated in the maintenance manual. The bushing shall be capable of withstanding vacuum operation when drying the transformer.

34. **DRAWINGS:**

The tenderers shall submit with his tender, one set of dimensional drawings of the equipment offered, alongwith illustrated and descriptive literature for scrutiny.

The successful bidders after the award of the contract shall supply five copies of the following drawings within 15 days after the receipt of purchase order, which will describe the equipment in detail for approval by the Purchaser. Purchaser (i.e. Punjab State Transmission Corporation Ltd.),purchaser's ref. No.(i.e. P.O. no. & date, specification No.),Rating of Transformer should invariably be specified on each drawing. Bill of material in respect of each drawing must indicate the quantity, make and specification of each item.

i) Detailed outline General Arrangement drawing showing plan, front elevation, side elevation with all fittings and accessories etc. The following information must be specifically included on this drawing.

a) Make of transformer oil.
b) The no. of cooling fans, input to each cooling fan & its sweep.
c) Electrical clearances, minimum as well as actual.
d) The no. of radiator headers, number of radiator elements, width, thickness of sheet & height of each radiator.
e) A small sketch showing un-tanking details.
f) Thickness of transformer tank bottom, side & top plates.
g) Type, shade, shade no. and thickness of transformer paint.
h) Roller, rail gauge sketch.

ii) Weight of oil, windings, core, untanking mass, transportation mass and dimensions
etc.

iii) Detailed drawing of bushings, showing plan elevation, terminal details, mounting details, make and type number, incorporating electrical characteristics, description of various parts, total creepage/protected creepage distance, weight of oil, total weight of bushing, dimensions (L2,L6,Le), short time rating etc.

iv) Transportation sketch showing dimensions and weights of the heaviest package & the shipping arrangements of the transformer.

v) Rating and diagram plate.
Note: Bushing CT's for WTI's are to be provided on HV side.

vi) Detailed structural drawings for the transformer tank, under carriage, conservator, radiators, supporting structures for cooling fans etc.

vii) Dimensional drawings of multi bolt bimetallic connectors for line ends and flexible connectors for the neutral ends.

viii) **COOLING EQUIPMENT DRAWINGS:**
General Assembly of fan control cubicle & marshalling box. The plan view showing foundation details must be specifically included if this cubicle box is separately mounted.

viii) Schematic diagram of cooler control scheme alongwith detailed write up explaining the sequence of operations and functions of each equipment.

ix) Wiring diagram/cabling details of fan control cubicle showing connections with RTCC, WTI, MOG etc.

x) a) General Assembly of remote tap change control panel (RTCC) including plan view showing foundation details indicating all audio/visual indications.

b) Wiring diagram of RTCC panel

c) Additional alarm and indication circuit in RTCC.

xi) ON LOAD TAP CHANGER DRAWING

a) Schematic diagram of Motor Drive as well as RTCC alongwith detailed write up explaining the sequence of operation and functions of each equipment, alongwith its location.

b) All drawings of OLTC viz, O.D.drg., diagram of connections for drive mechanism, wiring diagram tap change control panel.

xii) Wiring diagram/cabling details showing inter connections between motor drive-RTCC and marshalling box/fan control cubicle.

xiii) **CORE DRAWINGS**:

a) Core dimensional drawing showing frame size(Elevation plan),limb and yoke sections alongwith step details and calculations for flux density and make of CRGO.

b) Calculations for no load current, no load losses and characteristics of the core material shall also be furnished.

c) Make of CRGO and Sub-Supplier Name for cutting of CRGO shall be given in the drawing.

xiv) **WINDING DRAWING:**

a) HV, LV and Regulating winding conductor cross-sections alongwith calculations for current density.

b) Make of Copper used and insulating paper/press board used shall be given in the drawing.

c) Name of the Vendor for processing of copper shall be given.

xv) **THERMOSYPHON DRAWINGS**:

Thermosyphon arrangement drawing, showing tray details, internal tray arrangement and removal of tray assembly etc. showing dimensions, qty. of oil and sorbant used.

xvi) Roller stopper arrangement drg.

34. a) **ADDITIONAL DRAWINGS:**

The following drawings shall be supplied for reference and record in addition to the above drawings enlisted from (i) to (xvi):-

i) Schematic diagram showing flow of oil in the cooling system as well as each limb of the core and winding and cross sectional

views showing duct sizes, cooling pipes etc for the transformer/heat exchanger drawn to scale shall be furnished.

ii) Large scale drawing of high and low voltage windings of transformer showing the nature and arrangement of insulation and terminal end connections.

iii) Drawing showing sectional view of the HV & LV windings when viewed from top.

iv) Detailed drawings of conservator and pressure relief device mounted on position.

v) Fan mounting details.

vi) Valve & plug schedule plate indicating the location of various valves on the transformer mentioning the functioning of each.

vii) Any other drawing considered necessary by the Purchaser.

viii) A schedule showing the requirement of set of spare gaskets

NOTE: ANY MANUFACTURING DONE PRIOR TO APPROVAL OF DRAWINGS, CERTIFICATION OF RAW MATERIAL SHALL BE AT FIRM'S RISK PURCHASER RESERVE THE RIGHT TO MAKE ANY CHANGES IN DESIGN/RAW MATERIAL ETC. WHICH SHALL BE NECESSARY TO MAKE THE EQUIPMENT CONFORM TO THE STATED PROVISIONS OF THE SPECIFICATION WITHOUT ANY ADDITIONAL COST TO PURCHASER. APPROVAL OF DRAWINGS BY THE PURCHASER WILL NOT RELEIVE THE FIRM OF ANY PART OF THE CONTRACT OBLIGATION TO MEET ALL THE REQUIREMENT OF THE SPECIFICATION OR RESPONSIBILITY FOR THE CORRECTNESS OF THE FIRM'S DRAWING.

35 **INSTRUCTION MANUALS:**

The successful tenderer shall be required to supply ***5 sets*** of instruction manuals per transformer, each properly bound in hard cover. Each set shall consist of the following:-

i) All drawings listed above.

ii) Erection operation & maintenance manual for transformer/ OLTC and pamphlets for all spare parts e.g. OTI, WTI, MOG, OLTC, Buchholz relay, silica gel breather/pressure relief valve and cooling fans etc.

iii) Instructions for dehydration, if any.

iv) Precautions prior to vacuum application, if any.

v) Any other information / data / documents / instructions considered necessary by the manufacturer for efficient functioning of the transformer.

The Supplier shall also be required to supply one set of drawings listed above on superior quality tracing cloth/paper suitable for reproduction.

36. **GUARANTEED DATA AND OTHER PARTICULARS:**

Guaranteed data and other technical particulars of the transformers offered shall be furnished by the tenderer in accordance with Annexure-"B" of this specification.

37. **PLACE OF MANUFACTURE, TESTING AND INSPECTION:**

The Tenderer shall state in his tender, the place(s) of manufacture, testing and inspection of various portions of the work included in the tender. The place of manufacturing shall not be allowed to be changed at a later stage. The Purchaser or his duly authorized representative shall have access to the manufacturer's works at any time during working hours for the purpose of inspecting the manufacture & testing of materials, equipment and completed plant and the Supplier shall provide necessary facilities for inspection.

38. **INSPECTION AND TESTING** :

The successful tenderers shall submit complete set of drawings as already brought out in this specification within 15 days from the receipt of purchase order (i.e. 7 days from the issue of purchase order). Alongwith the drawings the suppliers will furnish the following intimation:-

a) Schedule of manufacturing of the transformer.
b) Name of the Vendor from whom cutting of CRGO & processing of copper shall be made, in case the facilities do not exist at the supplier works.
c) Name of the Sub-Supplier for manufacturing of tank.
d) The quality assurance programme of the vendors/sub- suppliers.
e) Make of the CRGO, Copper, Insulating Paper, Press Board, Tank Steel etc.

Purchaser can inspect the raw material, manufacturing process at sub-supplier works for which advance intimation of manufacturing activities shall be given.

