CHHATTISGARH STATE POWER TRANSMISSION CO. LTD.

(A Govt. of Chhattisgarh undertaking) (A successor Company of CSEB)

OFFICE OF EXECUTIVE DIRECTOR (STORE & PURCHASE)
CHHATTISGARH STATE POWER TRANSMISSION CO. LTD.
DAGANIYA, RAIPUR (C.G.) 492-013

Phone : 0771- 2574240 Fax : 0771- 2574246
Email id- nk.bisen@cspc.co.in

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TENDER SPECIFICATIONS

TR-21/S&P/04

FOR

SUPPLY OF
315 MVA, 400/220/33 KV
AUTO TRANSFORMERS

RFx No-8100022634

LAST DATE & TIME OF SUBMISSION OF TENDER
01.09.2021 (Time 15:00 Hrs.)
DUE DATE OF OPENING OF TENDER
01.09.2021(Time 15:30 Hrs.)

COST OF TENDER :-

i) **Rs.5600.00(Incl.GST@12%, if purchased from O/o ED (S&P)**
ii) **Rs.5900.00(Incl.GST@18%, if downloaded from website)**

TENDER NO TR-21S&P/04

INDEX

TENDER FORM

TR- 21/S&P/04

CHHATTISGARH STATE POWER TRANSMISSION CO. LTD., RAIPUR (C.G.)

Tender document Sl.No TR-21/S&P/04.

ISSUED to M/s ----------

Cost of Tender documents Rs…….

Received vide D.D.No……..dtd……..

Name of Bank ----------

Signature & Seal of Issuing Authority
C.S. Power Transmission Co. Ltd., Raipur

The undersigned hereby tender and offer (subject to CSPTCL's conditions of tendering), the Chhattisgarh State Power Transmission Co. Ltd. to test and supply, plant, machinery, materials, deliver and execute and do the several works and things which are described or referred to in the enclosures & Annexures to the specification **TR-21/S&P/04**, copies of which are annexed hereto and which under the terms thereof are to be supplied, executed and done by the bidder in a thoroughly good and workman like manner, and to perform and observe the provisions and agreements or the part of the contract contained in or reasonably to the inferred from the said tender documents for the sum and at the rates set out in schedules annexed hereto.

It is confirmed that:

(i) Questionnaire for Commercial terms and conditions.

(ii) Questionnaire for Technical specifications of the Equipments, and

(iii) All other conditions wherever described in the tender documents have been replied in full giving clear details. It has been noted that in case any reply is not given or any reply is incomplete / ambiguous, the CSPTCL will have right to take the same to be advantageous for the CSPTCL. CSPTCL's decision in this regard will be final. The bidder will have no right to furnish any technical or commercial clarification after opening of the bid which may in any way alter the offered prices.

Dated, this …… day of …….

Bidder's Signature

Bidder's Address

CHHATTISGARH STATE POWER TRANSMISSION CO. LTD.
(A Govt. of Chhattisgarh undertaking) (A successor Company of CSEB)
CIN- U40108CT2003SGC015820/ GSTIN-22AADCC5773E1ZX
Office of the Executive Director (Stores & Purchase)
Third floor, SLDC Building, CSPTCL
Danganiya, Raipur (CG) 492 013
Ph.No. 0771- 2574236/40 email:-nk.bisen@cspc.co.in Fax- 0771- 2574246

No. 02-16/NIT/TR-21/S&P/04/722 Raipur, dtd. 02.08.2021

NOTICE INVITING TENDER

Sealed tenders are invited from experienced manufacturers for supplying the following equipments/ material.

Sl. No.	Tender No.	Particulars	Qty.	Cost of tender doc. (Rs.)		E.M.D. (Rs.)	Due date
1.	**TR-21/S&P/04** **RFx No-8100022634**	315 MVA, 400/220/33 KV three phase Autotransformers along with oil & accessories	1 No.	5600.00 (incl. GST @12% if purchased from O/o CE (P&P)	5900.00 (incl.GST @18% if downloaded from website)	500000.00	**01.09.2021**

NOTE:- i) In case any of the above dates is declared as holiday then the particular date will automatically get shifted to next working day.
ii) The quantities mentioned above are tentative & may vary according to final requirement.
iii) Any notice for extension of due date of tender opening shall not be published in newspapers. It will be displayed only on official website of the company.
iv) **The tender will be processed through e-bidding module of SAP-SRM. Bidders are advised to visit our website www.cspc.co.in/csptcl for viewing detailed instructions regarding submission of offer through SAP-SRM**.
v) **The NIT shall also be published in www.tarang.website.**

// TERMS AND CONDITIONS //

(i) The tender documents can be obtained from the office of the ED (S&P), CSPTCL, Raipur in person on payment of cost of tender documents in the form of D.D. only made out in the name of 'Manager (RAO:HQ), CSPTCL, Raipur' accompanied with firm's application on its letter head. If tender document is required by post, Rs.250/- is to be paid by D.D. additionally along with the cost of documents. If more than one tender document is required, separate DDs should be furnished for each tender. CSPTCL shall not be responsible for any postal delay in receipt/ non-receipt of tender documents. No receipt of tender shall be issued in any case.

(ii) The tender document can also be downloaded from official website of CSPTCL '**www.cspc.co.in**' (go through Chhattisgarh State Power Transmission Co. Ltd. - Tender Notice) and required tender fee in form of DD in favour of 'Manager (RAO: HQ), CSPTCL, Raipur' payable at Raipur should be submitted along with EMD in envelope containing DD of EMD. The envelope containing DDs of cost of tender document & EMD should be suitably super scribed "DDs containing cost of tender document and EMD". The details of DDs should be mentioned on the outer side of the envelope also. Please note carefully that in absence of aforesaid requisite tender fee, further bid shall not be considered for opening.

(iii) Tender documents and the detailed specification can be obtained on any working day one day prior to the due date. The tenders duly filled in shall be dropped/get dropped in the specified tender box up to 15:00 Hrs. on the due date. Any other means of

delivery shall not be accepted. No receipt of tender shall be issued in any case. The tender box shall be locked/sealed at 15:00 Hrs. on the due date and shall be opened at 15:30 Hrs. on the same date.

(iv) After publication of NIT & before the date of opening of TC Bid, corrigendum/ other information (if any) shall be displayed on our official web only. The bidders are requested to remain in contact with this office or visit our web-site for any development/ clarification/ amendment issued subsequently.

(v) CSPTCL reserves the right to accept or reject any or all the offers, in part or full without assigning any reason whatsoever.

Executive Director (Store & Purchase)
C.S. Power Transmission Co. Ltd., Raipur

Special Instructions to bidders for submission of bid through SAP- SRM module (e-bidding)

The tender specification no. **TR-20/S&P/48,** is to be processed through e-bidding. The bid is to be submitted online as well as offline (hard copy). Details of NIT & Tender Documents are available on our website http://www.cspc.co.in & http://ebidding.cspcl.co.in:50724/irj/portal. The bidder may download the same from the above site. In e-bidding portal, tender documents will be displayed in online tender display at Technical RFx section.

Last date & time of submission of bid in hard copy and also in softcopy is **01.09.2021 upto 3.00 pm** and due date & time of opening of part –I and part-II of the tender is **01.09.2021 at 3.30 pm**.

Important Instructions :-

1 Please note that this tender shall be processed online as well as offline. The bidder has to submit all the documents in hard copy as per tender specifications in four envelopes. Besides above, scanned copy of following documents are to be uploaded in e-bidding portal:-

(a) The scanned copy of DD for tender fee.
(b) The scanned copy of DD for EMD/ EMD exemption.
(c) Schedule V commercial information.
(d) Schedule VI (A) Schedule for commercial deviation.
(e) Schedule VI (B) Schedule for Technical deviation.

It may please be noted that only above mentioned documents are to be uploaded in e-bidding portal and no other document is required to be submitted in e-bidding portal. The bidder shall give reply to following questions regarding above documents in e-bidding portal:-

(i) Whether scanned copy of tender fee DD uploaded. Yes/No

(ii) Whether scanned copy of DD of EMD /EMD Exemption uploaded. Yes/No

(iii) Whether scanned copy of Schedules of Commercial information Yes/No

(iv) Whether scanned copy of Schedules of Commercial deviation Yes/No

(v) Whether scanned copy of Schedules of Technical deviation Yes/No

2 It is not required to upload /attach scanned copy of price bid in Soft/ Hard copy. Only the rates are to be filled in the item tab in e-bid in SAP SRM System (online e-tender). Rates should be quoted online & in specified fields only. Once the rates are filled, the bidders may change their rates up to the due date and time of submission of tender. After due date and time, no change on any ground whatsoever will be accepted.

3 After scrutiny of techno-commercial bid, the price bid will be opened in e-bidding system only of eligible bidders for which suitable intimation will be given to the bidders offline & through email.

4 Please note that e-mail is always system generated, hence bidders are advised to regularly check their inbox/junk mail box.

5 CSPTCL shall not assume any responsibility for non-supporting of system, internet, line & associated hardware & software for bidding their tender. No extension in time shall be granted on such grounds. The bidder should submit their bid well before submission dead line to avoid any system related problem. It is strongly recommended not to wait for submission of bid in last minutes as internet/technical problem may disrupt their works.

6 Reference time for submission dead line shall be the time displayed in the portal and shall be treated as final.

7 After end of submission dead line, no alteration in the tender will be allowed by the system. However, in case of extension of due date of opening of tender, the bidders will be allowed to submit revised bid in the system.

8 CSPTCL will not accept incomplete bid.

9 The bidder must have a valid Digital Signature & SAP SRM User ID. User ID & Password from CSPTCL and Digital Signing Certificate and Digital Encryption Certificate from any recognized digital signature issuing authority are required for participation in any Tender. The bidder shall intimate in advance regarding details of digital signature issuing authority for ensuring the reliability of the same. For User ID and Password for participating in the tender, the bidder shall register on line through e-bidding portal.

10 The e-bidding vendor user manual displayed on website- http://ebidding.cspcl.co.in:50724/irj/portal for the help of the bidders. For any further queries the bidder may contact at Helpline no. 0771-2576672/73 (EITC, CSPDCL, Raipur)

11 The training for bidders will be on every Wednesday from 3.00 pm to 5.00 pm at office premises of Energy Info Tech Center (EITC) at Dangania, Raipur.

12 Tender shall be opened in the scheduled time as notified. If the due date of opening/submission of tender documents is declared a holiday by the Govt. or local administration, it will be automatically shifted to next working day for which no prior intimation shall be given. Tender opening shall be continued on subsequent days, in case the opening of all tenders is not completed on due date because of the technical constraints of system on the day of opening. It may be noted that the due date of opening/time may be altered/ extended if desired by CSPTCL without assigning any reason. However, intimation shall be available on company‘s tender portal/bidders email (if participation shown). The bidders are requested to keep track of the same.

13 Amendment in tender specification will be published on our website as well as in SRM system and the intimation regarding amendment in date extension will be conveyed through system generated e-mail to registered bidders only.

14 Before participating the bidder shall carefully read all the instructions and processes.

15 Tender duly completed in all respects will be accepted online up to due date & time and will be opened on the due date at specified time in the presence of tenderers or their authorized representatives. In case of authorized representative(s) they shall bring the original authorization letter with their signature attested by the bidder.

EXECUTIVE DIRECTOR (S&P)
CSPTCL: RAIPUR

SECTION-I
SPECIAL INSTRUCTIONS TO BIDDERS

1. The due date of submission of tender is **01.09.2021 till 3.00 p.m**. and opening of tender is on same day at 3.30 pm in the O/o ED (S&P), CSPTCL, Raipur.

2. The tender should be dropped in the tender box placed in the office of ED (S&P), CSPTCL, Raipur for this particular tender No. **TR-21/S&P/04 on or before 03.00** pm on due date of tender. In case, the tender is sent through post / courier, it will be responsibility of the bidder to drop/ get dropped the tender in the tender box. Receipt of tenders shall not be given in any case. The tender should be dropped before or up to 3.00 pm on due date of submission. Tender box shall be sealed at 03.00 pm and in no case tenders shall be allowed to be dropped after 03.00 pm.

3. **Earnest Money**:- The Earnest Money in the instant tender is **Rs 5,00,000.00 (Rs. five lacs only)** payable in the form of Demand Draft in favour of 'Manager (RAO: HQ), CSPTCL, Raipur'.

4. The bidding is open to manufacturers only who can provide satisfactory evidence to substantiate this.

5. **Pre qualifying requirements**:-
The bidders should submit documents in support of fulfillment of the pre qualifying requirements for the tender as detailed below:

Sl. No	Particulars	Proposed Pre-qualifying requirements for Instant Tender	Documents to be submitted by Bidder in support of PQR
	A) Technical & Supply Experience Requirements		
1	**Experience**	**1.1) The Bidder having manufacturing unit of Power Transformer in India:-** **a)** The bidder should have manufacturing unit for power transformers of offered or higher rating in India. They should have experience of design and manufacture of offered or higher rating Transformer. **b)** They should have experience of supply of offered or higher rating transformer to Indian central/ state power utilities/ Govt. Organizations of minimum **five years** i.e. the bidder should have supplied transformer with HV side of **400KV** or above & rating of **315 MVA** or higher of his own design and manufacture to	**Self attested** copies of following documents should be submitted: **a)** In support of manufacturing unit, bidder should submit valid NSIC/ DIC, (DIC is applicable for CG state SSI unit) certificate duly **Self attested**. In case firm is not registered with NSIC/ DIC, bidder should furnish **Self attested** copy of factory license issued by industries department of state/ central government for tendered item. **b) Self attested** copy of Material Receipt Certificate (MRC) of the transformer issued by the entities as mentioned in **clause 1.1 (b).** The date of receipt of transformer as mentioned in the MRC shall be treated as actual date of supply. This date should be minimum **five years** prior to date of issue of NIT. In case of

		following Indian Entities for minimum **five years** as on date of issue of NIT:- i) Power utilities owned and controlled by Central or State Govt, **Or** ii) PSUs, **Or** iii) Govt. organizations **OR** **1.2) <u>The bidders who have manufacturing unit in India and are part of parent company located outside India or have valid ongoing collaboration with a manufacturer outside India shall also be treated as qualified provided</u>**: **a)** The parent company located abroad or the Principals in case of valid ongoing collaboration should meet the requirements mentioned above i.e. the parent company / Principals should have minimum experience of **five years (5 years)** of supply of **315MVA** or higher capacity with HV winding of **400KV** or above to following Indian Entities as on date of issue of NIT:- i) Power utilities owned and controlled by Central or State Govt, **Or** ii) PSUs, **Or** iii) Govt. organizations **AND** **b)** The Indian unit should have minimum experience of **three years (3 years)** of supply of **315 MVA** or higher capacity with HV winding of **400KV** or above to following Indian Entities as on date of issue of NIT:- i) Power utilities owned and controlled by Central or State	non-availability of MRC, commissioning certificate / performance certificate should be furnished. In such case, date of commissioning of transformer shall be treated as actual date of supply. **c)** Purchase orders issued by entities mentioned above in clause **1.1 (b)** against MRCs furnished as per **(b)** above. **OR** **Self attested** copy of licensing agreement in support of ongoing collaboration with principals accepting joint and several liabilities under the contract should be furnished. In case of Indian unit being a part of parent company located abroad an undertaking given by parent company accepting joint and several liabilities under the contract should be furnished. Further, following documents should be submitted in addition to the above. (**A). Documents in respect of principals/ parent company:** **(a) Self attested** copy of Material Receipt Certificate (MRC) of the transformer issued by the entities as mentioned at **clause 1.2(a)**. The date of receipt of transformer as mentioned in the MRC shall be treated as actual date of supply. This date should be minimum **five years** prior to date of issue of NIT**.** In case of non-availability of MRC, commissioning certificate / performance certificate should be furnished. In such case, date of commissioning of transformer shall be treated as actual date of supply.