A) <u>Stage Inspection</u>

Stage inspection of built up core(in horizontal/vertical position),windings, tank and radiators shall be carried-out as detailed below:-

a) **Core:**
   i) Measurement of Flux Density.
   ii) Tests on CRGO sample taken from the core shall be carried-out from out side agency like ERDA/ CPRI etc. for Carlite test(Resistance Measurement), Watt. Loss Test, Lamination Thickness & Ageing Tests.
   iii) Physical inspection for quality of workmanship.

b) **Windings:**
   i) Measurement of Cross-sectional area for current density.
   ii) The measurement of weight of bare copper/covered copper by Resistance Method, ID/OD method, Per unit length methods.
   iii) Tests may be carried-out on sample of copper for assessing its quality.

c) **Tank:**
   i) Vacuum Test.
   ii) Pressure Test.

iii) DP Test.
iv) Peel-off Test.
v) Tests on welded joints such as X-ray testing may also be got carried out.

NOTE: For permissible deflection as per CBIP in pressure and vacuum test, Horizontal width shall be taken between nearest STIFFNERS.

d) **Radiators:**
Radiator shall be routine/type tests at sub-supplier works as per relevant standards.

e) **OLTC:** OLTC shall be routine/type tested at sub-supplier's works as per relevant standards.

B) ROUTINE TESTING:

All Routine tests shall be carried-out on each transformer as per IS-2026/IEC-76 & IEC-354 with latest amendments including Impulse Voltage Withstand Test with chopped impulse on all the three phases and ***Switching Impulse test as per IS-2026(Latest Revision).***

C) TYPE TESTING

Following type tests and T/F withstand capacity beyond name plate as per IEC-354 shall be carried-out as per IEC-76/IEC-354 & IS-2026 with latest amendment:-

i) Temp. Rise Test.
ii) Short Circuit Test**:**

D) SPECIAL TESTS:

All tests except DGA Test to be carried-out on each unit:-

i.	DGA Test before and after temp. rise test.
ii.	Noise Level Test.
iii	Measurement of Harmonics
iv	Measurement of Vibrations on tank as per IEEMA
v	Measurement of Tan Delta & Capacitance of Transformer windings and bushings at 5KV & 10KV.
vi	Magnetic balance test on HV and LV sides
vii	Magnetizing current at low voltage.
viii	Measurement of percentage impedance at all taps at low voltage
ix	**SFRA(Sweep Frequency Response Analysis)**

Charges of all the above tests *(i.e. Stage tests, Routine tests, Type tests & Special tests)*shall be deemed to have been included in the quoted prices. No separate charges shall be given for the tests. Offers of the firms who quote separate charges for the tests shall be rejected.

NOTE:

a) The insulation resistance values of the transformer windings will be recorded at the time of carrying out routine tests, for 20 seconds, one minute, two minutes & ten minutes with the help of 5000V motorized megger. (Preferably EVERSHED/ AVO & VIGNOLE MAKE). The polarization index value(ratio of 10 minute/1 minute values) will be accordingly calculated and recorded in the test certificates and it should not be less than 1.5.

b)

IR Values:	IR value taken at 60 secs. shall be converted to 60 Deg.C. It should not be generally less than 2 M.Ohm/ KV when converted to 60 Deg.C. For conversion the IR values shall be converted to 60 Deg.C by the following multiplication/conversion factor:-	
	Diff. in temp. factor	Multiplication/ Conversion
	1	1.04
	2.5	1.10
	5	1.21
	10	1.46
	15	1.78
	20	2.16
	25	2.62
	30	3.16
	35	3.83
	40	4.62
	45	5.65
	50	6.25
	For any other intermediate temperature diff. the multiplication /conversion factor shall be interpolated.	

c) Capacitance and Tan Delta values for each transformer and condenser bushings will be taken and recorded in the test certificates at 5/10 KV. Insulation Resistance value of Condenser Bushings shall also be recorded.

d) Pressure/vacuum test on empty tank and oil leakage test as per CBIP however, vacuum test shall be carried out at full vacuum.

e) Lightening impulse test with the chopped wave applications as per clause 13 of IS:2026/1981 (Part- III) / IEC-76 amended upto date. This test will be carried-out on all the limbs of HV and LV windings with positive polarity.

f) S.C.test shall be carried-out if not already carried out on the offered design and rating.

g) The tenderer should clearly indicate the testing facilities available with them and tests which are to be arranged outside.

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Supplier shall submit In house test certificates at least 15 Days in advance for final testing of t/f. For Testing of T/F. All Measuring Instruments shall be of highest efficiency and best quality. These shall be got calibrated from NPL/Govt. Agency and be got sealed by calibrating agency in the temper fashion. PSTCL reserves the right to calibrate the instruments in the manner it desires. The calibration of instruments being used for testing shall not be more than one year old for all moving coil instruments or 2 years for other static electronic instruments or the period of cycle recommended by the manufacturer of testing instruments whichever is less. Losses shall be measured with ***Power Analyzer*** only. Resistance shall be taken with Double-Kelvin Bridge/Digital resistance meter of adequate accuracy. Losses shall be measured Directly from CTs and PTs and through the panel. Ratio's of the measuring instruments shall be such that the multiplying factor is the minimum .

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All tests shall be carried out in the presence of the Purchaser before despatching the material. Test certificates in Quadruplicate will be submitted to the Purchaser for approval. No material shall be dispatched without prior inspection and approval of test certificates unless otherwise agreed to.
Type and routine test certificates of all bought out items from recognized testing agency shall be submitted for approval before commencing supplies.

39. **TESTING OF TRANSFORMER OIL, NIFPES & SPARES:**

i) Sufficient quantity (along with 5% extra) of insulating oil of Naphthenic type (made from Naphthenic crude) conforming to BS:148/IEC:296 class-I shall be supplied in non-returnable epoxy coated steel drums after carrying out necessary tests as per procedure prescribed in relevant IS:335/BS/IEC. Testing shall be carried out in the presence of PSTCL representative for which an intimation at least 15 days in advance shall be given to PSTCL for deputing the official. Sealed samples of T/F oil from each lot offered for inspection shall also be got tested from CPRI & PSTCL oil testing lab. No extra charges shall be paid by the purchaser. The dispatches shall be allowed after the T/F oil passes the tests of PSTCL Lab. at Patiala & CPRI.

Supplier will be required to submit Rs. 50000/- + GST per sample for testing at PSTCL's oil testing lab.

ii) Testing of NIFPES as per relevant standards shall be carried out at the sub-supplier's works before despatch in the presence of purchase's representative.

iii) Testing of Spares as per relevant standards shall be carried out at supplier's/sub-supplier's works in the presence of purchaser's representative.

40 **FOUNDATIONS AND FIXINGS:**

All plant and equipment shall be provided with a complete set of foundation bolts, washers, nuts, plates and other fixtures as may be required and these shall be supplied by the Supplier. These fittings shall be fixed by the Purchaser in the foundations, unless otherwise specified. All foundations bolts, fixtures etc shall be supplied as soon as possible after the contract drawings have been approved.

41 **PACKING, DESPATCH AND DELIVERY:**

The Supplier shall be responsible for suitable packing of all equipment and marking of the consignments so as to avoid any damage during transit, storage and to ensure correct dispatch to the destination. Damages to equipment/material in transit due to improper packing shall be to Supplier's account. All parts requiring protection from moisture shall be especially packed to prevent ingress of moisture. No parts of any kind shall be packed inside other larger parts. Heavy parts shall be so mounted that there is no difficulty in attaching slings etc for unloading at destination.

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

The weight and dimensions of the heaviest package of transformer shall be so arranged by tenderer that the transformer can be transported upto site in Indian Railways. It will be the entire responsibility of the supplier to obtain clearance from Indian Railways on all matters connected with dispatch of transformer and its accessories and their receipt.

In case the transformers are dispatched gas filled and oil for first filling is dispatched separately sufficient quantity of gas in NON RETURNABLE cylinders shall be supplied to maintain the pressure of the gas in the tank at site before, it is filled with oil.

The supplier will depute his representative along with the trailors for maintaining the Nitrogen Pressure in case of Nitrogen Filled Transformer.

42 **TOOLS**

The transformers shall be supplied with a set of special tools if considered necessary for assembling and dismantling of transformer. The details of the tools etc included in the offer shall be given.

43. **SPARES:**

A) **COMPULSORY SPARES**

Following spares shall be compulsory with each unit and the cost of the spares shall be included in the quoted price. No separate charges shall be paid for the spares.