		Govt, **Or** ii) PSUs, **Or** iii) Govt. organizations	**(b) Self attested** copy of purchase orders issued by entities as mentioned at clause **1.2(a)** to parent company/ principals against MRCs furnished as per **A (a)** above. **AND** **(B).Documents in respect of Indian unit:** **(a).Self attested** copy of Material Receipt Certificate (MRC) of the transformer issued by the entities as mentioned at **clause 1.2 (b).** The date of receipt of transformer as mentioned in the MRC shall be treated as actual date of supply. This date should be minimum three years prior to date of issue of NIT. In case of non-availability of MRC, commissioning certificate / performance certificate should be furnished. In such case, date of commissioning of transformer shall be treated as actual date of supply. **(b).Self attested** copy of purchase orders issued by the entities as mentioned at **clause 1.2 (b)** to Indian units of parent company/principals against MRCs furnished as per **B (a)** above.
2	**Performance**	The transformer of offered or higher rating i.e. **315 MVA or higher capacity** with HV winding of **400 KV or above** should be in satisfactory operation for minimum **three years (3 years)** as on the date of issue of NIT in the **aforesaid entities mentioned in clause 1.1(b).** **OR** In case of parent company being located abroad or principals with whom valid ongoing collaboration exists as per clause no. 1.2, the transformer of offered or higher	**Self attested** copies of performance certificate issued by **aforesaid entities mentioned in clause 1.1(b)** in India for satisfactory operation of **315MVA** or higher capacity transf**ormer with HV winding of 400 KV** or higher rating for the required periods should be furnished.

		rating i.e. **315MVA** or higher capacity with HV winding of **400KV** or above supplied by parent company /principals should be in satisfactory operation for minimum **three years (3 years)**in **aforesaid entities mentioned in clause 1.2(a)** as on the date of issue of NIT and that supplied by Indian unit should be in satisfactory operation for minimum **one year (1 year)** as on the date of issue of NIT in **aforesaid entities mentioned in clause 1.2(b).**	
3	**Type Test**	The transformers should be Type Tested as per IS 2026 or IEC 60076. Necessary test documents of previously tested similar or higher rated (both in MVA and voltage class) transformer within **last 5 years** from the date of issue of NIT shall have to be submitted with the bid. The Type tests conducted earlier should have either been conducted in NABL accredited laboratory. **OR** Type tests should have been conducted with test instruments calibrated by NABL accredited laboratory & witnessed by the representative(s) of CSPTCL or central/ state power utility. The type test reports, which could not be re-validated due to lock down since 23/03/2020, shall be treated as valid upto 30/09/2021 as per CEA's circular no. CEA-PS-80/1/2019-PSETD Division Part (2)/564-640.	**Self attested** copy of type test report shall be furnished by the bidder.
4	**Plant & machinery and testing facility**	The bidder should have adequate plant & machinery for manufacturing of **315 MVA** or higher rating transformers. Further, test facilities for carrying out all routine & type tests as per latest version of IS:2026 (Part-III) should be available in house with the manufacturer.	The list of plant & machinery and testing equipments should be furnished. Further, an undertaking should be given by the bidder that the list of plant and machinery is adequate and correct and in case any of the statement given is found to be incorrect, even at a later stage the tender shall be liable for rejection.

	B) Financial & Commercial Requirement:-		
5	**Financial Capability**	**1.1**The bidder should have Minimum Average Annual Turn Over (MAAT) for best three financial years out of last five financial years i.e. **2015-16, 2016-17, 2017-2018 , 2018-2019 & 2019-20** of **Rs. 26.00 Cr. (Rs. Twenty Six Crore only).** In case bidder is a holding company, MAAT shall be that of holding company only (i.e. excluding its subsidiary / group companies). In case bidder is a subsidiary of a holding company, the MAAT shall be of subsidiary company only (excluding its holding company).	Statement of annual turnover (as per annexure of the tender), audited balance sheets and profit & loss statement duly certified by Chartered Accountant. The audited balance sheets furnished should be for last five financial years **(i.e. F.Y 2015-16 , 2016-17 , 2017-2018, 2018-2019 & 2019-20).**
		1.2 Net worth of bidder for last three financial years i.e .**2017-2018 ,2018-2019 & 2019-20** should be positive. Net worth means the sum total of paid-up capital and free reserves (excluding reserves created out of revaluation) reduced by aggregate value of accumulated losses (including debit balance in profit and loss account for current year) and intangible assets.	**A** statement showing 'Net worth' including assets and liability of the bidder duly certified by chartered accountant for the last three financial years (i.e F.Y. **2017-2018 ,2018-2019 & 2019-20**) along with audited balance sheet of these years shall be furnished.
6	**Payment Obligation/Default Payment**	**1.3 The bidder shall submit Certificates (in original) from CA stating that,** a. All payment obligations (principal/interest) on outstanding debentures have been discharged and no such payment as on **30.06.2021** is outstanding /overdue. b. The Bidder is presently not in default in payment of any bank loan or interest thereon for more than three months or any loan account of the bidder has not been classified as NPA (Non performing assets) by the	Original certificate issued by CA as per clause 6

		creditor/ leading bank as on date of issue of NIT.	
	C) Other Requirements		
7	**Debar /Black listed statement**	**1.1** The bidder should not be debarred/black-listed by Bank / State Govt. / Central Govt./ State PSU/CPSU/SEB/Public utility as on the date of issue of NIT**.** However, the bid may not be considered for further processing in following cases also:- a. If, bidder is debarred/black-listed by Bank / State Govt. / Central Govt./ State PSU/CPSU/SEB/Public utility up to date of opening of price bid of the instant tender. b. If a case comes to notice regarding submission of forged/fake document in any other tender under process in CSPTCL up to date of opening of price bid of the instant tender.	A declaration in this regard shall be furnished by the bidder
8	**Settlement of Dues**	**1.2** "Any sums of money due to CSPTCL on the date of opening of tender should have been paid/settled in full prior to the date of opening of tender. Price bids of bidders not complying with the requirement shall not be opened."	A declaration in this regard shall be furnished by the bidder.
9	**Integrity Pact**	**1.3** The bidder shall have to submit pre-contract integrity pact in the format enclosed as **SCHEDULE XV** on non-judicial stamp paper worth **Rs.300/-** duly signed by the bidder along with the Techno-Commercial bid. The validity of this integrity pact shall be from the date of its signing and extended up to 02 years or the complete execution of the order to the satisfaction of both the Buyer and the Bidder/Seller, whichever is later. In case Bidder is unsuccessful, this Integrity Pact shall expire after six months from the date of its signing.	The bidder shall have to submit pre-contract integrity pact in the format enclosed as per **SCHEDULE XV**
10	**False Statement**	**1.4** All the documents/ statements/ attachments/ information submitted	A declaration in this regard shall be furnished by the bidder

		by the bidder in proof of the qualifying requirements must be authentic / genuine'/ correct and in case, any of the said documents/ statement / attachments/information are found to be false / fake / misleading the bidder will be disqualified and action will be taken against the bidder as per relevant provisions of the tender.	

Note: i) All the documents/ statements/ attachments/ information submitted by the bidder in proof of the qualifying requirement must be authentic / genuine / correct and in case, any of the said document / statement/ attachments/ information are found to be false/ fake/ misleading, the bidder will be disqualified and action as per provision of tender and pre integrity pact shall be taken against bidder by CSPTCL.

6. **Type test certificates**: The self attested copies of type test certificates of offered or higher rating transformer as per latest version of IS:2026 (Part-I & III) shall be submitted along with the tender. Further, copies of all the routine tests should also be submitted along with the tender. The test reports shall not be more than **five years** old from the date of issue of NIT.

7. The offfered prices should be variable as per IEEMA price variation formula as per circular enclosed in Annexure-I of this specifications with base indices as issued by IEEMA in its circular one month prior to the due date of opening of **TC bid i.e. 01.09.2021**. In case of any extension of due date the base date for working out the price variation shall be calculated as per the original due date only. In case IEEMA issues revised P.V. formula for the Power Transformers covered under the instant tender within contractual delivery period of particular transformer, the price variation shall be payable as per revised IEEMA PV Formula and guidelines issued by IEEMA in this regard. If delivery of material gets delayed beyond contractual delivery period, price variation claimed shall be governed as detailed in **clause-4.3.1, page-19** of section-I of this specifications.

8. **It is not required to upload /attach scanned copy of price in soft/hard copy. Only the rates are to be filled in the item tab in e-bid in SAP SRM System (online e-bidding portal). The prices should be quoted through SAP SRM system should indicating unit ex-works price inclusive of packing & forwarding charges, GST, freight charges & any other charges should be quoted separately. The freight shall be on FIRM basis irrespective of whether the ex-works prices are firm or variable. The total F.O.R. destination price should be quoted in the relevant column**.
PRICE BID has to be filled in prescribed format only as per Schedule-II (A) & indicating ex-works price including packing and forwarding charges. GST, any other charges & freight charges should be quoted separately in the E-Bidding portal. The total F.O.R. destination price should also be quoted in relevant col. in schedule-II (A). The freight & testing charges should be on FIRM basis. The rates erection, testing & commissioning should be offered in schedule-II (B) and filled in **E-Bidding portal**.

9. The rates quoted in the price bid format in **E-Bidding portal** shall be taken as final for computing the competitive rates and for all purpose.

10. The tender offers of those bidders, who do not agree to CSPTCL's payments terms, security deposit clause, penalty clause, performance guarantee clause shall be liable for rejection.

11. The tender document shall be available for sale in the Office of ED (S&P), CSPTCL, Raipur on payment of the cost of tender document through demand draft payment on all working days up to one day prior to the due date of opening. The tender document shall also be displayed in CSPTCL's **website i.e. www.cspc.co.in/csptcl/ tender notices/ store and purchase** bidders may download the tenders from the website directly. In such case, the payment of cost of tender document shall be made through demand draft along with the tender. The details are given in **clause-5 of Section-I** (General Instruction to bidders).

12. **The bidder should ensure following points in order to avoid rejection of tender**:-

i) **DD towards EMD OR proof of exemption valid on due date of opening , self attested (i.e copies attested by authorized signatory of the tender) is to be submitted in envelope –I**. Please note that in case of exemption claimed from EMD by the SSI units registered under NSIC/ DIC, the copy of certificate issued by concerned authority along with enclosures, in which name of materials for which certificate has been issued should also be furnished. The name of material under tender should appear in this list. Further, the copy of certificate (each page) should be self attested. In case of non compliance of above instructions, tender shall be liable for rejection. **The bidder should furnish valid GST registration number and certificate along with EM**D. **In absence of GST registration the offer shall not be accepted.**

ii) DD toward tender document cost, in case tender has been downloaded from our website, is also to be placed inside envelope-I . In case of non compliance of above instructions tender shall be liable for rejection.

iii) Techno-Commercial Bid is to be submitted inside envelope II

13. **Change of quantity:**
The tendered quantity is tentative. The CSPTCL reserves the right to vary the quantity of tendered item as per availability of sanctioned estimates/ final requirement. No correspondence shall be entered into regarding quantity variation.

14. The CSPTCL reserves the right to reject any or all tenders or accept any tender in full or part, considered advantageous to the CSPTCL, whether, it is lowest or not without assigning any reason whatsoever.

15. Tenders being submitted must be signed by a person holding a **Power of attorney** authorising him to do so. The self attested copy of power of attorney should be furnished. Tenders submitted on behalf of company registered under Indian Companies Act shall be signed by persons duly authorised to submit the tender on behalf of the company and shall be accompanied by self attested copy of resolution / abstract of Article of Association/ special or general power of attorney.

16. **'EXTREMELY IMPORTANT'-** ***Bidders to note this to avoid rejection***

i) Attention of bidder is drawn to the fact that all the documents required as tender are submitted alongwith bid or before due date of tender. The

submission date is cutoff date submission of all the document required as per tender and every bidder must adhere to this deadline. However , if any short coming is observed during Scrutiny of TC Bid , CSPTCL reserve the right to seek request clarification /documents from bidder giving them only one chance to such required documents/ clarifications confirmations within specified time limit.

ii) It may also be noted that if a bidder has quoted 'NIL' deviation (Schedule VI-A & Schedule VI-B) in the bid, this will have an overriding effect on any other conditions noted as deviations elsewhere in the bid and no correspondence will be made to withdraw such specific contradictory conditions".

17. CHECK – LIST:-

The check list (Schedule-XVIII) in respect of various schedules etc is required to be submitted by the bidder without which the tender will be considered incomplete and liable for rejection. The bidder should submit all schedule duly filled in along with this offer

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GENERAL INSTRUCTIONS TO BIDDERS

1. **Scope:**
The subject tender specifications covers supply of **1 No. 3 phase 315MVA, 400/220/33 KV Autotransformer**. The details of scope have been described in Section-II "Technical Specifications of the Tender Document".

2.1 **Acceptance of offers:**
While the tenderers may make all out efforts to offer for the complete scope of tender, they may please note that the Company reserves the right to split the tender into different lots towards supply.

Bidders are advised to go through the contents of specific requirement for standard conditions very carefully and in absence of non-compliance/lapse, responsibility for the same will rest on bidders.

2.2 CSPTCL reserves the right to place order on L-1 Bidder.

3. Bidders are requested to go through our technical requirement carefully and it may be noted that furnishing of all information as required in various schedules enclosed is a must. In case any of the schedule, duly filled in, is not found furnished as required in the Schedules / Annexures, the tender will be treated as incomplete, and will be liable for rejection without any correspondence by CSPTCL.

3.1. **Extension order:**
The CSPTCL reserves the right to place extension order for supply of 50% additional quantity of material/ equipments with associated accessories within six months from date of order and accordingly offered prices should be taken into account for these requirements.
For procurement of singular quantity of material/equipments the extension order clause shall be applicable for 100% additional quantity.

3.2**. Price Reduction clause**:
In case a fresh tender for the same item is issued prior to completion of supply against the extension order and lower rates are received in the fresh tender, the lower rates received in the fresh tender shall be applicable to quantity of extension order balance to be supplied.

4. **Offers:**
The offer for equipments/ materials are required to be submitted in duplicate in separate sealed envelopes for which following details may be noted:-

4.1 Part-I – EARNEST MONEY DEPOSIT:
Please note that techno-commercial bid of tender will not be opened if earnest money is not deposited in form of demand draft for the value mentioned in tender clause No. 4 of "SPECIAL INSTRUCTIONS TO BIDDERS" in the tender, unless exempted by the CSPTCL.

The following are exempted from payment of EMD:-

i) SSI units of Chhattisgarh state permanently registered with DIC. The registration should be permanent & should be specifically for the items quoted in the tender & valid on the date of opening of tender. Self attested copy of certificate should be submitted.

ii) Small scale units registered with NSIC: - In case of small scale units registered with NSIC, their registration certificates should be valid for the item under tender on due date of opening of Techno-commercial bid. In case the certificate is not valid on due date of opening the tender shall be liable for rejection. *Incomplete certificate should not be submitted. The list of items for which certificate is valid*

should also be furnished and name of item under tender should appear in this list failing which tender shall be liable for rejection.

iii) Fully owned State Govt /Central Govt. Units, if 100% shares are held by the state Govt. Concerned for which documentary evidence duly notarised must be furnished with offer.

iv) Self attested photocopy of the NSIC/ SSI registration certificate for the tendered item should be furnished with the offer. In case of not having self attested photocopy, the original certificate should be produced at the time of opening for verification failing which their offer will be liable for rejection.

v) The Bidders who come under any of above category must produce documentary evidence failing which offer shall be rejected.

The photocopy of valid NSIC certificate should be self attested by authorized signatory failing which tender shall be liable for rejection.

vi) The valid GST registration number and certificate alongwith EMD should be furnished. In absence of GST registration the offer shall not be accepted.

In case the bidder withdraws his offer during the validity period or after placement of order, the Earnest Money shall be forfeited. EMD of unsuccessful bidders shall be returned on placement of order. EMD of bidder on whom order is placed shall be returned on acceptance of security deposit. No interest shall be paid on the EMD amount.

4.2 **Part-II (A) Pre qualifying requirements:**

All documents in support of pre qualifying requirement as narrated in clause-5.0 of "Special instructions to bidders" along with duly filled and self attested Integrity Pact as per **schedule-XV** should be furnished.

Part- II(B) Technical Bid:

a) In this part of bid, bidder will have to furnish confirmation in regard to all our Technical requirements. The bid should clearly describe various technical particulars, as per details given in this specification. Also along with above information all details required in various schedules should be furnished so that the purchaser may be able to examine whether the offer submitted is technically acceptable or not. Schedule-I, VI B, VII, VIII, IX, X, XI, XII, XIII , XIV & XV and un-priced schedules II(A) & II(B) should be submitted duly filled with this part.

b) **Completeness of equipment & bought out items:**

The bidders must furnish the following information along with technical bid:

i) The responsibility for obtaining timely supplies of bought out items will rest on the bidder and only on this basis, delivery period will be offered in the tender. In case of delay in any accessory, the delivery of last accessory in good condition shall be treated as date of delivery for all contractual purposes.

ii) It may be noted in the case of damages / shortages due to improper packing or any other negligence, replacement shall be arranged within one month's time. If this is not done, date of delivery of such accessory will be treated as date of delivery of main equipment and full penalty should be recoverable from the bidder on total cost of the material.

iii) For bought out items, responsibility for guarantee and obtaining immediate replacement in case any defects are noticed and in case defective supply of any item is reported will rest on the bidder.

iv) In case for attending to defect in any equipment or inspection / replacement of the equipment, which may be bought out item for the

bidder; services of engineer of original manufacturer is required, the same will be organized on immediate basis by the bidder at his cost.

c) It would be obligatory on the part of tenderer to enclose a schedule of Technical deviation in **Schedule VI B** in case there are any deviations from our technical requirement. **Even if no deviations are involved a separate schedule of deviation for technical particulars should be enclosed wherein a certificate may be recorded that there are no deviations from all our technical requirements**. In the event of non-compliance of this instruction, it may be noted that the CSPTCL reserves the right to reject all such offers without assigning any reason or without making any correspondence for obtaining any clarification.

It may also be noted that if a bidder has quoted 'NIL' deviation (Schedule VI-A & Schedule VI-B) in the bid, this will have an overriding effect on any other conditions noted as deviations elsewhere in the bid and no correspondence will be made to withdraw such specific contradictory conditions".

4.3 Part - II (C): Commercial bid:

This bid should clearly spell confirmation in regard to various commercial terms and conditions for supply and questionnaire for commercial terms and conditions for supply duly filled in relevant schedules form part of commercial bid. The bidder therefore should furnish all information clearly. Schedule-III, IV, V & VIA should be submitted with this part.

It may please be noted that it is obligatory on the part of bidder to comply with all our commercial terms and conditions. In particular, specific confirmation towards acceptance of following commercial terms and conditions should be furnished in the tender.

4.3.1 **a) Prices:**

The prices of transformer, type tests and erection, testing & commissioning should be submitted in schedule-II(A) & II(B) in the E-Bidding portal. The prices offered should be valid for 180 days from due date of tender in Indian Rupees only. The offered prices should be variable as per IEEMA formula indicated in **Annexure-I** with base indices as issued by IEEMA in its circular one month prior to the due date of opening i.e. **base date shall be 01.08.2021**. In case IEEMA issues revised P.V. formula for the Power Transformers covered under the instant tender within contractual delivery period of particular transformer, the price variation shall be payable as per revised IEEMA PV Formula and guidelines issued by IEEMA in this regard. In case of any extension of due date the base date for working out the price variation shall be as per the original due date. The validity of offer shall be counted from the extended due date on which TC bid has been opened. The payment shall be initially done on the basis of base rates offered by the bidder subject to price adjustment to reflect changes in cost.

i) For calculation of price adjustment date of readiness of material for inspection at the works of the manufacturer shall be taken as date of delivery provided material is received in Area Stores within 45 days from date of issue of dispatch instructions failing which actual date of receipt of materials shall be treated as date of delivery.

ii) In case of delay in supply beyond contractual delivery, price variation up to scheduled delivery date or actual date of delivery, whichever is advantageous to CSPTCL, shall be considered.

iii) The bidder shall submit price adjustment invoices for supplies positively within three months from date of supply whether positive or negative. **However, price variation bills submitted after 06 months from the date of supply will not be entertained, but negative variation will be recoverable**. The invoices should be supported with calculation of price variation along with documentary evidence of applicable indices. If price

adjustment works out to be positive, the same is payable to bidder by CSPTCL and if it works out to be negative, the same shall be recovered from the bidder. The price variation bills should be submitted to Manager (Bills) O/o ED (Finance), CSPTCL, Raipur.

iv) The prices should be quoted in the proforma given in schedule-II (A) indicating unit ex-works price inclusive of packing & forwarding charges. The freight charges offered should be FIRM.

(b) Taxes & duties:

The prices given in schedule-II (A) should indicate unit ex-works price inclusive of packing & forwarding charges and freights charges inclusive of insurance. Applicable GST should be quoted separately in the relevant columns.

The rates for Erection, Testing & Commissioning (ETC) works of the transformer should be offered in schedule-II(B) on FIRM basis by the bidder. Applicable GST should be quoted separately in the relevant columns.

However, it will be the sole discretion of CSPTCL to get the work of ETC done through the bidder OR departmentally.

It may please be noted that any upward variation in tax rate shall be permitted within contractual delivery period. In case supplies against the contract are affected late i.e. beyond contractual delivery period and rate of tax undergoes upward revision the payment will continue to be made only on the basis of rates prevailing during the contractual delivery period. However, in case the rate of statutory levies undergoes downwards revision then the delayed supplies beyond contractual delivery period will be on actual.

(c) Transport charges: -

Freight charges should be offered for each transformer on FIRM basis. In this connection, it may be noted that the transformers will have to be delivered only by road transport i.e. directly by road trailer at the concerned EHV substations anywhere in the State of Chhattisgarh. Thus, in regard to offering of freight charges, the following should be noted carefully.

Average freight charges for delivery by road trailer on FIRM basis only should be offered for each transformer. The freight charges should include the cost of loading of transformer at the works and unloading of transformer at site. In case plinth is ready at site when transformer reaches there, the transformer has to be placed on plinth other wise at a location earmarked by the Engineer-in-charge.

(d) Escort:

It is obligatory on the part of the bidder to include free escorts services during transport of transformer.

(e) Price for imported components: -

It may be noted that if any imported components or accessory is utilized for manufacture of the power transformer, CSPTCL will not agree for any separate price variation on the cost of imported component.

4.3.2 **Terms of payment:**

95% payment along with all taxes and duties shall be made on production of necessary documents along with material receipt certificate (MRC) from our consignee within 30 days time. Balance 5% cost of transformer shall be paid after successful commissioning of transformer. The instructions for payment of balance 5% shall be issued by order placing authority on the basis of OIC's report regarding successful commissioning of transformer along with all accessories.

However, if in case of any individual transformer, CSPTCL decides to carry out the work of erection, testing & commissioning departmentally, then 100% payment along with all taxes and duties shall be made on production of necessary documents along with MRC from our consignee within reasonable time.

The supplier should submit original material receipt certificate issued by the Area Stores along with copies of bill and other necessary documents to Dy. General Manager (Bills), CSPTCL, Raipur for arranging payment.

4.3.3 **Delivery period:**

The delivery should commence in **Seven** months from the date of order .

The time for and date of delivery of the stores stipulated in the order shall be deemed to be the essence of the contract. In case of delay in execution of the order, the CSPTCL shall either:-

i) Recover from the supplier as agreed Penalty / liquidated damages at the rate mentioned in "Penalty" clause.

ii) Cancel the contract and purchase elsewhere on account and at the risk of the supplier, the stores not delivered.

4.3.4 **Liquidated Damages:**

The time for and the date of delivery of the material stipulated in the order shall be deemed the essence of the contract. In case of delay in execution or non-execution of the order, the CSPTCL at its option shall recover from the supplier/bidder as agreed towards liquidated damages a sum of ½ % of the **basic price excluding taxes of any store not delivered per week or part thereof up to a maximum of 10% of contract value excluding taxes.**

For this purpose date of offer **(date of readiness of material for inspection shall be treated as date of offer)** for inspection of material in the O/o ED (S&P) shall be considered as the date of delivery subject to condition that:-

i) The intimation of readiness of material in respect of each lot should be made atleast 15 days in advance from the scheduled date of completion of supply.

ii) Material should be delivered at stores within 45 days from issue of dispatch clearance. Please note that in case material is not received within 45 days from date of issue of dispatch instructions even though the delivery period exists liquidated damages shall be imposed on delay of dispatch.

The inspection offer, apart from postal/courier service shall be invariably **Faxed/E-mailed** to the ED (S&P) so that ambiguity does not arises for date of offer. In case the inspection offer is not received in the O/o ED (S&P) through Fax/E-mail the date of receipt of offer letter shall be taken as date of offer for inspection.

4.3.5 **Guarantee period:**

4.3.5.1 The transformers supplied shall be guaranteed for satisfactory performance for a period of 48 months from the date of receipt of the transformer along with all accessories at destination site in good condition or 42 months from the date of satisfactory commissioning of transformer along with all accessories, whichever is earlier. The transformer found defective / failed within the above guarantee period shall be replaced/ repaired by the bidder, free of cost to CSPTCL, within four months from date of issue of intimation letter to the manufacturer by CSPTCL regarding defect/failure.

If the bidder fails to repair /replace the failed/ defective transformer within four months, they will be liable to pay penalty charges for delayed repairs at the rate of 0.5% of the cost of transformer per week of delay or part thereof, subject to a maximum ceiling of 10% of the cost of the transformer. This penalty shall be in addition to the penalty for delay in supply of transformer as per clause-4.3.4.

If the defective/ failed transformer is not lifted for replacement/ repairing within 2 months from the date of intimation by CSPTCL regarding defect/ failure OR one month from date of acceptance of Indemnity Bond submitted by the manufacturer, whichever is later.

OR

not repaired within **seven** months from date of lifting of failed/ defective transformer, penal action may be taken which will include forfeiture of security deposit and debarring of the firm from future business with CSPTCL for a period as decided by CSPTCL in addition to the applicable penalty.

The above provisions shall be applicable for second time failure also, if any.

4.3.5.2 **Extended guarantee period post repairs:**

Further, the following extended guarantee shall be applicable in case the transformer fails within guarantee period.

a). **First time failure within guarantee period**:

i) If the transformer fails within 12 months from the initial commissioning, the guarantee period shall get extended to 48 months from the date of receipt of the transformer after its repair along with all accessories at destination site in good condition or 42 months from the date of satisfactory re-commissioning of transformer after repairs along with all accessories, whichever is earlier.

ii) If the transformer fails after 12 months within the original guarantee period, the original guarantee period shall get extended for a period equal to the time period lapsed between date of failure to date of re-commissioning after repairs i.e. the residual guarantee period or 12 months from date of re-commissioning after repairs, whichever is later.

b). **Second time failure of transformer within guarantee period**:

If the transformer fails again (second time) within the original/ extended guarantee period, the guarantee shall automatically get extended for further period of two years from the date of re-commissioning (post repair) or from the end of the original / previously extended period, whichever is later. Further, the bidder shall be required to submit an additional security deposit worth 10% amount of total FOR destination price of the transformer with validity up to expiry of extended guarantee period plus six months additional claim period. This security deposit shall be in addition to the Security deposit of 10% against supply as per clause 4.3.6.

c) **Third time failure of transformer within guarantee period:**

If the transformer fails within guarantee/extended guarantee period for third time, this will be treated as adverse performance of manufacturer and in such case penal action shall be taken which will include

(i) Forfeiture of 10% Security deposit against supply

(ii) Forfeiture of 10% additional Security deposit submitted subsequent to second time failure.

(iii) Debarring of the firm from future business with CSPTCL for a period as decided by CSPTCL.

If for the purpose of replacement / repairs, the equipment / material is required to be dispatched to bidder’s works, all charges towards transportation / insurance / packing / forwarding will have to be paid by bidder for to and fro dispatches.

In this connection, please note that the following additional conditions will also be applicable in case any damages / defects are noticed in the equipments or its accessories supplied by bidder.

If the material develops defect within guarantee/extended guarantee period after installation at site or subsequent to installation after repairs (1^{st} or 2^{nd} time), for the purpose of replacement / repairs, the same will have to be dismantled and taken out by CSPTCL, in such cases actual cost of dismantling and replacement of the equipment / material will also be recoverable from bidder.

In case, transformer fails during guarantee / extended guarantee period, the following terms shall also be applicable (in first or second time failure both):

(i) An Indemnity Bond on stamp paper of Rs.250.00 shall be required to be submitted by the bidder, in case the transformer is required to be taken back to the works for repairing. The value of Indemnity Bond shall be equal to the cost of transformer along with all taxes, duties, freight and testing charges. The transformer shall be handed over for repairing only after submission and acceptance of indemnity bond.

(iii) The transformer should be offered for inspection after completion of repairing work. The repaired Transformer shall be tested for all routine, additional routine, type and special test as per IS-2026 as narrated in clause-6 section-II and annexure-XI of the tender specification.

(iv) The Transformer should be offered for inspection after repairing within four months from date of intimation of failure by CSPTCL.

(v) The dispatch instructions shall be issued for repair transformer after its satisfactory inspection. The transformer should reach the destination (any where in C.G. state) within 45 days from date of issue of dispatch instruction failing which actual date of receipt of repaired transformer at site shall be treated as date of delivery of the repaired transformer for all contractual purposes.

(vi) In case of failure / defect in transformer (first or second time) within guarantee / extended guarantee period, the validity of security deposit submitted by the bidder against supply as per clause-4.3.6 should be extended up to expiry of extended guarantee period with additional claim period of six months. In case, bidder fails to extend the guarantee period, claim shall lodged with the issuing bank for encashment of the security deposit bank guarantee.

4.3.6 **Security deposit:**

The supplier has to submit the security deposit in form of Demand Draft / Bank Guarantee for value of order as indicated below to cover performance guarantee period for supply of equipments covered in this specification.

(i) All the outside state units shall be required to pay security deposit @10% of order value (i.e. Total FOR destination amount along with testing charges).

(ii) The SSI units of CG having annual business with the CSPTCL above Rs.50.00 Lacs shall be required to pay Security deposit @7.5% of the value of order, subject to maximum of Rs.10.00 lacs.

(iii) In case of SSI units of CG whose annual business with CSPTCL is up to Rs.50.00 Lacs, they will be required to pay Security deposit @5% of the value of order subject to maximum of Rs.20,000/- (Twenty Thousand Only).

This bank guarantee shall be submitted within 30 days from the date of dispatch of order and shall be kept valid for guarantee period with an additional claim period of six months. In case of delay in supply or failure of transformer within

guarantee / extended guarantee period, the validity of the security deposit shall be extended accordingly. The bank guarantee shall be submitted on stamp paper worth Rs. 250/- or as per the prevailing legal requirements/ any other amount as per the C.G. State Stamp Duty Act and shall be from a Nationalized/ Scheduled Bank in the prescribed form of CSPTCL. No interest shall be paid by CSPTCL on the security deposit. In case of non-fulfillment of contractual obligations by the supplier the security deposit shall be forfeited.

The bidders who have been exempted from submission of security deposit by erstwhile CSEB/CSPTCL shall have to submit copy of letter regarding exemption of security deposit along with the bid.

4.3.7 **Transit insurance:**

The responsibility of safe delivery of power transformers at destination shall rest with bidder. Therefore, to cover the risk during transit, the transit insurance may be arranged at bidder's cost. A trailor of adequate capacity is to be arranged by bidder through a duly registered transport agency with experienced driver along with suitable escort for safe delivery of transformers. It will be the responsibility of bidder to ensure proper packing so that there is no damage to the transformers and its accessories during transportation. Any loss or damage caused to the material during transit due to negligence on the part of supplier shall be made good by the supplier free of all charges within one month from the date of intimation by our consignee to this effect. The intimation will be sent within thirty days of receipt of Transformer and its accessories at site.

4.3.8 **Deviations:**

It would be obligatory on the part of the bidder to enclose a separate schedule of deviation, if there are any deviations from our commercial terms / conditions. Even if no deviations are involved, a separate schedule of deviation for commercial conditions should be enclosed wherein a certificate may be recorded that there are no deviations from all our commercial conditions. All tenders, wherein these conditions are not complied with, may run the risk of rejection without any correspondence from our side.

4.3.9 **Unsatisfactory performance:**

The bidder who has supplied material earlier in CSPTCL and which has been found to be defective/ not rendering satisfactory service within guarantee period and has not been replaced in the stipulated period shall not be considered for opening of price bid. (The cases reported as on date of NIT shall be taken).

4.4 **Part-III Price bid:**

Price bid shall include submission of details of **variable** prices for supply of transformer as per Schedule–II (A)**. Only the rates are to be filled in the item tab in e-bid in SAP SRM System (online e- bidding portal). The prices should be quoted through SAP SRM system should indicating unit ex-works price inclusive of packing & forwarding charges, GST, freight charges & any other charges should be quoted separately** .Price variation formula given in **Annexure-I** is only acceptable. Prices quoted with PV based on any other formula shall not be considered. No other information should be furnished in the price bid since the same will be opened at a later date. It may be mentioned that no any condition should be recorded in the price bid which may not be in conformity with details furnished in commercial or technical bids, in case of any discrepancy is found suitable loading on prices will be considered for which responsibility will rest on the bidder. It may please be noted that prices should be offered strictly as per format indicated in **schedule-II**. No addition/ alteration in the format of **schedule-II** should be done. The rates for erection testing & commissioning of transformer should be quoted in **schedule-II(B).**

5. Submission of offers:

The Bidders should submit their bids in three envelopes as under:-

(i) Envelope - I (To contain Part-I of the tender document)

This envelope should contain a covering letter with earnest money or earnest money exemption certificate as detailed in **clause (4.1).** The cover of the envelope should be suitably super scribed with the details of earnest money and tender number. The envelope should be sealed properly. **The bidder should furnish valid GST registration number & certificate alongwith EMD. In absence of GST registration the offer shall not be accepted.**

In case the tender document is downloaded from CSPTCL's Website the required cost of tender document in the form of MICR DD drawn in favour of Manager (RAO-HQ), CSPTCL, Raipur should also be kept inside this Envelope.

Please note that the tender shall be liable for rejection if

i) EMD as per tender specification / proof in support of exemption of EMD as per clause 4.1 of part –I is not found inside the envelope.

ii) **The GST registration certificate is not furnished**

iii) In case DD towards tender cost is not found inside this envelope in case tender document is downloaded from website .

(ii) Envelope - II (To contain Part-II of tender document)

This envelope should contain the Technical Bid and Commercial bid complete in all respects, in duplicate & Integrity pact as per proforma in **SCHEDULE XV**.