Sr. No.	**Description**	**Qty. (Nos.)**
1.	Complete sets of gaskets	1
2.	Silicagel(for one time filling)	-
3.	Sorbent for thermosyphon system for	

	one time filling etc.	-
4.	Silicagel Breathers for main tank	2
5.	Silicagel Breathers for OLTC	2
6.	Diaphram for exposing vent	2

B) **OPTIONAL SPARES**

The itemized prices for following spares and any other recommended spares shall be given in the tender on F.O.R. destination basis like the transformer. Each set of spares shall comprise following items :-

Sr. No.	Description	Qty. (Nos.)
1.	HV bushing(complete assembly)	1
2.	LV bushing(complete assembly)	1
3.	HV neutral bushing (complete assembly	1
4.	LV neutral bushing(complete assembly)	1

NOTE:

i) Bushing Assembly quoted under this category shall be equipped with terminal connectors.

ii) Voltage & current rating of each bushing should be clearly mentioned.

The Ex-Works Price, ED & CST applicable, F&I etc. shall be mentioned clearly against each item given above for comparative evaluation.

44. **ON-LOAD TAP CHANGER:(IN TANK TYPE DESIGN)**

Each transformer shall be provided with an On-Load Tap Changer for varying the effective transformation ratio while the transformer is On Load and without providing phase displacement. The salient features of the OLTC shall be as under:

i) The tap changing mechanism should be suitable for remote control operation from remote control panel in the control room in addition to being capable of local manual, as well as, local electrical operation.

ii) The On Load Tap Changer shall include the following:

a) An oil immersed tap selector and arcing switch on arc suppressing tap selector, provided with reactor or resistor for reduction of make and break arcing voltages, overloads and short circuits.
b) Motor driven mechanism.
c) Control and Protection devices.
d) Local tap changer position indicator.
e) Manual operation device.
f) Make of OLTC -BHEL,TELK,EASUN MR(FormerlyHHE),CGL,CTR
g) Voltage rating-110 KV for SYSTEMS T/F and 150 KV for AUTO T/F.
h) Current rating- ***700 Amp***.
i) Control voltage – ***220/110 Volt (Single phase AC)***

iii) The on-load tap changer shall be designed so that the contacts do not interrupt arc within the main tank of transformer. The tap changer

selector and arcing switch on arc suppressing tap selector switch shall be located in one or more oil filled compartments. The diverter switch should be provided with gas vent and buchholz relay. It shall be designed so as to prevent the oil in tap selector and diverter switch compartments from mixing with the oil in transformer. The barrier board between OLTC and the Transformer tank shall be made of silicon bonded rasin paper(SBRP)/Fibre Glass.

iv) The tap changer shall be capable of permitting parallel operation with other transformers of the same type 100 MVA or 160 MVA. The transformer shall give full load output on all taps without exceeding the limit of permissible temperature rise in oil and winding. The manual operating device shall be so located on the transformer that it can be operated by a man standing at the level of transformer track. It shall be of robust construction and shall be capable of frequent operations. It shall not be possible to operate the electric drive when the manual operating gear is in use.

v) Necessary interlocks blocking independent control when the units are in parallel shall be provided.

vi) The controls shall be so arranged as to ensure that when a tap change operation has commenced, it shall be completed independently of the operation of control relays or switches. Local or remote control switch shall cause one tap movement only until, the control switch has returned to the off position between successive operations. Under abnormal conditions such as may occur when the contractor controlling one tap change sticks, the arrangement must be such as to switch off supply to the motor so that an out of step condition is limited to one tap difference between the units. Limit switches shall be provided to prevent over running of mechanism.

vii) The transformer and the tap changing equipment shall be designed to permit full rated operation with tap changing equipment temporarily installed in any intermediate position. Details of out of step protection provided for the taps should be furnished in the tender.

viii) The control scheme for the tap changer shall be provided for independent control of the tap changer when the transformers are in independent service.

ix) In addition, provisions shall be made to enable parallel control also so that the tap changers of two or more transformers 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 features like "Master / Follower" and visual indication, during the operation of motor shall also be incorporated.

x) A mechanical tap position indicator shall be provided on the tap changer in addition to remote indication equipment in the control room on

remote control cubicle of OLTC. Necessary inter locks, for independent control when the units are in parallel shall be provided.

xi) The whole of the motor drive unit comprising the motor and its control gear including contractors indicator, local electrical push buttons, five digit operation counter, handle for manual control etc. as well as terminals for the control and indication wiring shall be housed in a dust proof kiosk mounted on the tap changer. A heating element with switch shall also be provided in kiosk, for ensuring trouble free operation of the drive in cold weather. Arrangement shall be made for padlocking the kiosk. Tap position indication shall be visible by a number appearing in a small glass window on the front of the kiosk. For remote indication, an indication type instrument or digital type shall be provided on a panel on the 415 Volts, 3 phase, 50 cycles external supply.

xii) Any enclosed compartment not oil filled shall be adequately ventilated. All contractors, relay coils or other parts shall be suitably protected against corrosion or deterioration due to condensation, fungi, etc.

xiii) The oil in the compartments of the main tap changing apparatus which do not contain contacts used for making or breaking current shall be maintained under conservator head by means of a pipe connection from the highest point of the chamber to the conservator. This connection shall be controlled by a suitable valve and shall be arranged so that any gas leaving the chamber will pass into the gas and oil actuated relay. A separate buchholz relay with trip contacts, shall be provided for the On Load Tap Changer chamber.

xiv) Each compartment in which the oil is not maintained under conservator head shall be provided with a suitable direct reading oil level gauge.

xv) A permanently legible lubrication chart shall be fitted with the driving mechanism chamber.

xvi) Local electrical control switches and the local operating gear shall be clearly labeled in suitable manner to indicate the direction of operation of tap changer.

xvii) The prices shall include necessary indoor and outdoor equipment except for power and control cables(between the tap changer and control room) which will be provided by the Purchaser, based on the information furnished by the Tenderer. Complete particulars of the on-load tap changer gear including, the capacity of the motor shall be stated in the tender.

xviii) The remote control panel of OLTC gear to be installed in the control room should match in colour and dimensions with the purchaser's transformer control panel for which details would be furnished to the successful tenderer. Plate/Sticker showing the rated no load voltage at all taps shall be affixed on RTCC panel in order to facilitate the

operator in deciding the tap position on which transformer is to be operated corresponding to incoming voltage.

xix) In addition to the fittings, auxiliaries and accessories considered necessary by the tenderer the following shall be provided:

A) **FOR LOCAL ELECTRICAL CONTROL:**

i) Raise lower selector switch with a intermediate `OFF' position.
ii) Auxiliary transformer (if necessary) alongwith fuses and links.
iii) Step by step contractor.
iv) Thermal Over-Load Relay for the motor.
v) Reversing contactor.
vi) ON/OFF automatic trip air circuit breaker for motor supply.
vii) Local/Remote change over selector switch

B) **FOR REMOTE ELECTRICAL INDEPENDENT CONTROL:**

i) All equipment listed in (A) above.
ii) Tap position indicator for mounting on control panel in the control room.
iii) Signal lamp and buzzer, for indicating tap changing in progress.
iv) Raise lower switch push button type with intermediate off/position for remote control.
v) Emergency stop button(push button type)with video indication
vi) Visual and alarm indication for non completion of operation within pre-set time.
vii) Provision of interlocking system for blocking independent control when the units are to run in parallel by providing interlockable phase sequence selector switch.
viii) All audio/visual indications should be brought to the RTCC panel.

NOTE: All equipment and their connections in RTCC panel should be properly marked. The buzzer/bell (industrial type) should be provided.

C) **FOR SIMULTANEOUS PARALLEL OPERATION OF TRANSFORMER:**

i) All equipment listed in (B) above.
ii) Out of step relay alongwith auxiliary relays, contactors and other equipment including a buzzer and signal lamp to indicate the out of step indication when transformers in one of pair of group of rating in parallel are one tap out of step and also to trip the circuit breaker.
iii) Control selector switch to enable to run a transformer as 'Master/Follower' or independent in a group.
iv) Selection switch for individual/parallel operation.

D) **ADDITIONAL PROVISION ON REMOTE CONTROL PANEL:**

In addition to all the equipment listed above, the following additional provisions shall be made on the remote control panel.

i) Switch for remote/manual electrical control of fan motor. Separate switch shall be provided for each fan motors.
ii) Remote lamp indication for fans working.

iii) Audio/Visual indication for supply failure to fans suitable for 220V AC operation.

iv) Remote winding and oil temp. indicators.

v) DC supply isolators, DC supply on indication & DC failure, hooter alongwith cancellation.