(iii) Envelope –III: This large envelope should contain all the above two envelopes. A certificate in the following format should be recorded on main envelope itself

TENDER SPECIFICATION No. TR-21/S&P/04, DUE FOR OPENING ON --/--/2021 FOR SUPPLY OF 315 MVA,400/220/33KV AUTOTRANSFORMER In case tender document is downloaded from website the envelope should also be Superscribed "DOWNLOADED FROM WEBSITE –TENDER COST FURNISHED".

THIS ENVELOPE CONTAINS TWO ENVELOPES FOR:-

1. Envelop-I- Part –I of tender document i.e. Earnest Money Deposit ,**GST registration certificate** & cost of tender document, if downloaded.
2. Envelop-II- Part – II (A) i.e. Technical bid & Part – II (B) i.e. Commercial Bid & Integrity pact as per proforma in **SCHEDULE XV**.

To,
The Executive Director(S&P),
C.S.Power Transmission Co.Ltd.,
Danganiya, RAIPUR (C.G.) 492013

IT IS CERTIFIED THAT WE AGREE TO THE FOLLOWING CLAUSES OF TENDER SPECIFICATION:-

1	PAYMENT TERMS	AGREED
2	SECURITY DEPOSIT	AGREED
3	PENALTY	AGREED
4	PERFORMANCE GUARANTEE & INTEGRITY PACT	AGREED
5	TECHNICAL SPECIFICATION	IT IS CERTIFIED THAT THE MATERIAL OFFERED BY US IS STRICTLY AS PER TECHNICAL SPECIFICATION AS STIPULATED IN THIS TENDER AND IN CASE ANY DEVIATION IS OBSERVED LATER ON, WE SHALL BE SOLELY RESPONSIBLE AND THAT OUR TENDER SHALL BE LIABLE FOR REJECTION.

Sign & Seal of Bidder

Tenders being submitted must be signed by a person holding a power of attorney authorising him to do so. The self attested copy of power of attorney should be furnished. Tenders submitted on behalf of company registered under Indian Companies Act shall be signed by persons duly authorised to submit the tender on behalf of the company and shall be accompanied by self attested copy of resolution / abstract of Article of Association/ special or general power of attorney

It may be noted that in no case the request for return of offer/bid dropped in the tender box shall be considered even if due date of tender is extended.

6. **Opening of tenders:**

Part – I i.e. Earnest Money shall be first opened on the due date & time. Part-II i.e. Part – I i.e.The envelop for Tender Cost (if downloaded) , Earnest Money & GST registration certificate shall be first opened on the due date & time. Part-II i.e. "Technical & Commercial Bid" will be opened thereafter on the same day in respect of the bidders **whose GST registration certificate is attached , EMD are found to be as per tender specification and tender cost is found to be as per tender** .These bids will be scrutinized and then we will take decision regarding opening of Part – III price bid in respect of successful Bidders. For the purpose of opening of price bid, a notice of not less than 7 days shall be given to the Bidders so that they may depute their representative for attending price bid opening. It may be mentioned that period of 7 days will be counted from the date of issue of fax intimation by us. Such intimation shall be given within a reasonable period from the date of opening of commercial and technical bids, and after its scrutiny. Only authorized representatives possessing necessary authority letter from the Bidder shall be allowed to participate in the tender.

7. **Compliance with other conditions:**

Although all other conditions have clearly been spelt out in the tender document, it is once again brought to the notice of bidders that they should go through our tender document carefully and comply all other conditions also, like furnishing of type test report, furnishing of list of past supplies, performance certificate, profit and loss account, balance sheets etc. In the nut shell, the offer at the time of submission of Technical and Commercial bid itself should be completed in all respects. It should not be expected that in case of lack of any information, the CSPTCL will make any correspondence with the bidders. The documents and details as called for in the tender must be submitted without making any reference to submission of such certificate against past order, tender or past experience of supplies with the CSPTCL etc. All tenders wherein these conditions are not complied with may run the risk of rejection without correspondence from our side.

8. **Change of quantity:**

The CSPTCL reserves the right to vary the quantities of any or all the items as specified in the technical specifications /schedules as may be necessary based on requirement. No correspondence shall be entered into regarding quantity variation.

9. **Inspection:**

9.1 The CSPTCL shall have access at all times to the works and all other places of manufacture where the equipments are being manufactured and the supplier shall provide all facilities for unrestricted inspection of the suppliers works, raw material, manufacture of all the accessories and for conducting necessary tests as detailed herein.

9.2 The successful bidder shall keep the CSPTCL informed in advance of the time of starting and of the progress of manufacture of equipment in various stages so that arrangements could be made for inspection.

9.3 No material shall be dispatched from its point of manufacture unless the material has been satisfactorily inspected and tested by the CSPTCL.

9.4 The acceptance of any quantity of equipment shall in no way relieve the successful bidder of his responsibility for meeting all the requirements of this specification and shall not prevent subsequent rejection if such equipments are later found to be defective.

10. **False inspection call:**

In case transformer is not offered for inspection (stage or final) on the date of inspection offered by the firm due to any reasons, the firm shall be required to remit a sum of Rs.5,000/- or actual expenses incurred in the visit of the inspector whichever is more.

11. **Quality Assurance Plan:**

The supplier shall invariably furnish following information along with his offer. Information shall be separately given for individual type of equipment offered.

a) Statements giving list of important raw materials, name of sub-suppliers for the raw material, list of standards according to which the raw material are tested, list of tests normally carried out on raw material in presence of suppliers representative, copies of test certificates.
b) Information and copies of test certificates as in (a) above in respect of bought out items.
c) List of manufacturing facilities available.
d) Level of automation achieved and list of areas where manual processing exits.
e) List of areas in manufacturing process where stage inspections are normally carried out for quality control and details of such tests and inspections.
f) Special features provided in the equipment to make it maintenance free.
g) List of testing equipment available with the supplier for final testing of equipment specified and test plan limitation, if any, vis-à-vis the type/ special acceptance and routine test specified in the relevant standards. These limitations shall be very clearly brought out in schedule of deviations from specified test requirements.

12. **Erection, testing & commissioning:**

Erection, testing & commissioning work of transformer is to be offered by the bidder in schedule II-B. However, CSPTCL shall have the rights to get the work done either through the bidder or departmentally. The rates should be quoted for erection, testing & commissioning in schedule II-B which should include the cost towards placement of transformer on plinth and its erection, testing & commissioning to the satisfaction of CSPTCL's engineer-in-charge. In case erection, testing & commissioning work is offered to the bidder all activities for placement of transformer on plinth, erection, testing & commissioning are to be carried out by the bidder with his own man power, tools and plants. While unloading is to be done immediately on reaching of trailer at site, the placement on plinth erection, testing & commissioning will be carried out as per the programme intimated by CSPTCL. For this purpose intimation shall be given one week advance to the bidders. It will be obligatory on the part of the bidder to depute his gang positively within a week's time from date of intimation. The work should be carried out in supervision of experienced Engineers.

In case erection, testing & commissioning work is done departmentally, your erection engineer & commissioning engineer should be deputed for a period of seven days to supervise erection & five days to supervise testing & commissioning of each transformer. Although erection works shall be done by us in this case, free services of erection engineer will have to be provided for

supervision and guidance. It will be obligatory on the part of bidders to depute their erection supervisor and commissioning engineer positively within one week of telegraphic intimation from CSPTCL failing which action as deemed fit shall be taken which may include forfeiture of security deposit also.

13. **Pool rates:**

Formation of bidders' cartel is strictly prohibited. 'Cartel' includes an association of sellers, distributors, traders or service providers who by agreement amongst themselves, limit, control or attempt to control the production, distribution, sale or price of or trade in goods or provision of services, Here, "agreement" includes any arrangement or understanding or action, whether or not is formal or in writing.

Quoting same rates i.e. pool rate is not acceptable. In case the same rate is found to be quoted by more than two bidders, offers of all such bidders shall be out rightly rejected. However, if rates of two bidders are found to be same, quantity of orders to be placed on them will be reduced to half of the quantity a bidder is entitled to be allocated by virtue of their common rank. But, in case of multi-item tender, if rates of even two bidders for more than one item are found to be same, it will be considered as deliberate cartel and offers of both the bidders shall be rejected. Accordingly, all the bidders are advised to quote their own individual and most competitive rates.

Rated received in a tender will be minutely scrutinized to find out as to whether some or all bidders have entered in to any such 'agreement'. If CSPTCL is satisfied with the conclusion that some or all the bidders have formed a cartel, offers of all such bidders shall be rejected.

14.1 **Permissible losses of 315MVA, 400/220/33 KV transformer:**

The losses of 315MVA, 400/220/33KV Autotransformer should be within the range of prescribed below for respective losses (without any positive tolerance):

Sl. No.	Particulars	Maximum	Minimum
1.	**No load loss in KW**	**90**	**81**
2.	**Load loss in KW at rated voltage, rated frequency and rated current at 75^{o}C in KW**	**475**	**427.5**
3.	**Auxiliary Loss in KW**	**20.0**	**18.0**

The bidders shall have to offer no load loss, load loss and auxiliary loss separately.

In case any of the offered losses (i.e. no load loss, load loss and auxiliary loss) quoted by the bidder is more than the maximum permissible limits, the bid shall be considered as non responsive and shall be out rightly rejected without any correspondence in the matter.

In case any of these losses are below the minimum range prescribed above, the bid shall be treated as responsive. However, for price bid evaluation purpose, the minimum range of the respective loss prescribed above shall be considered.

14.2 **Capitalisation of losses:**

The capitalisation of no load loss, load loss and auxiliary loss for the bidder who has quoted above the minimum of the respective range of losses specified in pre clause-14.1 shall be done on following rates (differential of quoted loss and minimum value of the range for respective loss).

(a) For differential no load loss above 18 KW : Rs. 4,01,840.00 per KW

(b) For differential load loss above 93 KW : Rs. 2,13,780.00 per KW

(c) For differential auxiliary loss above 1.8KW : Rs. 1,60,700.00 Per KW

In case a bidder quotes any of the losses below the minimum value of the range prescribed in pre clause-14.1, the value of loss shall be considered equal to minimum of the range specified at clause-14.1 for respective loss for price bid evaluation purpose. However, it should be clearly noted that during final testing of each of transformer, the measured losses individually (i.e. no load loss, load loss & auxiliary loss as applicable) should not exceed the values quoted by the bidder in the bid. In case any of the loss exceeds the quoted loss, respective transformer shall not be accepted.

14.3 **Evaluations of prices:**
The comparative prices shall be arrived on the basis of **total landed cost** which will be worked out as mentioned below:-

Unit comparative price of transformer for particular bidder = Unit FOR destination Price of Transformer quoted+ erection, testing and commissioning of single Transformer+ capitalisation of losses as per clause-14.2.

15. **Testing at an independent test laboratory:**
CSPTCL at its discretion may get any one or all the transformers tested at a Govt. approved laboratory like CPRI / ERDA for all the routine and type tests at the expenses of CSPTCL. In case, the test results are found to be deviating from the results during the inspection at manufacturing works or test results are found to be beyond permissible limits as per the tender specifications and concerned standards, the whole lot of the transformer shall be liable for rejection.

16. **Amendment in specifications:**
The Company may revise or amend the specification and drawing, prior to the date notified for opening of tender. Such revision/ amendment, if any, will be communicated to all the bidders as amendment/ addendum to the invitation of tender and the same will be displayed in CSPTCL's website also.

17. **Telex/ telegraphic/ fax bids:**
Telex/ telegraphic/ fax offers will not be considered under any circumstances.

18. **Mistakes in bids:**
Rates should be quoted in both figures and words. In case of ambiguity between rates in figures and words, lower of the two shall be considered.

19. **Lump sum based bids:**
In case prices for some items or all items are given as lump sum, instead of unit prices as required in the tender specifications, CSPTCL can summarily reject such incomplete tender.

20. **Printed terms & conditions in bids:**
Supplier's printed terms and conditions will not be considered as forming part tender under any circumstance whatsoever.

21. **Alterations/ correction in bids:**
No alternations in the tender document will be permitted.

22. **Incomplete bids:**
Tender which is incomplete or obscure is liable for rejection.

23. **Ambiguities in conditions of bids:**
In case of ambiguous or self contradictory terms/ conditions mentioned in the bid, interpretations as may be advantageous to the Company may be taken without any reference to the tender.

24. **Disqualification of bids:**
A bid which gets opened before the due date as a result of improper or no indication has been given on the cover to indicate that it is a tender, will be

disqualified. Bidders will not be permitted to change the substance of his tender on post interpretation/ improper understanding grounds. This includes post tender price changes/ modifications etc. after opening of price bid. In such events, otherwise, that is, when a bidder does not comply, tender will be rejected.

25. **Language of bids:**
All tenders should be made either in English or in Hindi only.

26. **Cancellation of order:**

26.1 The company may upon written notice of default, terminate contract in the circumstances detailed here under:

a) If in the opinion of the Company, the supplier fails to deliver the material within the time specified or during the period for which extension has been granted by the Company.

b) If in the opinion of the Company, the supplier fails to comply with any of the other provisions of this contract or material is found not in accordance with prescribed specifications and or the approved samples.

c) If as a result of stage inspection, it is revealed that material and / or workmanship is substandard, which is likely to affect the performance of the finished product, a notice would be served by the Company to the supplier to suspend further activities and to take urgent steps towards corrective measures, failing which the entire order would be cancelled.

26.2 In the event of such termination, the CSPTCL shall exercise its discretionary power as:

(a) To recover from the supplier the agreed liquidated damages as given in the clause No. 4.3.4 above.

or

(b) To purchase form elsewhere after giving due notice to the supplier on account and at the risk of the supplier such stores/ material not so delivered or others of similar description in respect of consignment not yet delivered.

or

(c) To cancel the contract reserving Company right to recover damages.

26.3 Notwithstanding that the power under clause-26.2 a, b & c referred to above, are in addition to the rights and remedy available to the Company under the general law of India relating to contract.

26.4 In the event of risk purchase of stores of similar description, the opinion of the Company shall be final. In the event of action taken under clause-26.2 (a) or (b) above, the supplier shall be liable to pay for any loss, which the Company may sustain on that account but the supplier shall not be entitled to any saving on such purchases made against the default.

26.5 The decision of the CSPTCL shall be final regarding the acceptability of the stores supplied by the supplier and the Company shall not be required to give any reasons in writing or otherwise at any time for the rejection of the stores/ material.

26.6 In the event CSPTCL does not terminate the order as provided in clause 26.1 & above, the supplier shall continue execution of this order, in which case he shall be liable to the CSPTCL for liquidated damages for the delay as per clause 4.3.4 until supplies are accepted.

27**.** **Canvassing of bids:**
Tenders shall be deemed to be under consideration, after opening of tender/ bid till placement of order. During this period, the bidders or their authorised representatives or other interested parties are advised strongly in their own interest, to refrain from contacting by any means any of the CSPTCL's personnel or representative.

28. **Force majeure:-**
The force majeure condition/circumstances shall include strikes, slow-down by labour, lock outs, war, fire accidents, earthquakes, floods, natural calamity, riots, damage to plant, stoppage at the works and or any other reasons what-so-ever beyond reasonable control of the supplier. Power cut and non availability of raw materials will not be considered as force majeure reason. Please note that only in case of force majeure conditions, CSPTCL may consider request for time extension if found valid.

29. **Arbitration:**
If at any time, any question, dispute or difference, whatsoever shall arise between the Purchase and the supplier, upon or in relation to or in connection with the Contract, either party may forth with give to the other, notice in writing of the existence of such question, dispute or difference and the same shall be referred to the adjudication of two arbitrators, one to be nominated by the Purchase and the other to be nominated by the supplier or in the case of said arbitrators not agreeing, then to the adjudication of the Umpire to be appointed by the arbitrators, whose decision shall be final and binding on the parties and the provisions of the Indian Arbitration Reconciliation Act 1996, and of the rules there under and any statutory modification thereof shall be deemed to apply. The arbitrators or the Umpire, as the case may be, are bound to give a detailed speaking award assigning reasons for the findings.

Supplies under the contract shall be continued by the Bidder during the arbitration proceedings, unless otherwise, directed in writing by the Purchase or unless the matter is such that the work cannot possibly be continued until the decision of the arbitrators or of the Umpire, as the case may be is issued.

30. **Jurisdiction:**
Any dispute or difference, arising under, out of or about this tender/ contract order shall be subject to exclusive jurisdiction of competent court at Raipur only.

31. **Integrity Pact:**
The bidder shall have to submit pre-contract integrity pact in the format enclosed as **Schedule-XV** on non-judicial stamp paper worth **Rs.300/-** duly signed by the bidder along with the Techno-Commercial bid. The validity of this integrity pact shall be from the date of its signing and extended up to two years or the complete execution of the contract to the satisfaction of the Buyer and the Bidder/ Seller, whichever is later. In case Bidder is unsuccessful, this Integrity Pact shall expire after six months from the date of the signing of the contract.