45. **THERMOSYPHON FILTER ARRANGEMENT**:

Thermosyphon filter arrangement shall be provided on the transformer for preserving the quality of transformer oil. The filter assembly shall be mounted on the transformer or/and ground supported and connected with pipes and shut off valves. Suitable instructions required to be followed for commissioning, dismantlement & maintenance of the filter arrangement, re-generation and storage of the adsorbent etc. must be included in the instruction manual. A detailed drawing showing, internal arrangement shall also be required to be submitted. Suitable capacity pump (alongwith motor) shall also be provided to boost circulation of oil.

For Forced Oil Circulation in the Thermosyphon Filter, Oil Pump with Motor of suitable capacity with flow indicator shall be provided in the By-pass line with shut off valves on both sides of the pump.

The oil & absorbent capacity required in the Thermo- Syphon Filter is as under:

i) Qty. of oil ***2 %*** of total oil by wt.

ii) Qty.of sorbent ***1%*** of total oil by wt.

46. **ELECTRICAL CLEARANCES**

The electrical clearance in air between live conductive parts and live conductive parts to each structure shall be as under:-

Nominal System Voltage (KVP)	Testing Voltage Impulse (KVP)	Clearance	
		Phase to Phase	Phase to Earth
66	325	780	660
220	1050	2520	2100
11	95	280	178
132	650	1250	1050

or clearance as per CBIP(latest edition) whichever is higher.

47. DELIVERY

"Commencement with one unit within 5 months from the date of drawing approval and completion at the rate of one unit per month thereafter. The drawings shall be submitted by the firm within 1 months from the date of issue of Purchase Order."

48. PERFORMANCE CERTIFICATES:

The bidders should submit along with their offer latest performance certificates of 160 MVA 220/66 KV or above rating Power T/Fs supplied to other SEBs/Utilities.

ANNEXURE-A

IMPORTANT TECHNICAL PARTICULARS FOR 160MVA 220/66KV TRANSFORMER

Sr. No.	Description	112/136/160 MVA 220/66KV T/F
1.	Transformer Rating	112/136/160 MVA
2.	Type of cooling	ON/AF/OF
3.	Percentage Impedance	15%
4.	Designation of T/F	Large
5.	**Loss (Max.): KW** **i) No Load Loss** **ii) Load Loss** **iii) Auxiliary losses**	 ***67*** ***258*** **8**
6.	Current Density (Amp./Cm2) (Max.)	250
7.	Flux Density(Tesla) Max.	1.57
8.	Reference Ambient Temp.(Deg.C)	40
9.	Oil Temp. Rise (Deg.C) Max.	35
10.	Winding Temp. Rise(Max.) (Deg.C)	45
11.	Hot spot Gradient (Max.)	15(1.3X Wdg. gradient)
12.	Oil Time constant(Hrs.)	ON-3 Hrs. (Min.)
13.	Short Ckt. Thermal withstand capability (sec.)	5 Sec.
14.	Capability of withstand Auxiliary supply failure (Minutes) (Note:- Hot Spot Temp. not to exceed130 Deg. C under Adverse Ambient Conditions and 120 Dec. C under over load conditions of IEC)	30 Minutes
15.	Type of tank	Bell type
16.	Losses to be fed from Heat Run Test	1.1 times the total losses at 75 Deg. C at highest current tap.
17.	Testing	As per IEC-76 & IEC-354(Latest Edition)
18.	Weight of Alumina	***1%*** weight of Oil

Note:- 1. Oil Conservator Tanks for Main T/Fs. OLTC. T/F Bushing shall be suitable to take care of oil expansion upto 115 Deg. C or more. If the oil temperature rises beyond 115 Deg.C what is the release provided.

2. ***Terminal Connectors, Current T/Fs. etc. shall be rated to 1.5 times the highest current rating at any tap.***

ANNEXURE-B

FITTINGS AND ACCESSORIES

Each transformer shall be complete with the following fittings and accessories:-

1. One 150mm (6") dial type indicating thermometer (OTI) of robust pattern mounted on the side of the transformer at a convenient height to read the temperature in the hottest part of oil and fitted with alarm and trip contacts. Provision in the OTI for connection to repeater in RTCC shall also be provided.
2. 3 Nos.150 mm dial type winding hot spot temperature indicators(WTI) placed in HV winding (IU & IW)and in LV winding (2V), as described below:-
   "It shall be indicating type responsive to the combination of top oil temperature and winding current calibrated to follow the hottest spot temperature of transformer winding. The device shall have a additional pointer to register the highest temperature reached. Each winding temperature indicator should have three sets of contacts. Two contacts of the one of the WTI shall be used for trip and alarm purpose, wiring of which will go to the main control and relay panel of the transformer [external control cables from the marshalling box to the C&R panel to be provided by the purchaser). 2 Nos. Bushing CTs for WTI to be provided on HV side on U & W phase & 1 No. to be provided on LV Side V-Phase. The Third set of contacts of WTI shall be used in the cooler control circuit. In other words, it will act as a winding temperature control under ONAF/OFAF OR ODAF rating for automatic control of fans/pumps depending upon the temperature. Fourth set of contacts shall be spare. Provision in the WTI for connection to repeater in RTCC shall also be provided. The contacts of each WTI should be adjustable to close between 60 deg.C to 120deg.C and shall reopen when the temperature has fallen by any desired amount between 10deg.C to 25deg.C.However,supplier should mention in the their manuals the actual adjustable settings of these contacts".

   Cooler control contacts of all the WTIs shall be wired in parallel. Repeaters for all WTIs/ OTIs shall also be provided in the RTCC panel.
3. One conservator along with two no. shut off valves, oil surge relay, breather connecting pipe etc. exclusively for OLTC.
4. ***Two*** pressure relief valves/devices (PRV) of minimum 6 inch size for main tank and one No. PRV for OLTC of size 3 inch (approx.) with provision for trip contacts.
5. Inspection covers with jacking bolts in the top cover plate of the tank.
6. One filter cum oil drain valve with plug or blanking flange: size 80mm.
7. One filter valve at top of transformer tank size 50mm.
8. Three oil sampling valves for taking samples of top, middle & bottom oil.
9. Set of lifting lugs/jacking lugs and eye bolts on all parts for ease of handling.
10. One double float gas/oil surge detecting(Buchholz) relay in the pipe connecting the conservator with tank, complete with alarm and tripping contacts to detect accumulation of gas and sudden changes of oil pressure,

complete with two shut off valves on conservator side as well as tank side and a coupling to permit easy removal without lowering flange/oil level in the main tank. The size of shut off valve shall be 80mm. Expansion Bellow shall also be provided in the pipe.

11. Two grounding terminals on breadth side of tank.
12. One ONAN/ONAF/OFAF OR ODAF cooling equipment comprising of two no. radiator banks of 50% cooling capacity each with fans/pumps for forced cooling, piping, shut of valves, air release and drain plugs etc. The fans/pumps shall be arranged in two groups.
13. Skids and pulling eyes on both sides.
14. One marshalling box housing dial type thermometers for winding and oil temperature indicators, with automatic control equipment for controlling fan/pump, motors, heather, complete wiring and local/auto selector switch and supply isolating switches with H.R.C. fuses/single phase protectors.
15. 4 No. Thermometer pockets for mercury in glass thermometer of minimum 10 " depth from top oil level at different locations on Tank Top.
16. ***A set of universal type bi-metallic multi bolt double grooved conductor clamp/connector each capable of receiving double for HV/quadruple for LV ACSR conductor of appropriate size upto Zebra.***
17. Suitable bi-metallic flexible connectors for neutral terminals.
18. Suitable size bi-directional wheels for 1676mm. rail gauge in both direction-4nos.
19. One OLTC along with remote control panel with each transformer complete with wiring, oil surge relay, PRV etc.
    a) OLTC conservator pipe and valves diameter should be 25 mm.
    b) The height of RTCC panel should be 2312 mm & shade of paint should be of No.631 of IS:5.
20. The following plates in English shall be fixed to the transformer tank at about 1750mm above ground level:-
    a) Rating Plate bearing data as specified in IS:2026/1977, it must contain insulation levels of various windings, impedance at tap 1/5/17 oil Rise, winding gradient & hot spot Temp. etc. . Short circuit duration, control voltage of OLTC ,WTI CT ratio besides other information.
    b) Terminal marking plate showing the internal connections & voltage vector relationship of various windings in accordance with IS:2026/1977(Latest Edition).
    c) Diagram plate showing the location and function of all valves and air release cocks/plugs.
    d) Diagram plate showing the functions of thermosyphon.
21. A plate showing the rated no load voltage at various taps shall be affixed on the remote control panel in order to facilitate the operator in deciding the tap position on which the transformer is to be operated corresponding to the incoming voltage.

22. Oil conservator(for main tank-Air Cell Type) complete with magnetic type oil level gauge, prismatic oil level gauge, filling hole and cap, drain valve size

19mm,shut off valve, inter connecting pipes etc. Magnetic type oil level gauge shall be provided with low oil level alarm contacts and a dial showing minimum, maximum and normal oil level. The gauge shall be readable from the transformer base level. Silicagel breather with oil seal, shall be fitted as already prescribed. Breather should be made of see through material and should consist of two compartments placed in parallel. One drain pipe upto floor level with one valve may be provided.

23. One no. thermosyphon filter arrangement with suitable capacity oil pump fitted with motor for forced circulation of oil and spare Alumina for one time replacement.
24. One no. ladder with provision for anti climbing device.
25. Any other item which is not included above but is essential for the satisfactory operation of the equipment.
26. Two nos. 50NB valves be provided on the Transformer tank for online dehydration/moisture removal equipment.
27. One no. 50NB valves be provided on the Transformer tank for Online Dissolved Gas Analyser.

ANNEXURE -'C'

SCHEDULE OF GUARANTEED AND OTHER TECHNICAL PARTICULARS

SL.NO.		DESCRIPTION	PARTICULARS
1.	a)	Name of manufacturer:	
	b)	Place of Manufacturing (From where Transformer are to be supplied against this tender enquiry):	
2.		Service :	
3.		Normal continuous rating KVA under Site conditions on any tap:-	
		a) HV Winding	KVA
		b) LV Winding	KVA
4.		Rated Voltage:	
		a) HV Winding	KV
		b) LV Winding	KV
5.		Rated Frequency:	
6.		Number of Phases:	
7.		Connections:	
		a) HV winding	
		b) LV winding	
8.		Connection Symbol:	
		a) HV----------LV	
9.		Tappings:	
		a) Range	
		b) Number of Steps	
		c) For high voltage variation/ low voltage variation	
10.		Reference ambient temperatures:	
	a)	Maximum ambient air temperature	deg. C
	b)	Maximum daily average ambient temp.	deg. C
	c)	Maximum yearly weighted average temp.	deg. C
11.		Type of cooling:	

12. Temperature Rise
    a) Top Oil — Deg. C
    b) Winding — Deg. C
    c) Hot spot temperature calculated over an annual weighted temp. of 40 Deg. C — Deg. C
    d) Limits of hot spot temperature for which transformer is designed as per IS: 6600 — Deg. C
    e) Temperature gradient between Winding & HV Oil Temp. — Deg. C

13. Total Loss at rated voltage (at principal tapping, rated frequency & rated ONAF output) at 75 Deg. C. including cooler loss — KW (max.)

14. Component Losses (Maximum)
    a) No-load loss at rated voltage on principal tapping at rated frequency — KW (max.)
    b) Load loss at rated current at Principal tapping at 75 deg.C — KW (max.)

15. Impedance voltage at rated current for the Principal tapping at 75 deg.C
    a) HV-LV — Percent

16. Reactance at rated current & rated voltage
    a) HV-LV (Positive sequence) — Percent
    b) HV-LV (Zero sequence) — Percent

17. a) No load current at rated voltage and rated frequency — Percent
    b) Power Factor of no load current at rated voltage & rated frequency
    c) No load current at (Approx. calculated values)
        i) 75% Voltage
        ii) 80% Voltage
        iii) 85% Voltage
        iv) 90% Voltage
        v) 95% Voltage
        vi) 100% Voltage
        vii) 105% Voltage
        viii) 110% Voltage
        ix) 115% Voltage
        x) 120% Voltage
        xi) 125% Voltage
        xii) 130% Voltage
        xiii) 135% Voltage

xiv) 140% Voltage

18. a) Input to cooling plant KW
    b) Input to conservator heater KW

19. Insulation level
    a) Separate source power frequency voltage withstand
        i) HV Winding KV rms
        ii) LV Winding KV rms

    b) Induced over voltage withstand
        i) HV Winding KV rms
        ii) LV Winding KV rms

    c) Full wave lightening impulse withstand
        i) HV Winding KV peak
        ii) LV Winding KV peak

    d) Voltage to earth for which start point will be insulated KV rms

20. Efficiency at 75 deg. C at unity power factor
    a) At full load Percent
    b) At 3/4 full load Percent
    c) At 1/2 full load Percent

21. Regulation at full load at 75 deg. C at normal tap
    a) At unity power factor Percent
    b) At 0.8 power factor lagging Percent

22. Equipment for ONAN/ONAF/OFAF cooling
    a) State
        i) Radiators on main tank
        ii) Separate cooler bank
    b) ONAN rating
    c) ONAF rating
    d) OFAF rating

23. Number of coolers or cooler banks per transformer

24. Rating of each cooler or cooler bank

25. Details of ON-LOAD tap changer
    a) Make

b) Type
c) Rating:
   i) Rated voltage

   ii) Rated current
   iii) Step voltage
   iv) No. of steps
d) Control
e) Auxiliary supply details
f) Voltage Control
g) Parallel operation
h) Protective devices
i) Approx. over all weight Kg
j) Approx. over all dimensions mm
k) Approx. overall qty. of oil litres

26. Terminal Arrangement
   a) High Voltage
   b) Low voltage
   c) Neutral

27. Masses (KG)
   a) Bare copper used
      i) For windings
      ii) For leads and connections
   b) Windings
      i) With insulation
      ii) Soaked in oil
   c) Core
      i) CRGO Laminations
      ii) Supporting frame work
   d) Core & winding package
   e) Tank, fittings & accessories
   f) Oil
   g) Total weight (as erected)

28. Approximate quantity of oil required for first filling (Litre)

29. Approximate overall dimensions
   a) Length mm (approx.)
   b) Breadth mm (approx.)
   c) Height mm (approx.)

30. Dispatch details
   a) Approximate mass of heaviest package Kg. (approx.)
   b) Approximate dimensions of largest package

i) Length mm
ii) Breadth mm
iii) Height mm

31. Untanking height mm

32. Thickness of transformer tank (appox.)
a) Sides mm
b) Bottom
mm
c) Top mm

33. Overall dimensions of HT Bushings

34. Working flux density as a percentage of
Knee voltage

35. Percentage of harmonics at normal frequency
percent
and at maximum system voltage

36. Continuous overload in percent percent

37. Maximum current density in winding
at CMR and at any tap
a) HV & Reg. winding Amp/cm^2 (max.)
b) LV winding Amp/cm^2 (max.)

38. Maximum flux density in iron at normal
voltage at Normal Tap & frequency
a) Core) Weber/m^2 (max.)
b) Yoke) Weber/m^2 (max.)
c) Maximum flux density under worst operating conditions Weber/m^2 (max.)
d) Maximum flux density under 31% over voltage for 1 min. Weber/m^2 (max.)
e) Maximum flux density under 44% over voltage for 5 secs. Weber/m^2 (max.)

39. Core
a) Material of core laminations
b) Grade of core material
c) Thickness of core laminations
d) Whether core plates are
cold rolled grain oriented.
e) Insulation of core lamination
f) Details of oil cooling ducts:

i) Whether in the plane & at
right angle to the plane of winding
ii) Across the plane of lamination

40. Type of winding
a) HV winding
i) Main winding
ii) Regulating winding
b) LV winding

41. a) Insulation of HV winding
b) Insulation of LV winding
c) Insulation between LV & HV winding
d) Insulation between HV & regulating winding

e) Insulation between Core & LV winding

42. Maximum out of balance force in winding
on short circuit at terminals

43. Type and detail of winding hot spot temperature
indicator

44. Total volume of conservator for
a) Main tank litres (approx.)
b) OLTC litres(approx.)

45. Volume of conservator between highest & lowest levels for
a) Main tank ltrs. (approx.)
b) OLTC ltrs. (approx.)

46. Type, make & specifications of fan/pump motors

47. a) Temperature rise of motors at full load
b) Efficiency of motors at full load

48. Number of fan motors/pump motors (approx.)

49. a) Period of continuous working at full (approx.)
load without fan
b) Continuous KVA rating without fans/pumps KVA (approx.)
c) Continuous rating without oil pumps KVA (approx.)