32. **Limitation of Liability**:- Except in cases of gross negligence or wilful misconduct,

a) The bidder and CSPTCL shall not be liable to the other party for any indirect or consequential loss or damage, loss of use, loss of production, or loss of profits or interest costs, provided that this exclusion shall not apply to any obligation of the bidder to pay liquidated damages to the CSPTCL

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b) The aggregate liability of the bidder to CSPTCL, whether under the contract, the tort or otherwise, shall not exceed the total contract price, provided that this limitation shall not apply to the cost of repairing or replacing defective equipments, or to any obligation of the bidder to indemnity CSPTCL with respect to patent infringement.

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SECTION-II
TECHNICAL SPECIFICATION
400/220/33 KV,315 MVA AUTOTRANSFORMER FOR EHV SUB-STATION

1 **Scope:-**

1.1 This specification covers design, engineering, manufacture, testing at manufacturer's works, delivery at site including all materials, accessories, spares, unloading, handling, proper storage at site, erection, testing and commissioning of the **400/220/33KV, 315 MVA Autotransformer**. External or internal reactors shall not be used to achieve the HV/LV and IV/LV impedance specified.

1.2 It is not the intent to specify completely herein all detail of the design and construction of equipments. However, the equipment shall conform in all respects to standards of engineering, design and workman ship listed in clause-2 and shall be capable of performing in continuous commercial operation up to the bidder's guarantee in a manner acceptable to the purchaser, who will interpret the meanings of drawing and specification and shall have the power to eject any work or material which, in his judgment, is not in accordance therewith. The equipments offered shall be complete with all components necessary for their effective and trouble free operation. Such components shall be deemed to be within the scope of bidder's supply, irrespective of whether those are specifically brought out in this specification and / or in the commercial order or not.

1.3 The transformers shall conform in all respects to high standards of engineering, design, workmanship and latest revision of relevant standards at the time of offer and purchaser shall have the power to reject any work or material which, in his judgment, is not in full accordance therewith.

1.4 **Climatic Conditions:**

Peak Ambient Temperature	50 Degree Celsius
Minimum Temperature in Shade	6 Deg. C
Maximum Relative Humidity	95% (sometime approaches saturation)
Average number of thunderstorm	58 days per annum.
Average number of rainy days per annum	90 days.
Average Annual Rainfall	125 cm.
Maximum Wind Pressure	150 kg/meter square.
Altitudes (Not Exceeding)	1000 metres.
Seismic Level Horizontal	0.3 g.

2.0 Standards:

2.1 The transformers and associated accessories shall conform to the latest issues of standards as given below: -

Indian Standard	Title	Internationally recognized std.
IS-2026 (part I to V)	Power Transformers	IEC-76
IS-3639	Fittings & Accessories for power transformers	
IS-335	Insulating oils for Transformers.	IEC-296, BS-148
IS-2099	Bushings for alternating Voltage above 1000 V	IEC-137, BS-223
IS-2705	Current Transformers	IEC-185
IS-325	Three phase Induction Motors	IEC-34
IS-375	Marking & arrangements for Switchgear, bus bars, Main Connections and auxiliary Wiring.	
IS-3737	Gas operated relays	
IS-1886	Code of practice for installation and maintenance of transformers	
IS-2147	Degrees of protection.	
IS-5	Colors for ready mix paints	

IS-6272	Industrial cooling fans	
IS-6600	Guide for loading of oil Immersed transformers	BSCP-0160
IS-778	Gun metal gate, globe and check valves for general purpose	
IS-3401	Silica gel.	
IS-4253	Park & Rubber	
IS-5561	Electric power connector	
IS-5578, IS-11353	Marking & arrangement for switch gear, bus bar, main connections and auxiliary wiring.	
IS-9434	Guide for sampling and analysis of dissolved gas in oil filled equipments.	
IS-12676	Oil impregnated paper insulated condenser Bushing Dimension and requirements.	
	Insulation Co-ordination	IEC-71
	Indian Electricity rule, 1956	
	CBIP publication no 275 Manual on power transformers	
DOC.ETD 16 (3487)	Draft standard by BIS for revision of IS-8468 for OLTC	
DOC.ETD 16 (3574)	Draft standard by BIS for revision of IS-3639 for fitting & accessories for transformers part-I-standardization of conservator	
DOC.ETD 16 (3575)	--- do --- part 2: dehydrating breather	
DOC.ETD 16 (3576)	--- do --- part 3: earthing terminals	
DOC.ETD 16 (3577)	--- do --- part 4: temperature indicators	
DOC.ETD 16 (3578)	--- do --- part 5: rating & diagram plate	

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

3. Auxiliary power supply:

Auxiliary electrical equipment shall be suitable for operation on the following supply system:-

Power Devices Like drive motors	415 V, 3 Phase 4 wire 50 Hz, neutral grounded AC supply
Lighting, space heaters and fractional kW motors	240 V, single phase, 50 Hz neutral grounded AC supply.
Alarm, control and protective devices	220 V/110 V DC, 2 wire with facility for selection of either 220 volt or 110 volt.

Each of the foregoing supplies shall be made available by the bidder at the terminal point for each transformer for operation as accessories and auxiliary equipment. Bidders scope include supply of interconnecting cables, terminal boxes etc. the above supply voltage may very as below and all. Device shall be suitable for continuous operation over entire range of voltages.

i)	AC supply:	Voltage +10% (-) 20%, frequency + 5%
ii)	DC supply:	(-) 15% to +10%

4. TECHNICAL PARAMETERS : 3 PHASE, 315 MVA AUTO TRANSFORMER

Sl. No	ITEM	Specification of 315 MVA X'mer
1.	Rated Voltage Ratio: kV	400/220/33 KV
2.	No.of windings	Auto transformer with tertiary
3.	MVA rating a) HV/IV b) LV(Tertiary)	 315 MVA / 315 MVA 105 MVA
4.	No. of phases	Three
5.	Frequency	50 Hz
6.	Type of cooling	ONAN/ ONAF/OFAF
7.	MVA rating corresponding to cooling system: a) ONAN Cooling b) ONAF Cooling c) OFAF Cooling	 60% 80% 100%
8	Rated current of HV side at (-)10% volts tap & what will be the Temp. Rise & Losses if 10% continuous over loading done on (-) 10% tap.	**Please furnish**
9	Transformer KVA rating at 105% over voltage	The transformer shall be capable of delivering rated current at a voltage equal to 105% of the rated voltage
10.	Method of connection a) Windings b) Neutral	 HV & IV –Star , LV –Delta Solidly grounded
11.	Connection Symbol (Vector group)	YN a0 d11,
12.	System earthing	Effectively earthed
13.	Percentage impedance, voltage on normal tap and at rated MVA (a) HV-IV impedance (b) HV-LV impedance (c) IV-LV impedance	 12.5 $\pm$10 % 45 $\pm$ 15% 30 $\pm$ 15% Note:- The percentage impedance should match with the percentage impedance of existing transformers for parallel operation as detailed **in ANNEXURE –XIV**
14.	Anticipated continuous loading of windings: a) HV and LV b) Tertiary	**Not to exceed 110% of its rated capacity** Suitable for no load operation as well as for loading to its rated capacity with capacitive or inductive loading or combination of both. (Subject to a maximum of 33% of the rated capacity of HV winding).

Sl. No	ITEM	Specification of 315 MVA X'mer
15.	Tap changing gear:- i) Type ii) Provide on iii) Tap range iv) Step voltage	 i) On load ii) On IV side for variation of IV iii) -5% to $\pm$15% iv)1.25 %
16.	Over voltage operating capability and duration	110 % rated voltage for continuous 125% rated voltage for 60 secs. 140% rated voltage for 5 secs.
17.	Minimum Air core reactance of HV windings.	20%
18.	(a) Max. Flux density in any part of core and yoke at rated MVA, voltage and frequency shall be such that under 10 % continuous over voltage condition it does not exceed . (b) No load current of the transformer at 105%of rated voltage (c) Current density in winding	1.9 Tesla (Maximum) **0.5**% of rated current (maximum) <= **3 Amp/ sq. mm (max.)**
19.	Insulation levels: For windings a)1.2/50 microsecond impulse withstand voltage (kVp) b)20/200/500microsecond switching surge withstand voltage (kVp) c) Power frequency withstand voltage (kV rms.)	HV IV LV 1425 950 250 1050 -- -- 630 460 95
	d) Tan delta values of winding	The measured Tan delta values of winding shall not exceed 0.45% at 20^0C temperature. In case Tan delta of transformers during testing at works of manufacturer is measured above maximum ceiling of 0.45% at 20^0C temperature, then CSPTCL reserves right not to accept such of the transformer.
20.	Type of winding insulation:- a) HV/IV winding b) LV winding	Graded Full
21.	System short circuit fault level and duration for which the transformer shall be capable to withstand thermal and dynamic stresses (kA rms/sec)	The transformer and all its accessories including CTs etc. shall be designed to withstand without injury, the thermal and mechanical effects of any external short circuit to earth and of short circuits at the terminals of any winding for a period of 3 secs with the subject transformer connected at infinite bus.

Sl. No	ITEM	Specification of 315 MVA X'mer
22.	Maximum partial discharge level at 1.5/sq.root 3 of rms. Phase to ground voltage.	500 pico coulombs
23.	Noise level at rated voltage and frequency	81 dB
24.	Permissible temperature rise: Over ambient temp . i) Of top oil measured by thermometer. ii) Of winding measured by resistance.	 40^0 c 45^0 c
25.	Minimum clearances in air (mm): a) HV b) IV c) LV	Phase to Phase / Phase to ground 4200 / 3500 2100 / 2100 320 / 320
26.	Terminal Bushings(OIP condenser bushing) :- a) HV Winding Line end b) IV Winding Line end c) HV/IV Winding Neutral d)LV Winding	 420 KV 245 KV 72.5KV 72.5KV with center spacing of 1000mm
27.	Max. Radio Interference voltage level at 1 MHz & 1.5/sq root 3 of rms phase to ground voltage for HV winding	1000 micro volts
28.	Minimum Visual Corona extinction voltage a) For 400 KV System b) For 220 KV system	 320 KV rms 156 KV rms
29.	Cooling Equipment's: No. of Banks with adequate number of Fans/oil pumps , standby fans/oil pumps etc. with oil flow indication.	Two Banks each 50% radiator
30.	Bushings:	HV / IV / LV / Neutral
	1) Voltage Rating (kV rms)	420 / 245 / 72.5 / 72.5
	2)Current Rating	1250 / 1250 / 3150 / 1250
	3)Insulation level:	
	a) 1.2/50 micro sec.lightning impulse with stand voltage (kVp)	1425 / 1050 / 325 / 325
	b)250/2500micro.sec.swiching impulsewith stand voltage (kVp)	1050 / --- / --- / -----
	c) 1 Minute power frequency withstand voltage (kV rms)	630 / 460 / 140 / 140
	4) Min.Total Creepage distance (mm)	10500 / 6125 / 1813 / 1813
31.	(I) Maximum & Minimum Losses at rated voltage & frequency at 75 dgree C	**Maximum** / **Minimum**
	a) No Load Losses (Iron Losses) KW	**90** / **81**
	b) Load(Copper Losses) KW	**475** / **427.5**
	c) Auxiliary Loss KW	**20.0** / **18.0**
	(II) No load losses at 110% of rated voltage & rated frequency	**Not more than 130% of the losses at rated voltage & frequency**

Sl. No	ITEM	Specification of 315 MVA X'mer
32.	Bushing CTs for REF Protection	Two cores each of Bushing CTs of adequate ratio should be provided in HV, IV and neutral bushing for REF protection.
33	Bushing CTs forWTI	One core each in middle phase of HV,IV and LV wdgs. Suitable turns ratio as per manufacturer's practice.
33.	Service	Out door
34.	Duty	Continuous
35	**Transformer oil:**	**IS:335:2018 TYPE II - UNINHIBITED TRANSFORMER OIL (TECHNICAL**
A	**FUNCTION**	
a	Viscosity at 40^{o}C	15 mm^2 /s, Max
b	Viscosity at 0^{o}C	1800 mm^2 /s, Max
c	Pour point	-10^{o}C, Max
d	Water content	40 mg/kg, Max (for drum supply)
e	Breakdown voltage	30 kV (Min) 70 kV (Min) After Laboratory Treatment
f	Density at 20^{o}C	0.895 g/ml, Max
g	DDF at 90^{o}C	0.005, Max
B	**Refining/stability**	
a	Appearance	Clear, free from sediment and suspended matter
b	Acidity	0.01 mg KOH/g, Max
c	Corrosive sulphur	Not Corrosive
d	Potentially corrosive sulphur	Not Corrosive
e	DBDS	Not detectable (<5 mg/kg)
f	Inhibitors according to IS 13631/IEC 60666	(U) Uninhibited oil : Not detectable (<0.01%)
g	Metal passivator additives according to IS 13631/IEC 60666	Not detectable (<5mg/kg))
h	2- Furfural and related compounds content	Not detectable (<0.05 mg/kg) for each individual compound.
C	**Performance**	
a	Oxidation Stability	For oils with other antioxidant additives and mental passivator Additives
b	Total Acidity	1.2 mg KOH/g, Max
c	Sludge	0.8%, Max
d	DDF at 90^{o}C	0.500, Max
e	**Health, safety and Environment**	
f	Flash Point	135^{0}C, Min
g	PCA content	3% Max
h	PCB content	Not detectable (< 2mg/kg)

Note:-

5. GENERAL TECHNICAL REQUIREMENTS

5.1 GUARANTEED LOSSES AND MAXIMUM PERMISSIBLE LOSSES:-

5.1.1 Permissible losses of 315MVA, 400/220 KV transformer:
The losses of 315MVA, 400/220 KV Auto transformer should be within the range of prescribed below for respective losses (without any positive tolerance):

Sl. No.	Particulars	Maximum	Minimum
1.	No load loss in KW	**90**	**81**
2.	Load loss in KW at rated voltage, rated frequency and rated current at 75^{o}C in KW	**475**	**427.5**
3.	Auxiliary Loss in KW	**20.0**	**18.0**

The bidders shall have to offer no load loss, load loss and auxiliary loss separately.
In case any of the offered losses (i.e. no load loss, load loss and auxiliary loss) quoted by the bidder is more than the maximum permissible limits , the bid shall be considered as non responsive and shall be out rightly rejected without any correspondence in the matter.

In case any of these losses are below the minimum range prescribed above, the bid shall be treated as responsive. However, for price bid evaluation purpose, the minimum range of the respective loss prescribed above shall be considered.

5.1.2 **Capitalisation of losses:**
The capitalisation of losses shall be done on the differential losses for each of no load loss, load loss and auxiliary loss for price bid evaluation purpose. The best parameter of respective losses quoted for no load, load loss and auxiliary loss quoted by any technically responsive bidder/minimum of the range prescribed in **clause-5.1.1** above whichever is higher shall be taken as the base value and the differential losses for each of no load loss, load loss and auxiliary loss shall be worked out as mentioned below:

(i) In case where the no load loss, load loss and auxiliary loss quoted are within the range prescribed in **clause-5.1.1** for the respective losses, the difference between the respective best parameter/minimum of the range prescribed in clause-5.1.1 above whichever is higher and that quoted by the bidder shall be considered as differential loss for each of no load loss, load loss and auxiliary loss for bid evaluation purpose.

(ii) In case any of the no load loss, load loss or auxiliary loss quoted is less than the range prescribed in clause-5.1 for the respective loss, then minimum range prescribed for the particular loss shall be considered for bid evaluation purpose. For the losses which are offered within the prescribed range, the differential loss shall be worked out as per (i) above.

The differential losses so worked out separately for each of the no load loss, load loss and auxiliary loss shall be multiplied with number of transformers in the project and the capitalisation factors as mentioned below:

(a) For no load loss above 81 KW : **Rs. 4,01,840.00 per KW**
(b) For load loss above 427.5 KW : **Rs. 2,13,780.00 per KW**
(c) For auxiliary loss above 18 KW : **Rs. 1,60,700.00 Per KW**

The capitalised value of the above mentioned losses worked out on differential loss basis as mentioned above shall be loaded on the total cost of the project for price bid evaluation purpose.

5.1.3 During final testing of each of transformer, the measured losses (individually i.e. no load, load & auxiliary loss as applicable) should not exceed the values quoted by the bidder in the bid. In case of any of the losses exceed the quoted losses, respective transformer shall not be accepted.

5.2. Performance

5.2.1 The autotransformers shall be used for bi-directional flow of rated power.

5.2.2 Transformers shall be capable of operating under natural cooled condition up to the specified load. The forced cooling equipment shall come into operation by pre-set contacts of winding temperature indicator and the transformer shall operate as a forced cooling unit initially as ONAF up to specified load and then as OFAF. Cooling shall be so designed that during total failure of power supply to cooling fans and oil pumps, the transformer shall be able to operate at full load for at least ten (10) minutes without the calculated winding hot spot temperature exceeding 150^0C. Transformers fitted with two cooler banks, each capable of dissipating 50 per cent of the lossesat continuous maximum rating, shall be capable of operating for 20 minutes in the event of failure of the oil circulating pump or blowers associated with one cooler without the calculated winding hot spot temperature exceeding 150^0C at continuous max. rating. The bidder shall submit supporting calculations for the above for CSPTCL's approval.