50. Time for which transformer can be run at rated KVA in case of failure of all cooling equipments — approx.

51. Resistance per phase at 75 deg. C

	Normal Tap.	Min. Tap.	Max Tap.
a) HV winding			
b) LV winding			

52. Calculated time constants :

a)	Natural Cooling	hours (approx.)
b)	Forced Air Cooling	hours (approx.)
c)	Forced Air & Oil Cooling	hours (approx.)

53. Wave form for impulse test

54. Inter-turn insulation
    a) Extent of extreme end turns
    b) Reinforcement
    c) Extent of end turns reinforcement
    d) Extent of turns adjacent to tappings reinforced

55. Type of axial coil supports:
    a) HV winding
    b) LV winding
    c) Regulating winding

56. Type of radial coil supports:
    a) HV winding
    b) LV winding
    c) Regulating winding

57. Whether HV windings are inter-leaved
    Details of special arrangement (if any) made to improve stress condition

58. Size of cooling ducts

59. Drawing to scale indicating flow of oil in the radial and axial ducts of each limb and winding

60. Withstand pressure of tank

61. Withstand pressure of cooling equipment

62. Buchholz Relay description data

63. Bushings

		HV	LV	LV-N	HV-N
i)	Type of bushing				
ii)	Dry flashover voltage				
iii)	Wet flashover voltage				
iv)	Dry 60-s withstand test voltage				
v)	Wet 30-s withstand test voltage				
vi)	Puncture withstand test voltage				
vii)	Full Wave impulse withstand test voltage 1.2 US wave (Positive)				
viii)	Creepage distance				
ix)	Recommended gap setting				
x)	Weight of assembled bushing				
xi)	Free space required at the top for removal of bushings				
xii)	Short time withstand capacity				

ANNEXURE -'D'

SCHEDULE OF REQUIREMENT :-

Sr. No.	Description of Material	Qty.
1.	112/136/160MVA, 220/66 Oil immersed outdoor type system transformer suitable for 50 C/S supply star-star connection for primary & secondary winding having Vector group Ynyno. HV and LV neutral brought- out for solid grounding. T/F shall have OLTC of BHEL/TELK/ EASUN MR(Formerly HHE)/CGL/CTR make having current rating of 700 Amps. with control voltage of 110V/220V single phase AC with Local/ Remote Control Scheme to take care of primary voltage variation from +5% to -15 % in equal steps having all essential control & indication. Percentage impedance at Principal Tap at 75 Deg. C shall be 15% at 160MVA base, 14.25% at Tap-1 and 17.75% at Tap-17 suitable for parallel operation with T/F of 100 MVA or 160 MVA of similar rating/make and of any other make. T/F shall be dispatched Nitrogen filled/Dry Air filled(without oil) having nitrogen/Dry Air cylinders attached for maintaining N2 Pressure during Transportation. The following extra spares with each Transformer shall form part to the supplies:- 1) Complete Set of Gaskets. 2) Silicagel for one time filling. 3) Sorbent for thermosyphon for one time filling. 4) One Set(2 Nos. Silicagel Breathers) for main tank.	**6 Nos.**
2.	T/F shall be ONAN/ONAF/OFAF Cooling design having two cooler Banks of 50% capacity each, fitted with fans/oil pumps with mothers & standby Fans/Pumps having 50% cooling capacity with minimum one no. standby Fan/Pump in each cooling Bank.	
3.	Transformer oil (Napthanic base) conforming to BS-148/IEC-296/PSTCL specification for first filling of T/F along with 5% extra quantity shall be dispatched directly from sub-suppliers works in non-returnable epoxy coated steel drums.	

SECTION-III

SCHEDULE OF QUOTED PRICES

TENDER ENQUIRY NO. VALIDITY : DAYS FROM THE DATE OF OPENING OF TENDERS

Sr. N0. (1)	Description (2)	HSN Code (3)	NIT Qty. (No./Sets) (4)	Qty Offered (No./Sets) (5)	Unit Ex-Works Price (Rs.) (6)	F&I Charges (Rs.) (7)	Total (Rs.) (8=6+7)	GST @---% (in Rs.) (9)	Unit FOR Destn. Price (Rs.) (10 = 8+ 9)	Price FIRM/ Variable (11)
1.	Main T/F		6 Nos.	___Nos.						VARIABLE as per IEEMA with base date 01.08.17
2.	NIFPES		6 Nos.	__Nos.						FIRM
3.	OPTIONAL SPARES. Each set shall comprise of following items :- a) One no. HV Bushing Assembly b) One no. LV Bushing Assembly c) One no. HV Neutral Bushing Assembly d) One no. LV Neutral Bushing Assembly **Total (a+b+c+d)**		3 sets	____Sets						FIRM

Note:- 1. Rate of GST applicable must be mentioned clearly otherwise maximum rate of GST shall be taken into account for evaluation purpose.

2. The firm indicating NIL or concessional rate of GST will have to absorb the GST upto full rate applicable at the time of tendering. The firm who do not agree to this stipulation or indicate GST as extra without indicating the applicable rates shall be loaded with max. rate of GST.

3. For MAIN Transformer tenderers should quoted only VARIABLE prices as per IEEMA with base date as first working day of the calendar month one month prior to the date of opening i.e. 01.08.17. Firm Prices for main T/F will not be accepted. However for NIFPES and OPTIONAL SPARES only FIRM prices should be quoted.

4. Supervision of erection and commissioning is to be provided free of cost by the supplier as per clause 1.2 of Technical specification (SECTION – II).

5. Comparison of prices of main T/F and NIPFES/Spares shall be done on the composite basis.

   "Composite unit FOR destination price shall be calculated as per following formula for the purpose of caparison of rates:

   Composite unit FOR destination price = unit FOR destination price of Main T/F unit + unit FOR destination price of NIFPES + (FOR destination price of one set of spares x NIT quantity of Spares/NIT quantity of T/Fs)"

6. Tenderers should upload copy of "UNPRICED BID" in Part-II (Techno-Commercial) of their offer.
7. The bidders should not be allowed to indicate over all discount on the quoted price for which split up has been given. However, quantity/payment discount can be given by the tenderer in the main tender (i.e. part II Techno commercial bid). Any firm offering discount of the quoted price or after the opening of tender will be out rightly rejected.

Section-IV

SCHEDULE OF DEVIATIONS FORM COMMERCIAL CLAUSES

All deviations and exceptions in respect of commercial clauses to the tender specification shall be clearly brought out by the tender as per the format given hereunder. The details shall be exhaustive in all respects.

Sr. No	Clause No.	Page no. of Tender Spec.	Exceptions & Deviations from the tender Spec.	Remarks

Certified that the above listed deviations and exceptions are exhaustive and the contract shall be executed as per the tender specifications except for the above deviations and exceptions in the event of placing an order on us.

Date: For M/s

Place Signature
(By its constituted attorney)
Seal

Section-V

SCHEDULE OF TECHNICAL DEVIATIONS

All deviations from technical clauses shall be clearly brought out by the tenderer as per the format given hereunder.

The details shall be exhaustive in all respects.

Sr. No	Clause No.	Page no. of Technical Spec.	Deviations/ Exceptions	Remarks

Certified that the above listed deviations and exceptions are exhaustive and the contract shall be executed as per the tender specifications except for the above deviations and exceptions in the event of placing an order on us.

Date: For M/s

Signature
(By its constituted attorney)
Seal

Section-VI

SCHEDULE OF PAST SUPPLIES

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Sr. No.	Rating	Purchase Order No.	Qty. ordered	To whom Supplied	Date of Supplies as per PO	Actual date of Completion

Note:- Performance Certificate against the supplies made to various Electricity Boards and other utilities shall be supplied from the purchase departments of the concerned Boards & utilities .