5.2.3 The transformers shall be capable of being operated, without danger, on any tapping at the rated MVA with voltage variation of ± 10% corresponding to the voltage of the tapping.

5.2.4 **The maximum flux density in any part of the core and yoke at the rated MVA and frequency shall be such that under 10 per cent continuous over voltage condition it does not exceed 1.9 Tesla.**

5.3 Radio Interference and Noise Level

5.3.1 The transformers shall be designed with particular attention to the suppression of maximum harmonic voltage, especially the third and fifth so as to minimise interference with communication circuit.

5.3.2 The noise level of transformer, when energised at normal voltage and frequency with fans and pumps running shall not exceed the values specified in NEMA standard, when measured under standard conditions.

5.3.3 The transformers shall be capable of being loaded in accordance with IS: 6600/IEC-354.There shall be no limitation imposed by bushings, tap changers etc. or any other associated equipment.

5.3.4 The transformer and all its accessories including CTs etc. shall be designed to withstand without injury, the thermal and mechanical effects of any external short circuit to earth and of short circuits at the terminals of any winding for a period of 3 secs with the subject transformers connected at infinite bus.

The system fault level may be taken as 50 kA (symmetrical,rms, 3 phase fault on 400 KV & 220 KV) & 25 kA (symmetrical, rms, 3 phase fault on 33 KV).

5.3.5 Transformer shall be capable of withstanding thermal and mechanical stresses caused by symmetrical or asymmetrical faults on any winding.

5.3.6 Transformers shall withstand, without injurious heating, combined voltage and frequency fluctuations which produce the following over fluxing conditions:

i) 125% for 1 - minute 140 % for 5 sec

ii) Bidder shall indicate 150% and 170% over voltage withstand time.

5.3.7 The air core reactance of HV winding of transformer shall not be less than 20%.

5.4 Tertiary Windings for autotransformer.

5.4.1 The tertiary windings shall be suitable for connection or capacitors which would be subjected to frequent switching. All the windings shall be capable of withstanding these stresses that may be caused by such switching.

5.4.2 The Tertiary winding shall be designed to withstand mechanical and thermal stresses due to dead short circuit on its terminals.

5.4.3 The tertiary winding shall be suitable for connection to LT Transformer for auxiliary supply.

5.4.4 **Tertiary winding**:-For 315 MVA transformer, ONAF rating of HV & IV shall be 315 MVA and that of 33 KV LV (tertiary) rating shall be 105 MVA .The tertiary of 315 MVA transformer shall be designed for full rated MVA loading of either capacitive or inductive or mixed load. The tertiary winding shall not have taps. Tertiary winding shall be without tap changer. The tertiary winding is intended to be loaded for the specified rating as mentioned above and accordingly terminals of delta winding needs to be brought out on transformer through three bushings. One 33 KV class CT of ratio 1000/1-1 Amps having two secondary cores of rating 1Amp, one of accuracy class 5P20 and other of accuracy class 1 shall be provided in any one phase of tertiary winding before delta formation for monitoring circulating current and also to provide protection against circulating current beyond rated capacity.

One No. PS class CT shall be provided in each phase of the tertiary bushing for Differential protection. One CT core of suitable ratio shall be provided in the middle phase for monitoring WTI. For measurement of circulating current of delta winding one Ampere meter of digital /numeric type suitable for specified CT ratio shall be provided on the RTCC panel. The tertiary winding shall be designed to carry the fault current under worst fault condition.

5.5 Construction Details

The features and construction details of each power transformer shall be in accordance with the requirement stated hereunder.

5.5.1 **Tank and Tank Accessories**

5.5.1.1 **Tank**

a) Tank shall be of welded construction and fabricated from tested quality low carbon steel of minimum thickness of 25 mm. (Base & Tank cover) and 12mm for sides.

b) All seams and those joints not required to be opened at site shall be factory welded and whenever possible they shall be double welded. After completion of tank construction and before painting, dye penetration test shall be carried out on welded parts of jacking bosses, lifting lugs and all load bearing member. The requirement of post weld heat treatment for tank/stress relieving parts shall be based on recommendations of BS: 5500 table 4.4.3.1

c) The Tank stiffeners shall be provided for general rigidity and these shall be designed to prevent retention of water.

d) The tanks shall be designed to withstand

(i) Mechanical shocks during transportation
(ii) Vacuum filling of oil at 10 millitorr
(iii) Continuous internal pressure of 35 kN/m2 over normal hydrostatic pressure of oil.
(iv) Short circuit forces.

e) Wherever possible the transformer tank and its accessories shall be designed without pockets wherein gas may collect. Where pockets cannot be avoided, pipes shall be provided to vent the gas into the main expansion pipes.

f) Adequate space shall be provided at the bottom of the tank for collection of sediments. The minimum clearance of outermost winding/connection leads to tank shall not be less than 300 mm on all 4 sides to allow free movement of two persons for inspection. Suitable platforms may be provided on bottom to facilitate free movement of person all around inside the tank. The arrangement should be brought out clearly in the drawing.

g) The base of each tank shall be so designed that it shall be possible to move the complete unit by skidding in any direction without injury when using plates or rails.

h) Tank shields shall be such that no magnetic/fields shall exist outside the tank. If required impermeable shields shall be provided at the coil ends. Tank shield shall not resonate when excited at the natural frequency of the equipment. Bidder may confirm use of tank shields in the schedule of additional information.

i) Suitable guides shall be provided in the tank for positioning the core and coil assembly.

j) Each tank shall be provided with

(i) Lifting lugs suitable for lifting the equipment complete with oil
(ii) A minimum of four jacking pads in accessible position at 500 mm height to enable the transformer complete with oil, to be raised or lowered using hydraulic or screw jacks.
(iii) Suitable haulage holes shall be provided.

k) The transformer should be of bell tank design only. No other design is acceptable. Proper tank shielding shall be done to prevent excessive temperature rise of the joint.

5.5.2 Tank cover:

(a) The tank cover shall be sloped to prevent retention of rainwater and shall not distort when lifted.

(b) At least two adequately sized inspection openings, one at each end of the tank shall be provided for easy access to bushings and earth connections. The inspection covers shall not weigh more than 25 kg. The inspection covers shall be provided with two handles.

(c) The tank covers shall be fitted with pockets at the position of maximum oil temperature of MCR (Maximum Continuous Rating) for bulbs of oil and winding temperature indicators. It shall be possible to remove these bulbs without lowering the oil in the tank.

(d) Bushings, turrets, covers of inspection openings, thermometer, pockets etc. shall be designed to prevent ingress of water into or leakage of oil from the tank.

(e) All bolted connections shall be fitted with weather proof, hot oil resistant gasket in between, for complete oil tightness. If gasket is compressible metallic stops shall be provided to prevent over-compression.

5.5.3. Axles and Wheels:

(a) The transformers are to be provided with flanged bi-directional wheels and axles. These shall be so designed as not to deflect excessively to interfere with the movement of the transformer. Wheels shall be provided with suitable bearings, which shall be rust and corrosion resistant. Fittings for lubrication shall also be provided.

(b) Suitable locking arrangement along with foundation bolts shall be provided for the wheels to prevent accidental movement of transformer.

(c) The wheels are required to swivel and they shall be arranged so that they can be turned through an angle of 90° when the tank is jacked up to clear of rails. Means shall be provided for locking the swivel movements in positions parallel to and at right angles to the longitudinal axis of the tank.

5.5.4 Foundation and Anti Earthquake Clamping Device

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

The details of the device used and its adequacy shall be furnished by the bidder.

5.5.5 Conservator & Oil Preservation System

a. Main conservator shall have air cell type constant oil pressure system to prevent oxidation and contamination of oil due to contact with moisture and shall be fitted with magnetic oil level gauge with low oil level potential free contacts. Additionally, prismatic oil level gauge shall also be provided for the full height of the end section of the conservator.

b. OLTC shall have conventional type conservator with magnetic oil level gauge with low oil level potential free contacts and prismatic oil level gauge also.

c. **Conservator tank**

(a) The conservator tank shall be of minimum 8mm thickness and shall have adequate capacity between highest and lowest visible levels to meet the requirement of expansion of the total cold oil volume in the transformer and cooling equipment from minimum ambient temperature to 100^{o}C. Conservator shall be with volumetric capacity at least 7½ percent of a total volume of oil in the main tank of the transformer.

(b) The conservator tank shall be bolted into position so that it can be removed for cleaning purposes. Suitable provision shall be kept to replace air cell

(c) The conservator shall be fitted with magnetic oil level gauge with low level electrically insulated alarm contact.

(d) Conservator shall be provided in such a position as not to obstruct the electrical connections to the transformer.

(e) Separate conservator tank/compartment in the main conservator shall be provided for OLTC.

d. **Oil Preservation Equipment**

The requirements of air cell type oil sealing system are given below.

i) Contact of the oil with atmosphere is prohibited by using a flexible air cell of nitrile rubber reinforced with nylon cloth.

ii) The temperature of oil is likely to rise upto 100^{0}C during operation. As such air cell used shall be suitable for operating continuously at 100^{0}C.

iii) Air cell of conservator shall be able to withstand the vacuum during installation/maintenance periods. Otherwise provision shall be kept to isolate the conservator from the main tank when the latter is under vacuum by providing a vacuum sealing valve or other suitable means in the pipe connecting main tank with the conservator.

iv) The connection of air cell to the top of the conservator is by air proof seal preventing entrance of air into the conservator.

5.5.6 Dehydrating Filter Breather

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

a) Passage of air is through silicagel.
b) Silicagel is isolated from atmosphere by an oil seal.
c) Moisture absorption indicated by a change in colour of the tinted Crystals can be easily observed from a distance.
d) Breather is mounted not more than 1200 mm above rail top level.
e) To minimise the ingress of moisture following shall be provided.
   i. Three silicagel breathers (of identical size) shall be connected in series for main tank conservator. Each of the breathers shall be properly supported. Minimum quantity of silicagel to be 1 kg for every 3500 litre of oil in the tank.
   ii. Two breathers (each of 2.5 litres minimum volume) shall be connected in series for OLTC tank conservator.

5.5.7 Pressure Relief Device

Adequate number (Minimum3 Nos.) of pressure relief devices shall be provided at suitable locations. These shall be mounted on an extended pipe section and not directly on the tank top and shall be of sufficient size for rapid release of any pressure that may be generated in the tank and which may result in damage to equipment.The device shall operate at a static pressure less than the hydraulic test pressure of the transformer tank. It shall be mounted directlyon the tank. One set of electrically insulated contacts shall be provided for alarm/tripping. Discharge of pressure relief device shall be properly taken through pipes and directed away from the transformer/other equipment and this shall be prevented from spraying on the tank. Following routine tests shall be conducted on PRD.

a. Air pressure test
b. Liquid pressure test
c. Leakage test
d. Contact test
e. Dielectric test.

5.5.8 Buchholz Relay

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

5.5.9 <u>Temperature Indicators :</u>

a) Oil Temperature Indicator (OTI)

All transformers shall be provided with a 150 mm dial type thermometer for top oil temperature indication. The thermometer shall have adjustable, electrically independent ungrounded alarm, trip contact. A temperature sensing element suitably located in a pocket on top oil shall be furnished. This shall be connected to the OTI by means of capillary tubing. Temperature indicator dials shall have linear gradations to clearly read atleast every 2^0C. Accuracy class of OTI shall be ± 1.5% or better.

b) Winding Temperature Indicator (WTI)

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

i) Temperature sensing element.
ii) Image coil.
iii) Auxiliary CTs, if required to match the image coil, shall be furnished and mounted in the cooler control cabinet.
iv) 150 mm dia local indicating instrument with maximum reading pointer and two adjustable electrically independent, ungrounded contacts; besides that required for control of cooling equipment if any, one for high winding temperature alarm and one for trip.The contacts used for cooler control settings shall have differential operate and reset settings. Temperature indicator dials shall have linear gradations to clearly read at least every 2^0C.
v) Calibration device.
vi) Accuracy class of WTI shall be ± 1.5% or better.
vii) In addition to the above, the following equipment shall be provided for remote indication of winding temperature for each of the winding:
a) Remote winding temperature indicator
It shall be suitable for flush mounting on panel. This shall not be repeater dial of local WTI and will operate by signal transmitter.Any special cable required for shielding purpose, for connection between cooler control cabinet and remote WTI control circuit, shall be in the scope of Bidder. Only one RWTI with a four point selector switch shall be provided for all the three windings (HV, IV and LV).

5.5.10 **On line DGA monitoring device** shall be provided to detect **eight gases plus nitrogen and moisture content** dissolved in the transformer insulating oil. No carrier/consumable gases shall be required for Online DGA monitor. One Online DGA unit shall be provided on the Auto transformer. The device shall detect any change in quantity of the above gases which may occur due to faults in the transformer or degradation of transformer insulation and oil. The DGA monitoring device shall be supplied along with software interface and PC. The online gas analysis shall facilitate user to configure alarm,sampling rate, offering password protection, access to interrogate the monitoring of gases locally or remotely and down load for data analysis. The soft ware to produce graphical representation of data giving analytical presentation for diagnosis shall also be provided.
The device should have capacity to internally store minimum two years of Data. It should have non volatile memory storage to prevent loss of data.

The device should have following communication facilities:-
(i) Two separate channels for remote communications plus local USB connection and Ethernet connections.
(ii) Communications protocols supported should include IEC61850.
(i) Connection via RS485, Ethernet,

5.5.11 **<u>Nitrogen injection fire prevention system</u>:-**

Each oil filled transformer shall be provided with a dedicated Nitrogen Injection system for prevention against the transformer explosion which shall use nitrogen as quenching medium. The system shall prevent transformer oil tank explosion and possible fire in case of internal / external cause.

In the event of fire by external causes such as bushing fire, OLTC fires, fire from surrounding equipment etc., it shall act as a fast and effective fire fighter. It shall accomplish its role as fire preventer and extinguisher without employing water or carbon dioxide. Fire shall be extinguished within reasonable with time (not more than 3 minutes so as not to harm the transformer) of system activation and within 30 seconds (maximum) of commencement of nitrogen injection.

Activation of the system

Mal-functioning of the Nitrogen injection system could lead to interruption in power supply. The supplier shall ensure that the probabilities of chances of malfunctioning of the Nitrogen injection system are practically zero. To achieve this objective, the supplier shall plan out scheme of activating signals which should not be too complicated to make the system inoperative in case of actual need. The system shall be provided with automatic controls to prevent the explosion of transformers. Besides automatic control, remote electrical push button control at Control box and local manual control in the cubicle shall also be provided. Simultaneous activation of the following electrical-signals shall be used for initiating the system under prevention mode/fire extinguishing mode.

Auto Mode

For prevention:

• Differential relay operation.

• Buchholz relay paralleled with pressure relief valve

Tripping of all circuit breakers (on HV,IV& LV side) associated transformer is the pre-requisite for activation of system.

For extinguishing

• Fire Detector

• Buchholz relay paralleled with pressure relief valve

Tripping of all circuit breakers (on HV,IV& LV side) associated with transformer is the pre-requisite for activation of system.

Manual Mode (Local / Remote)

Tripping of all circuit breakers (on HV,IV& LV side) associated with transformer is the pre-requisite for activation of system.

Manual Mode (Mechanical)

• Tripping of all circuit breakers (on HV,IV& LV side) associated with transformer is the pre-requisite for activation of system.

The system shall be designed to be operated manually in case of failure of power supply to the system.

General description

Nitrogen Injection system should be a dedicated system for each oil filled transformer. It should have a Fire Extinguishing Cubicle (FEC) placed on a plinth at a distance of 5-10 m away from transformer or placed next to the firewall (if fire fighting wall exists). The FEC shall be connected to the top of transformer oil tank for depressurization of tank and to the oil pit (capacity is approximately equal to 10% of total volume of oil in transformer tank / or existing oil pit) from its bottom through oil pipes.

The FEC should house a pressurized nitrogen cylinder (s) which is connected to the oil tank of transformer oil tank at bottom. The Transformer Conservator Isolation Valve (TCIV) is fitted between the conservator tank and Buchholz relay. Cable connections are to be provided from signal box to the control box in the control room, from control box to FEC and from TCIV to signal box. Detectors placed on the top of transformer tank are to be connected in parallel to the signal box by Fire survival cables. Control box is also to be connected to relay panel in control room for receiving system activation signals.

Operation

On receipt of all activating signals, the system shall drain - pre-determined volume of hot oil from the top of tank (i.e. top oil layer), through outlet valve, to reduce tank pressure by removing top oil and simultaneously injecting nitrogen gas at high pressure for stirring the oil at pre-fixed rate and thus bringing the temperature of top oil layer down. Transformer conservator isolation valve blocks the flow of oil from conservator tank in case of tank

rupture / explosion or bushing bursting. Nitrogen occupies the space created by oil drained out and acts as an insulating layer over oil in the tank and thus preventing aggravation of fire.

System components

Nitrogen Injection system shall broadly consist of the following components. However, all other components which are necessary for fast reliable and effective working of the system shall deemed to be included in the scope of supply.

MS Storage tank for storage of extracted oil

The MS storage tank of cylindrical shape should be provided for storage of extracted oil. The capacity of tank should be minimum 12% of total oil capacity of transformer.

The MS storage tank should have facility of oil filtration in side the tank. For this 2 No. flanges (one for delivery and the other for suction) should be provided. The suction flange should be connected to the bottom of the tank. The storage tank should be made of 8 mm thick plat. The inner side of the tank shall be painted with 2 coats of heat resistant, oil insoluble, insulating varnish. The outer surface shall be given a primary coat of zinc chromate, second coat of oil & weather resistant varnish of a colour distinct from primary and final two coats of glossy oil and weather resisting light grey paint in accordance with shade No. 631 of IS-5. Adequate size of inspection window should be provided so that tank can be cleaned by manual labour. A vent pipe of adequate diameter shall be provided a breather fitted on it in order to allow breathing of air.

CUBICLE (FEC)

The Cubicle Frame shall be made of CRCA sheet of 3 mm (minimum) thick complete with the base frame, painted inside and outside with post office red colour (shade 538 of IS -5). It shall have hugged / hinged split doors fitted with high quality tamper proof lock. The doors, removable covers and panels shall be gasketted all round with neoprene gaskets. The degree of protection shall be IP55. The following items shall be provided in the Cubicle.

- Nitrogen gas cylinder with regulator and falling pressure electrical contact manometer.
- Oil drain pipe with mechanical quick drain valve.
- Electro mechanical control equipment for draining of oil of pre-determined volume and injecting regulated volume of nitrogen gas.
- Pressure monitoring switch for back-up protection for nitrogen release.
- Limit switches for monitoring of the system.Limit switch for pressure switch/sensor
- Butterfly valve with flanges on the top of panel for connecting oil drain pipe and nitrogen injection pipes for transformer.
- Panel lighting (CFL Type)
- Oil drain pipe extension of suitable sizes for connecting pipes to oil storage tank.
- Space heater.

Control box:

Control box is to be placed in the control room for monitoring system operation, automatic control and remote operation. The following alarms, indications, switches, push buttons, audio signal etc. shall be provided.

- System Oil.
- TCIV open.
- Oil drain valve closed.
- Gas inlet valve closed
- TCIV closed
- Detector trip
- Buchholz relay trip

- Oil drain valve open
- Extinction in progress
- Cylinder pressure low
- Differential relay trip
- PRV trip
- Transformer trip
- System out of service
- Fault in cable connecting fault detector
- Fault in cable connecting differential relay
- Fault in cable connecting Buchholz relay
- Fault in cable connecting PRV
- Fault in cable connecting transformer trip
- Fault in cable connecting TCIV
- Auto / Manual / Off
- Extinction release on / off
- Lamp test
- Visual / Audio alarm for AC supply fail
- Visual / Audio alarm for DC supply fail
- Nitrogen cylinder pressure indication.
- Fire in Transformer.
- Oil drain started.
- Conservator oil isolation valve closed.
- Nitrogen injection started.

As far as possible the control box should be such devised that all the transformers and or group thereof should be controlled from single spot.

Transformer Conservator Isolation Valve:
Transformer conservator isolation valve (TCIV) to be fitted in the conservator pipe line, between conservator and buchholz relay which shall operate for isolating the conservator during abnormal flow of oil due to rupture / explosion of tank or bursting of bushing. The valve shall not isolate conservator during normal flow of oil during filtration or filling or refilling, locking plates to be provided with handle for pad locking. It shall have proximity switch for remote alarm, indication with visual position indicator.The TCIV should be of the best quality as malfunctioning of TCIV could lead to serious consequence. The closing of TCIV means stoppage of breathing of transformer.Locking plates shall be provided for pad locking.

Detectors:
The system shall be complete with minimum 24 numbers of detectors (quartz bulb) fitted on the top cover of the transformer oil tank. The bulbs should be provided to ensure monitoring of all the HV, IV, LV & neutral bushings. Redundancy of detectors should be ensured & clearly brought in the drawing submitted for approval.Minimum 25 numbers of fire detectors shall be provided.

Signal box:
It shall be mounted away from transformer main tank, preferably near the transformer marshalling box, for terminating cable connections from TCIV & detectors and for further connection to the control box. The degree of protection shall be IP55.

Cables:
Fire survival cables (capable to withstand 750º C.) of 4 core x 1.5 sq. mm size for connection of detectors in parallel shall be used. The fire survival cable shall conform to

BS 7629-1, BS 8434-1, BS 7629-1 and BS 5839-1, BS EN 50267-2-1 or relevant Indian standards.

Fire Retardant Low Smoke (FRLS) cable of adequate size shall be used for connection of signal box / marshalling box near transformer and FEC mounted near transformer with control box mounted in control room. Fire Retardant Low Smoke (FRLS) cable of 4 core x 1.5 sq. mm size shall be used for connection between control box to DC & AC supply source, FEC to AC supply source, signal box / marshalling box to transformer conservator isolation valve connection on transformer. Separate cables for AC supply & DC supply shall be used.

Pipes:
Pipes complete with connections, flanges, bends and tees etc. shall be supplied along with the system.

Other items to be supplied:
(a) Oil drain and nitrogen injection openings with gate valves on transformer tank at suitable locations.
(b) Flanges between Buchholz relay and conservator tank for fixing TCIV.
(c) Detector brackets on transformer tank top cover.
(d) Spare potential free contacts activating the system i.e. in differential relay, Bucholz relay. Pressure Relief Device, Circuit breaker of transformer.
(e) Pipe connections between transformer and FEC and between FEC and oil pit required for collecting top oil.
(f) Cabling for detectors mounted on transformer top cover.
(g) Inter cabling between signal box, control box and FEC.
(h) Butterfly valves / Gate valves on oil drain pipe and nitrogen injection pipe which should be able to withstand full vacuum.
(i) Supports, signal box etc. which are to be painted with enameled paint.
(j) Any other item required for satisfactory operation of system.

Power supply
For Control Box 220 V DC
For FEC Auxiliary 230 V AC
Spares for three (3) years Operation & Maintenance

The bidder apart from the below mentioned spares shall submit a list of recommendation spares for three years trouble free operation of the equipments and also furnish unit rates. The owners will scrutinize the said list and decide on the items on spares to be ordered and the quantities. These spares shall be supplied by the bidder before end of guarantee period. The owner reserves right to order the spares with twelve (12) months from the date of order for main equipments and the rate shall be kept valid till this date. The prices of these spares shall not be considered for evaluation of the bid.

Mandatory Spares
Cylinder filled with Nitrogen of required Capacity per transformer - 1 No.
Detectors per transformer - 3 no.
Regulator assembly per sub-station 1 No.

Modification on the transformer
No modification on the transformer shall be allowed which affects its performance (i.e. efficiency, losses, heat dissipation ability etc.) safety, life etc. or it's any other useful parameter. This requirement shall be paramount importance and shall form the essence of the contract. However, in any case, performance of transformer should not be affected in any manner by having Nitrogen Injection Fire Prevention Cum Extinguishing System (NIFPES) and the Bidder / Sub-vendor shall give an undertaking to this effect. All pipes

should be washed / rinsed with transformer oil. If any damage is done to the transformer and / or any connected equipment during installation & commissioning full recovery therefore shall be effected from the Bidder /Sub-vendor, of NIFPES system.

It shall be solely the responsibility of bidder / Sub-vendor to install, carry out pre-commissioning tests & commission NIFPES at the mentioned Sub-Station in this specification, to the entire satisfaction of the CSPTCL.

Interlocks:
It shall be ensured that once the NIFPES gets activated manually or in automode, all the connected breakers shall not close until the system is actually put in OFF mode. Also PRV shall get closed only if all the connected breakers are open.

Tests:
Bidder has to carry out the type test as per relevant IS/IEC. Specifically IP 55 on FEC or have to produce the report from NABL approved Lab. Reports of all routine test conducted as per relevant IS/IEC standards in respect of various bought out items including test reports for degree of protection for FEC / control box / signal box shall be submitted by the supplier.

The supplier shall demonstrate all the functional test associated with the following as Factory Acceptance Tests:

- FEC, Control Box
- Fire Detector
- Transformer Conservator Isolation Valve

The performance test of the complete system shall be carried out after erection of the system with transformer at site. Detailed layout drawings, equipment drawing along with 4 sets of Operation and Maintenance manual along with soft copies (In CDs) shall be submitted by the supplier along with the consignment. The guaranteed and other technical particulars for the offered system are indicated in Section - "Guaranteed and Other Technical Particulars". Any other particulars considered necessary in addition to those listed in that Section may be furnished by the Bidder.
The system should have provision for storage of sufficient volume of nitrogen for fire prevention/extinguishing. The control and monitoring of the device shall be integrated into Substation Automation System.

5.5.12 Earthing Terminals

a) Two (2) earthing pads (each complete with four (4) nos. holes, M 10 bolts, plain and spring washers) suitable for connection to 75 x 12 mm galvanised steel grounding flat shall be provided each at position close to earth of the two (2) diagonally opposite bottom corners of the tank.

b) Two earthing terminals suitable for connection to 75 x 12 mm galvanised steel flat shall also be provided on cooler, marshalling box and any other equipment mounted separately.

5.5.13 Core

a) The core shall be constructed from high grade, non-ageing, cold rolled, super grain oriented, silicon steel laminations (Hi B).The core material shall be of prime quality. Bidder will offer the core for inspection and approval by the purchaser during manufacturing stage.The bidder call notice should be accompanied with the following documents as applicable as a proof towards use of prime grade material.

a) Invoice of the supplier
b) Mill's test certificate
c) Packing list
d) Bill of loading

e) Bill of entry certificate by customs.

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

c) CORE EARTHING ARRANGEMENT

The manufacturer should bring out leads from core ,end frame and tank to top of the transformer through insulated bushings. It may be noted that internal earthing of any nature from core and frame should not be provided. Earthing at site shall be done by taking connections from top of the tank. The insulation of core to bolts and core to clamp plates shall be able to withstand a voltage of 2 KV (rms) for 1 minute.

d) Core and winding shall be capable of withstanding the shock during transport, installation and service. Adequate provision shall be made to prevent movement of core and winding relative to tank during these conditions.

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

f) Each core lamination shall be insulated with a material that will not deteriorate due to pressure and hot oil.

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

h) Adequate lifting lugs will be provided to enable the core and windings to be lifted.

5.5.14 Windings

a) The Bidder shall ensure that windings of all 400 kV class transformers are made in dust proof and conditioned atmosphere.

b) The conductors shall be of electrolytic grade copper free from scales andburrs.

c) 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 inactive in transformer oil during service.

d) 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.

e) The coils would be made up, shaped and braced to provide for expansion and contraction due to temperature changes.

f) The conductor shall be transposed at sufficient intervals in order to minimize eddy currents and to equalise the distribution of currents and temperature along the winding.

5.5.15 Insulating oil:

(a) **Insulating oil shall be type II of IS: 335:2018**. The quality of the oil supplied with transformer shall conform to the oil parameters specified in this clause. No inhibitors shall be used in the oil. The oil samples will be drawn as follows

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

All tests as per IS: 335:2018 shall be conducted on all samples.

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

(c) Sufficient quantity of oil necessary for first filling of all tanks, coolers and radiator at the proper level along with 10% extra oil by weight for topping up shall be supplied in on-returnable containers suitable for outdoor storage.

(d) Power Transformers shall be supplied with oil.

(e) The parameter of the **Type II** transformer oil should confirm the values given in schedule-I Sl. No. 32.

(f) The bidder shall warrant that characteristic of oil furnished shall comply with the requirements specified in **IS-335, 2018** with latest amendment/revision and shall be suitable for EHV grade transformers.

5.5.16 Terminal Arrangements

i) Bushings

Oil impregnated paper insulated condenser type bushing shall be provided for 420 KV, 245 KV and 72.5 KV class with the following specifications.

Oil Filled condenser type bushing shall be provided with at least the following fittings:

(a) Oil level gauge.
(b) Oil filling plug and drain valve if not hermetically sealed.
(c) Tap for capacitance and tan delta test.

These bushings shall be outdoor immersed self-contained draw-through lead or rod type, with oil filling. The active part of bushing shall consist of a condenser body built up around a centre tube using high quality kraft insulating paper. The paper craft shall be wound over the centre tube with pure aluminium foils inserted at pre designed locations to get optimum combination of external flashover and internal puncture strength.

The condenser body shall be enclosed in weather resistant housing consisting of a top expansion chamber, upper porcelain, a welded flange – ground sleeve assembly, lower porcelain and a bottom cap. The annular space between the condenser body and the housing shall be filled with Grade-I transformer oil. An assembly located in the top housing hold all the gasket and O ring between porcelain and metal parts thereby completely sealing the bushing. An oil sight window shall be provided on the expansion chamber for observing the oil level. The space in the expansion chamber above oil shall be filled with dry Nitrogen gas.

Brown glazed porcelain insulators of high strength are used as air end and oil end insulators. Air end porcelain shall normally be provided with total nominal creepage length 25 mm/KV of the rated voltage unless otherwise specified. Oil end porcelain shall be cone shaped without shed. Air end porcelain shall be provided with long and short sheds(aerodynamic shed profile).Porcelain used in bushing manufacture shall be homogenous, free from lamination, cavities and other flaws or imperfections that might affect the mechanical or dielectric quality and shall be thoroughly vitrified, tough and impervious to moisture. Bushings shall be manufactured from high quality porcelain. Glazing of the porcelain shall be uniform brown in colour, free from blisters, burrs and similar other defects.

Bushings hollow column insulators shall be designed to have ample insulation, mechanical strength and rigidity for the conditions under which they will be used. The hollow column insulator shall be of reputed make and subject to the approval of CSPTCL. Bushing porcelain shall be robust and capable of withstanding the internal pressures likely to occur in service. The design and location of clamps and the shape and the strength of the porcelain flange securing the bushing to the tank shall be such that there is no risk of fracture. All portions of the assembled porcelain enclosures and supports

other than gaskets, which may in any way be exposed to the atmosphere shall be composed of completely non hygroscopic material such as metal or glazed porcelain.

When operating at normal rated voltage there shall be no electric discharge between the conductors and bushing which would cause corrosion or injury to conductors, insulators or supports by the formation of substances produced by chemical action. No radio interference shall be caused by the insulators bushings when operating at the normal rated voltage.

All iron parts shall be hot dip galvanised and all joints shall be air tight. Galvanized bolts and nuts shall be used as fasteners. Surface of joints shall be trued up porcelain parts by grinding and metal parts by machining. Bushing design shall be such as to ensure a uniform compressive pressure on the joints.

After assembly, the bushings shall be dried out at a very high vacuum pressure. These shall then be impregnated with transformer oil. Oil impregnation shall be carried out under pressure. The oil level in bushing shall then be adjusted and the bushings shall be sealed subsequently.

For the bushings of rated voltage 420 KV &245 KV, stress relieving shield shall be provided on the lower cap. The shield shall consist of an aluminium shroud insulated in kraft paper and press board moulding. The maximum stress in oil and the surface of these shield insulation must be limited to those values normal for insulated conductors and similar components in the same transformer.

The draw lead or draw rod connecting the top terminal will be supplied along with bushing. The complete joint connector shall be provided with the draw lead and the free connector shall be suitable for brazing the lead from the connecting improvement in the case of draw rod the free end shall form the connector. For the air side connection, rod type terminal shall be provided.

The bushing shall be provided with an insulation test tap suitable for measuring bushing power factor (dissipation factor) and capacitance by ungrounded specimen test method. The cover of this tap should be removed from the tap attachment only for testing purpose. Normally the tap shall be grounded through the cover and the bushing shall not be operated with cover remove.

Where current transformers are specified, the bushings shall be removable without disturbing the current transformers.Bushings of identical rating shall be interchangeable.Bushing turrets shall be provided with vent pipes, to route any gascollection through the Buchholz relay. Suitable insulating cap (preferably of porcelain) shall be provided on the terminal of Bushing of tertiary winding to avoid accidental external short circuit. Tertiary Bushing shall preferably be mounted at the same level as that of HV and IV bushings.

Tests:

Bushings shall conform to type tests and shall be subjected to routine tests in accordance with IS: 2099, IEC 60137, IS: 2544 & IS: 5621. The following type test reports of the offered bushings shall have to be submitted for approval.

a) Wet power frequency voltage withstand test.
b) Dry lighting impulse voltage withstand test.
c) Dry or wet switching impulse voltage withstand test.
d) Thermal stability test.
e) Temperature rise test.
f) Thermal short time current withstand test.
g) Dynamic current withstand test.

h) Cantilever load withstand test.
i) Tightness test on liquid filled and liquid insulated bushings.