Date: For M/s

Place Signature
(By its constituted attorney)
Seal

SECTION-VII

SCHEDULE OF GUARANTEED CHARACTERISTICS OF NEW TRANSFORMER OIL (IN DRUMS)

S. No.	Characteristics	Requirements
1	Appearance	Oil shall be clear & colour less (approx.) & transparent &free from Suspended matter or sediments
2.	Density at 29.5 deg.C(Max.)	: 0.89 g/cm 3
3.	Kinematics viscosity at 20 deg.C (Max.)	: 40 CST
4.	Interfacial tension at 27deg.C (Min)	: 0.04 N/M
5.	Flash point (Min.)	148 deg.C
6.	Pour point(Mix.)	- 30 deg.C
7.	Neutralization value	
	a)Total acidity (Max.)	0.03 mg KOH/g.
	b) Inorganic acidity/ alkalinity	Nil
8.	Corrosive sulphur	Non-corrosive
9.	Electric strength (Break down Voltage) Min.	
	a) New unfiltered oil	30KV (rms) (Min.)
	b) After filtration	If the above value is not obtained the oil shall be filtered.60KV (rms) (Min.)
10	Dielectric dissipation factor (Tan-delta)at 90deg.C	0.002(Max.)
11	SK value (Max.)	0-8%
12	Water content(Max.)	50 PPM
13	Specific resistance (resistively)	12
	a) At 90deg.C (Min.)	150x10 ohm-cm
		12
	b) At 27 deg.C (Min.)	2500x10 ohm-cm
14	Oxidation stability(after Oxidation for 164 Hours @ 100deg.C)	
	a)Neutralist ion value after oxidation (Max.)	0.40 mg KOH/g.
	b) Total sludge after oxidation (Max.)	0.10% by weight
15	Ageing characteristics after Accelerated ageing(open Beaker method with copper Catalyst.) 96 Hours @ 115 deg.C	
	a) Specific resistance(resistively)	12

	i) At 27 deg.C (Min.)	2.5x10 ohm-cm 12
	ii) At 90deg.C (Min.)	0.2x10 ohm-cm
	b) Dielectric dissipation factor (Ten delta) at 90deg.C	0.20 Max.
	c) Total acidity, mg KOH/g	0.05 Max.
	d) Total sludge value percent by weight	0.05 Max.
16	PNA Component analysis	N- More than 46%(Nepthenic) P- Less then 46% (Paraffinic) A- less than 8%(Aromatic)
17	Presence of oxidation Inhibitor	Absent

B) CHARACTERISTICS OF OIL IN THE TRANSFORMERS

The important characteristics of the transformer oil after it is filled in the transformer (after 3 months & within one year of filling) shall be as follows:-

S.No.	Characteristics	Permissible limit Satisfactory for use
1.	Electric strength (Breakdown voltage KV)	60KV/min. (Prior to energi-sation) 40 KV/min. (After energies-ation)
2	Water contents (PPM)	25 PPM (Max.)
3	Specific resistance (Resistively) ohm-cm at 90deg.C	12 20x10 ohm-cm (Min.)
4	Dielectric dissipation factor (Ten Delta) at 90 deg. C	0.01 (Max.)
5	Neutralization value (Total acidity)	0.2 mg KOH/gm (Max.)
6	Sediment and/or perceptible sludge	Absent
7	Flash point	140 deg.C (Min.)
8	Interfacial tension at 27deg.C	0.030 N/m (Min.)

Section-VIII
LISTOF RECOMMENDED VENDORS

S.No.	Item	Recommended- Vendors
1.	Winding-Conductors	a) Bhandari Powerline Pvt. Ltd., Manipal b) Shakti Insulated wires Ltd ***Ankleshwar***. c) Shree Cables, Bhopal. d) Incab, Jamshedpur. e) Delta Conductors, Mumbai. f) KSH International (P) Ltd Mumbai. g) Signet conductor Pvt Ltd.Rawa h) Ken Electricals Ltd.Rawa. i) BCPL Conductors Pvt. Ltd. j) Precision Wires.
2.	Insulating Paper	a) H.Weidman b) Munksio c) Krammerer d) Dupont e) Mitsubishi Japan f) Elof Hansen,Sweden.
3.	Press Board & Press Board Components.	a) H. Weidmann b) ***Fighoem***, Sweden. b) Reman Boards. Ltd., Mysore. c) Senapathy Whitley Ltd., Bangalore.
4.	C.R.G.O. (H.I.B. MOH OR SUPERIOR)	a) Nippon steel corp. Japan. b) Kawasaki Corp. Ltd Japan. c) AK Steel corporation, USA d) POSCO, works Phohang, Korea.
5.	Porcelain Insulators	a) W.S.I. Ltd. b) BHEL c) JAYSHREE d) CJI, Khujra e) IEC f) Modern Insulators g) Luster Ceramics h) Sarvana Insulators
6.	Gaskets	a) TALBROS b) PACKING & JOINTINGS c) SRB Cork Sheets, Vadodara d) Crotica Mfg,(India) Chennal. e) Nu-Cork, Gurgaon.

	f) Bharat Corrub Industries ,Vadodara g) Indian Cork Industries,Delhi
7. Radiators	a) BHEL/TELK b) CTR,Pune c) PE Engineers, Hyderabad. d) Deepti Radiator,Bangalore. e) Hi-Tech Switchgear, Bombay f) TTP,Bangalore. g) Tarang Engineering Pvt Ltd Nagpur h) **Transpares Ltd., Ahmedabad, Gujrat** i) **Trafo Power & Electricals (P) Ltd., Agra**
8. Terminal connectors	a) Milind Engineering Works b) Vinayak & Co. c) M/s Nootan, Bina d) M/s UTSAV, Baroda. e) PEE VEE Engineering, Bangalore.
9.CT's, PT'S	a) BHEL b) Automatic Electric(P) Ltd. c) CGL,Nasik. d) Kappa Electricals. e) Prayog Electricals(P) Ltd. f) Mohindra Elecrical Works,Thane(Mumbai) g) A.V. Electro Machines Allahabad. h) Narayan Power
10.Insulating Oil	a)Raj Petro, Madras/Ankleshwar/**Silvasa**. b) Apar Ltd. c) Savita chemical, Mumbai.
11.WTI, OTI, RTD.	a) Perfect control/Perfect instruments. b) Precimeasure.
12.Magnetic oil Gauge	a) Sukrut udyog, Pune.
13.Valves (Gate/Batterfly)	a) Leader valves. b) Bombay Matal &Alloys Mfg. Ltd. c) AUDCO. d) PETSON Ind./Petson Valves. e) Punjab Metal works, Jalandhar. f) Manikon Industrial Cropn., Agra. g) **Apar Udyog, Jalandhar(AURUM & APAR)**

14.	Bucchhols Relay/ Oil surge relay	a) Instruments & Controls. b) PRAYOG c) ATVUS. d) P & B Weir Electric, UK
15.	Thermal over load Ralays/Contactors.	a) English Electric (GEC A) b) Siemens. c) L&T.
16.	Fuses	a)English Electric(GEC A) b) Siemens.
17.	Miniature Circuit Breakers	a) MDS b) S&S Switchgears. c) L&T. d) Siemens e) Telemechanique. f) Merlin Gerin.
18.	Terminal Blocks	a) Elmex. b) Phoneix. c) Connect Well d) Technoplast e) Essen f) Tosha
19.	Tank Steel	a) Steel Authority of India Ltd. (Tested Steel)
20.	Fans	a) ***Marathon Electric Ltd.*** b) Khaitan Calcutta. c) Areva T&D Kolkata d) EPC Kolkata
21.	Oil Pumps	a) Best & Compton b) CGL c) Flow well Meters & Pumps. d) SPP, UK
22.	Pressure Relief Devices (PRD'S)	a) ATVUS. b) SUKURT.
23.	OLTC. (IN TANK MR DESIGN WITH SEPARATE SELECTOR &	a) ***EASUN MR***(Formerly HHE) b)TELK c) BHEL d) CGL

	DIVERTOR)	e) CTR
24.	Bushing 145KV to245KV 72.5 KV to 145 KV	a) BHEL,TELK,S&S, CGL,WSI, ABB b) TELK, S&S, CGL, WSI, ABB, **Yash High Voltage**
25.	Fabrication of Tank	a) By Self/G.T.V. Gwailor or Bhopal/ MECH.& FAB Bhopal. b) Electromechanical, Bhopal. c) Sangam Structuralas Ltd. Naini (Allahabad) d) Monal Equipment Engineers Pvt. LTd. Baroda. e) MECH MEN, BHOPAL f) M/S Kaushal Equipment Manufacturers Mumbai g) Satyam Industries, Bhopal. h) **Jay Tanks & Vessels, Nashik** i) **Electro Auto Industries, Bhopal** j) **Allahabad Enterprises Pvt. Ltd., Allahabad**
26.	Air cell of Conservator	a) Pronal (France) b) Unirub, Pune. c) Rubber Product, Thane.
27.	NIFPES	***CTR***

Note:- The Material of only above vendors is to be used. However, in case of any of any deviation, Prior approval of TS Design office is required.

Section-IX

Prevision of Inbuilt Complete Nitrogen Injection Fire Prevention Cum Extinguishing System. (CTR make)

Nitrogen Injection System for the protection of Power Transformer against fire due to arc, during internal faults and internal fires have been developed and are available. This system is required to be provided with the 160MVA Transformer for preventing tank explosion.

The system should comprise the following:-

1. **Fire Extinguishing Cubicle** with base frame and containing oil drain assembly, nitrogen cylinder, electro mechanical control unit for oil drain and nitrogen release, detections necessary for monitoring system, flanges on top panel for connecting pipe connections from transformer, panel lighting etc. One spare Nitrogen Cylinder(filled) shall from part of this supply. Inspection window as well as part of cubical door in front of inspection window to be filled with unbreakable glass & wire mesh etc. for checking of oil leakage without opening the cubicle.
2. **Control Box** for monitoring system operation, automatic control and remote operation, with alarms, indication light switched, push buttons, audio signal, suitable for tripping and signaling on ***220V*** DC supply.
3. **Pre-stressed non-return valve (PNRV**) working on transformer oil flow rate, with proximity switch for remote alarm indication and with visual position indicator.
4. Required number of **fire detectors** rated for 141 C for heat sensing, each fitted with two number cable glands. 5 Nos fire detectors shall be provided spare with each system
5. **Signal box.** For terminating cable connections from PNRY and fire detectors.
6. Pressure relief valve with limit switch.
7. Non- corrosives, water proof, epoxy coated (from inside outside) Mild Steel oil tank ***of capacity 10% of total oil in T/F*** to be embedded in ground to store drained out oil.

The following arrangements are required to be made on the transformer tank at the time of fabrication of the tank:-

1. Oil drain opening with pipe, flange and manual gate valve at about 120 mm below the top cover. Pipe size DN80 for transformers below 100MVA and DN125 for 100MVA and higher ratings.
2. Nitrogen Injection openings with pipe size DN25 with flange the manual gate valve on tank sides at about 100-200mm from the bottom plate.

3. Flanges having 4 Mrs. 18 dia. holes with pod as 155mm and dummy pipe on the conservator pipe between buchholz relay and conservator tank manual gate valve for fixing PNRV.
4. Supply and welding of the detector brackets on top cover.
5. Supply and welding of the brackets for fixing signal box at a suitable location on top cover or tank side wall.

The following jobs shall not be within the scope of the supplier.

1. Fire wall civil work
2. Material handling facility for placing F.E. cubicle on plinth.
3. Required electric signals connections to control box except fire detectors and PNRV.
4. Power supply connections for control box as ***220V*** DC or 230V AC.
5. Power supply connection for F.E. cubicle lighting as 230V AC

However all cabling, piping and any other material required shall be supplied by the manufacturer . Installation and Pre- commissioning tests shall be carried by the supplier or his representative prier to commissioning of the system.

Section-X

List of Directors

Name and addresses of the Directors

Sr. No.	Name of Director	Address	Telephone No.	PAN No.

Turn over of the firm for the last 3 years .

Sr.No.	Year	Amount (In Crores)
1		
2		
3		

Date :

Place: Signature of Tenderers
Seal.

SECTION-XI

UNDERTAKING FORM

(TO BE ENTERED ON A NON-JUDICIAL STAMPED PAPER OF RS._____ONLY).

We _____ state that our works are situated in the state of Punjab and we claim "Order Preference" as stipulated in the P.S.T.C.L tender specification No. _____
Due on_____ against which we have submitted out tender No._____
Dt._____.

We undertake to execute the order/contract if placed/awarded on to us even by counter offer at the rates worked out by Punjab State Transmission Corporation Ltd. in accordance with its Purchase Regulations. It is further understood that in the event of refusal by us or failure on our part to execute the order/contract(full or part) placed/awarded on to us under `Order preference' on any account whatsoever, the Punjab State Transmission Corporation Ltd. shall have the right to forfeit the earnest money deposited by us and we shall have no claim for the refund thereof. The Punjab State Transmission Corporation Ltd. shall also have the right to suspend without prejudice to other rights accruing to the Punjab State Transmission Corporation Ltd. under the Purchase Order/ Contract if placed / awarded on to us .

Signature of Constituted Attorney.

SECTION- XII

PROFORMA FOR SELF APPRAISAL/WORKS APPRAISAL

1.	A)	Name of Tendering firm.	
	i)	Complete address of the office.	
	ii)	Telegraphic address:	
	iii)	Telephone Number(S):	
	iv)	Fax No.	
	v)	Name of two responsible Officers with Designation: (Managing	
	B) i)	Director/Partner/Chief Engineer/Works Engineer etc.)	
	ii)	Day on which weekly holiday is observed.	
	C)	Complete address of the works:	
	i)	Telegraphic address:	
	ii)	Telephone Number(S):	
	iii)	Fax No.	
	iv)	Name of two responsible Officers with Designation: (Managing Director/Partner/Chief Engineer/Works Engineer etc.)	
	v)	Day on which weekly holiday is observed.	
	D)	Name, address & telephone numbers of two references having facilities of P&T Telephones.	
	a) i)	Name	b) i) Name
	ii)	Address	ii) Address
	iii)	Telephone No.	i) Telephone No.
2.		Year of Establishment.	
3.		Constitution of the firm.	
	a)	Private or Public Limited	
	b)	Registered under the companies Act or any other Act, give Registration No. & Date.	
4.		Financial Position.	
	i) a	Land (Area & Value)	
	b	Building (Covered Area and Value)	
	c	Plant & Machinery:	
	d	Total drawing Limit from Banks	
	ii)	Annual Financial Turnover (duly audited for the last two years):	
	iii)	Latest Income Tax clearance certificates:	
5.		Man Power:	
	a)	Graduate Engineer (s):	
	b)	Diploma Holder (s):	
	c)	Skilled Workers:	
	d)	Un-Skilled Workers:	
6.		Production capacity per month of the item covered in your quotation	

		and justification for assessment.
	a)	Details of Plant & machinery installed (Please attach separate sheets, if necessary).
	b)	Details of raw material required:
	c)	Source of raw material
	d)	Stock of raw material
	e)	In case, any raw materials are required to be imported, indicate arrangements of its procurement.
	f)	Quality Controls exercised in procurement of raw materials.
7.	a)	Details of manufacturing process:
	b)	Scheme of quality controls:
	i)	During manufacturing process:
	ii)	At the finished stage
	c)	Whether, any record is being maintained in respect of quality controls exercised.
8.		Details of testing facilities available with the firm.
9.		Details of orders executed/under execution during the last three years. Photo copies of Purchase orders of similar material supplied to other state utilities by them to the standard specified in this tender documents must be submitted.
	a)	With PSEB
	b)	Other State Electricity Boards/State Govt./Govt. Of India & other Institutions/undertaking:
	c)	Other important customers.
10.	a)	Whether the item (s) are on Punjab Govt./DGS&D/Central Govt..Approved Rate Contracts (Attach copies of Rate contracts)
	b)	Whether item offered conforms to ISS or any other internationally recognized Standards, if so, give reference:
	c)	Whether the firm is licensed to use ISI Mark of any other Govt. Quality Mark (copies of latest Test Certificates issued by Govt. Laboratories/Any recognized Test House be attached.)

SIGNATURE OF AUTHORISED
SIGNATORY OF THE FIRM
WITH OFFICE STAMP

NOTE:

1. Please attach additional sheets, wherever required.
2. Copies of documents, attached with the Performa should be attested by the firm's authorized stamp mark of the firm.