The dielectric tan delta value shall not be more than 0.005.The insulation resistance of the bushing shall not be less than 20 G ohm. The partial discharge of the bushing shall not be more than 10 pC.

ii) Terminal connectors:

a) Terminals shall be provided with terminal connectors of approved type and size for connection to external parts. Terminal connectors must have been successfully type tested strictly as per IS: 5561.The connector offered should be in line with the approved drawing.

b) Connectors shall be in two parts. The Bushing stud part shall be of copper and conductor part shall be of Aluminium. The copper part shall be electrolytic grade copper forged and silver plated/tinned for 10 Minorca's.

c) No part of a clamp shall be less than 15mm thick.Minimum conductor coverage on the clamp shall be 100mm. Minimum terminal coverage in the clamp shall be 100mm and minimum pad overlap in the clamp shall be 100*100 mm.

d) Non-magnetic stainless steel nuts, bolts and washers shall be used. Nuts and bolts shall have hexagonal head with threads as per IS and shall be fully threaded type. Also instead of spring washers check/lock nuts shall be provided.

e) The connectors shall be designed for minimum 120% of the maximum current carrying capacity of the ACSR conductor and the temperature rise under these conditions shall not be more than 50% of that of the main conductor.The terminal connector of should be suitable for twin Moose conductor

The terminal connectors shall also meet the following requirements:

i) Terminal connector shall be tested for short circuit current capability test, temperature rise test, corona test etc. The drawing of terminal connector offered shall have to be got approved by CSPTCL
ii) All castings shall be free from blow holes, surface blisters, cracks and cavities. All sharp edges and corners shall be blurred and rounded off.
iii) For bimetallic connectors, copper alloy liner of minimum thickness of 2 mm shall be integral with aluminium body.
iv) Flexible connectors shall be made from tinned copper sheets.

iii) Bushing Current Transformer:

a) The transformer shall be provided with bushing CTs on HV, IV & Neutral for the purpose of REF protection. The ratio and accuracy class shall be as specified. The bushing CTs will be in addition to the WTI CTs required on HV, IV & LV.

b) Current transformers shall comply with IS: 2705.

c) It shall be possible to remove turret mounted CTs from the transformer tank without removing the tank cover. Necessary precautions shall be taken to minimize the eddy currents and local heat generated in the turret.

d) All secondary leads shall be brought to a terminal box near each bushing. These terminals shall be wired out to cooler Control Cabinet using separate cables for each core.

e) Bushing CT parameters indicated in the specification are tentative and liable to change within reasonable limits. The Bidder shall obtain Purchaser's approval before proceeding with design of Bushing CTs.

iv) Terminal Marking

The terminal marking and their physical position shall be as per IS: 2026.

5.5.17 Neutral Earthing Arrangement

The neutral terminal of auto transformer shall be brought to the ground level by a tinned copper grounding bar (min. size 80 mmx 10 mm), supported from the tank by using porcelain insulators of 36 KV rating. The end of the tinned copper bar shall be brought to the bottom of the tank, at a convenient point, for making bolted connection to two (2) **numbers Moose conductor** connected to grounding mat.

Suitable flexible copper strip connection of adequate size shall be provided for connecting to Neutral Bushing terminals to avoid terminal load on the Bushings.

5.5.18 Cooling Equipment and its Control

A) <u>Cooling Equipment</u>

i) The cooler shall be designed using 2 x 50% radiator banks. Design of cooling system shall satisfy the performance requirements.

ii) Each radiator bank shall have its own cooling fans, oil pumps, oil flow indicator, shut off valves at the top and bottom (80 mm size), lifting lugs, top and bottom oil filling valves, air release plug at the top, a drain and sampling valve and thermometer pocket fitted with captive screw cap on the inlet and outlet.

iii) Required number of standby fans of approximately 20% capacity shall also be provided with each radiator bank.

iv) Cooling fans shall not be directly mounted on radiator bank which may cause undue vibration. These shall be located so as to prevent ingress of rain water. Each fan shall be suitably protected by galvanised wire guard. **The exhaust air flow from cooling fan shall not be directed towards the main tank in any case.**

v) Two (2), 100% centrifugal or axial on line oil pumps (out of which one pump shall be standby) shall be provided with each radiator bank. Measures shall be taken to prevent mal operation of Buchholz relay when all oil pumps are simultaneously put into service. The pump shall be so designed that upon failure of power supply to the pump motor, the pump impeller will not limit the natural circulation of oil.

vi) An oil flow indicator shall be provided for the confirmation of the oil pump operating in a normal state. An indication shall be provided in the flow indicator to indicate reverse flow of oil/loss of oil flow.

vii) Cooling fans and oil pump motors shall be suitable for operation from 415 volts, three phase 50 Hz power supply and shall conform to IS:325. Each cooling fan and oil pump motors shall be provided with starter thermal overload and short circuit protection. The motor winding insulation shall be conventional class 'B' type. Motors shall have hose proof enclosure equivalent to IP:55 as per IS:4691.

viii) The cooler and its accessories shall preferably be hot dip galvanised or corrosion resistant paint should be applied to it.

ix) Expansion joint shall be provided, one each on top and bottom cooler pipe connections.

x) Air release device and oil plug shall be provided on oil pipe connections. Drain valves shall be provided in order that each section of pipe work can be drained independently.

B) Cooling Equipment Control (ONAN /ONAF /OFAF COOLING)

i) Automatic operation control of fans/pumps shall be provided (with temperature change) from contacts of winding temperature indicator. The Bidder shall recommend the setting of WTI for automatic change over of cooler control from ONAN to ONAF and then to OFAF. The setting shall be such that hunting i.e. frequent start-up operations for small temperature differential do not occur.

ii) Suitable manual control facility for cooler fans and oil pumps shall be provided.

iii) The changeover to standby oil pump in case of failure of service oil pump shall be automatic.

iv) Selector switches and push buttons, shall also be provided in the cooler control cabinet to disconnect the automatic control and start/stop the fans and pump manually.

C) Indicating Devices

Following lamp indications shall be provided in cooler control cabinet :

a) Control Supply failure.
b) Cooling fan failure for each bank.
c) Cooling pump failure for each pump.
d) No oil flow/reverse oil flow for pumps.
e) Common thermal overload trip.

One potential free initiating contact for all the above conditions shall be wired independently to the terminal blocks of cooler control cabinet . It shall have the provision of control and monitoring of cooler individual fan/pump also.

5.5.19 Valves

a) All valves upto and including 100 mm shall be of gun metal or of cast steel/cast iron. 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 clock wise when facing the hand wheel.

b) Suitable means shall be provided for locking the valves in the open and close positions. Provision is not required for locking individual radiator valves.

c) Each valve shall be provided with the indicator to show clearly the position of the valve.

d) All valves flanges shall have machined faces.

e) All valves in oil line shall be suitable for continuous operation with transformer oil at 100^0C.

f) The oil sampling point for main tank shall have two identical valves to be put in series . Oil sampling valve shall have provision to fix rubber hose of 10 mm size to facilitate oil sampling.

g) A valve or other suitable means shall be provided to fix the on line dissolved gas monitoring system to facilitate continuous dissolved gas analysis. The location & size of the same shall be finalised during detail engineering stage.

h) Suitable valves shall be provided to take sample of oil from the OLTC chamber during operation of the transformer.

i) After testing, inside surface of all cast iron valves coming in contact with oil shall be applied with one coat of oil resisting paint/varnish with two coats of red oxide zinc chromate primer followed by two coats of fully glossy finishing paint conforming to IS:2932 and of a shade (preferably red or yellow) distinct and different from that of main tank surface. Outside surface except gasket setting surface of butterfly valves shall be painted with two coats of red oxide zinc chromate conforming to IS:2074 followed by two coats of fully glossy finishing paint.

j) All hardware used shall be cadmium plated/electro galvanised.

5.5.20 Tap Changing Equipment

5.5.20.1 Tap Change Switch General Requirement:

OLTC shall be motor operated for local as well as remote operation. An external handle shall be provided for local manual operation. This handle shall be suitable for operation by a man standing at ground level.

5.5.20.2 <u>On Load Tap Changing Gear (OLTC)</u>

i) Each Autotransformer shall be provided with voltage control equipment of the tap changing type for varying its effective transformation ratio whilst the transformers are on load and without producing phase displacement.

ii) The requirements of on load tap changing equipment are given here below :

a) The current diverting contacts shall be housed in a separate oil chamber not communicating with the oil in main tank of the transformer.

b) The contacts shall be accessible for inspection without lowering oil level in the main tank and the contact tips shall be replaceable.

c) The Bidder shall indicate the safeguards in order to avoid harmful arcing at the current diverting contacts in the event of operation of the OLTC gear under overload conditions of the transformer. Necessary tools and tackles shall be furnished for maintenance of OLTC gear.

d) The OLTC oil chamber shall have oil filling and drain plug, oil sampling valve, relief vent and level glass. It shall also be fitted with a oil surge relay the outlet of which shall be connected to a separate conservator tank.

e) The diverter switch or arcing switch shall be designed so as to ensure that its operation once commenced shall be completed independently of the control relays or switches, failure of ancillary supplies etc. To meet any contingency which may result in incomplete operation of the diverter switch, adequate means shall be provided to safeguard the transformer and its ancillary equipment.

f) Tap changer shall be so mounted that bell cover of transformer can be lifted without removing connections between windings and tap changer.

g) Local OLTC control cabinet shall be mounted on the tank in accessible position. It should be adequately ventilated and provided with anti-condensation metal clad heaters. All contactors relay coils and other parts shall be protected against corrosion, deterioration due to condensation, fungi etc.

h) Operating mechanism for on load tap changer shall be designed to go through one step of tap change per command. Subsequent tap changes shall be initiated only by a new or repeat command.

i) On load tap changer shall be equipped with a time delayed INCOMPLETE STEP alarm consisting of a normally open contact which closes, if the tap changer fails to make a complete tap change. The alarm shall not operate for momentary loss of auxiliary power.

j) The selsyn units or approved equivalents shall be installed in the local OLTC control cabinet to provide tap position indication for the transformer .The Bidder shall also provide a set of instruments for tap position indication in the control room. Complete mounting details shall be included in the approved diagram.

k) Transformer on load tap shall be equipped with a fixed resistor network capable of providing discrete voltage steps for input.

l) Limit switches shall be provided to prevent overrunning of the mechanism and shall be directly connected in the circuit of the operating motor. In addition, a mechanical stop shall be provided to prevent over-running of the mechanism under any condition.

m) Limit switches may be connected in the control circuit of the operating motor provided that a mechanical de-clutching mechanism is incorporated.

n) Thermal device or other means shall be provided to protect the motor and control circuit. All relays, switches, fuses etc. shall be mounted in the local OLTC control cabinet and shall be clearly marked for the purpose of identification.

o) A permanently legible lubrication chart if required shall be fitted within the local OLTC control cabinet.

p) Any 'DROP DOWN' tanks associated with the tap changing apparatus shall be fitted with guide rod to control the movements during lifting or lowering.

q) A five digit counter shall be fitted to the tap changing equipment to indicate the number of operations completed.

r) All relays and operating devices shall operate correctly at any voltage between the limits specified.

s) It shall not be possible to operate the electric drive when the manual operating gear is in use.

t) It shall not be possible for any two controls to be in operation at the same time.

u) The equipment shall be suitable for supervisory control and indication with make before break multi-way switch, having one potential free contact for each tap position. This switch shall be provided in addition to any other switch/switches which may be required for remote tap position indication.

v) Operation from the local or remote control switch shall cause one tap movement only until the control switch is returned to the off position between successive operation.

w) All electrical control switches and the local operating gear shall be clearly labelled in a suitable manner to indicate the direction of tap changing.

x) Transfer of source in the event of failure of one AC supply shall not affect the tap changer.

5.5.20.3 OLTC Control of Three Phase AutoTransformers

Each three phase transformer shall be suitable for local and remote control. The control feature shall provide the following:

i) Local Electrical Control

(a) 'Local-remote' selector switch mounted in the local OLTC control cabinet shall switch control of all load tap changers as followings:

i) When the selector switch is in 'local' position, it shall be possible to operate the 'raise-lower' control switches specified in clause 5.5.20.3(i-b) below. Remote control of the raise-lower functions shall be prevented.

ii) When the selector switch is in 'remote' position the local OLTC control cabinet mounted 'raise-lower' switch specified in clause 5.5.20.3(i-b) below shall be in-operative. Remote control of the raise/lower function shall be possible from the remote control panel. The 'local-remote' selector switch shall have at least two spare contacts per position which are closed in that position but open in the other position.

(b) A 'raise-lower' control switch/push button shall be provided in the local OLTC control cabinet. This switch shall be operative only when 'local remote' selector switch is in 'local' position.

(c) An OFF-ON tap changer control switch shall be provided in the local OLTC control cabinet of the transformer. The tap changer shall be inoperative in the OFF position. Also the OFF-ON switch shall have atleast one spare contact per position which is closed in that position but open in the other position.

(d) There shall be a provision of Emergency trip of tap operation.

ii) Manual Control

The cranking device for manual operation of the OLTC gear shall be removable and suitable for operation by a man standing at ground level. The mechanism shall be complete with the following:

a) Mechanical tap position indicator which shall be clearly visible from near the transformer.

b) A mechanical operation counter.

c) Mechanical stops to prevent over-cranking of the mechanism beyond the extreme tap positions.

d) The manual control considered as back up to the motor operated load tap changer control shall be interlocked with the motor to block motor start-up during manual operation. The manual operating mechanism shall be labelled to show the direction of operation for raising the HV terminal voltage and vice-versa.

iii) Remote Electrical Group Control

The OLTC control scheme offered shall have provision of remote electrical group control during the parallel operation of transformer. This is in addition to independent control of OLTC.

a) A four position selector switch having Master, Follower, Independent and Off position shall be provided in the remote OLTC control panel for each transformer. This shall be wired to enable operator to select operation of OLTC in either Master, Follower or Independent mode.

b) Out of step relays with timer contacts shall also be provided to give alarm and indication in case tap position in all the transformers under group control are not in same position.

c) Master Position

If the selector switch is in Master position, it shall be possible to control the OLTC units in the follower mode by operating the controls of the master unit. Independent operation of the units under Follower mode shall have to be prevented. However the units under independent mode will be controlled independently.

d) Follower Position

If the selector switch is in Follower mode, control of OLTC shall be possible only from panel of the Master unit.

e) Independent Position

In this position of Selector Switch, Control of OLTC of individual unit shall only be possible.

f) There shall be a provision of emergency Trip of the tap change operation.

iv) The control circuits shall comply with following conditions:

1.1 An interlock to cut off electrical control automatically upon recourse being taken to the manual control in emergency.

1.2 Reinforcement of the initiating impulse for a tap change, ensuring a positive completion once initiated to the next (higher or lower) tap.

1.3 "Step-by-Step" operation ensuring only one tap change from each tap changing impulse and a lock-out of the mechanism if the control switch (or push button) remains in the "operate" position.

1.4 An interlock to cut-out electrical control when it tends to operate the gear beyond either of the extreme tap positions.

1.5 An electrical interlock to cut-off a counter impulse for reverse step change being initiated during a progressing tap change and until the mechanism comes to rest and resets circuits for a fresh position.

1.6 Tap change in progress indication shall be provided by means of an indicating lamp at the Employer's control panel. Necessary contacts for this and for remote tap position indicator at Employer's control panel shall be provided by the Bidder.

1.7 Protective apparatus, considered essential by the Bidder according to specialities of the gear.

v) Local OLTC Control Cabinet, Cooler Control Cabinet and Remote Tap Changer Control Panel

1.1 Each single/three phase transformer unit shall be provided with local OLTC control cabinet, cooler control cabinet and RTCC panel.

1.2 The sheet steel used for cooler control cabinet and local OLTC control cabinet shall be at least 2.5 mm thick. The degree of protection shall be IP:55 in accordance with IS:13947. The gaskets used shall be of neoprene rubber. All the separately mounted cabinets and panels shall be free standing floor mounted type and have domed or sloping roof. All the control cabinets shall be provided with suitable lifting arrangement.

1.3 A space heater, and cubicle lighting with ON-OFF switch shall be provided in each panel.

1.4 Necessary shorting of terminals shall be done at the cooler control cabinet, local OLTC cabinet and remote OLTC panel. All the CT secondary terminals in the cooler control cabinet shall have provision for short circuiting to avoid CT open circuit while it is not in use.

vi) Cooler Control Cabinet

1.1 The cooler control cabinet shall have all necessary devices meant for cooler control and local temp. indicators. All the contacts of various protective devices mounted on the transformer and all the secondary terminals of the bushing CTs shall also be wired upto the terminal board in the cooler control cabinet. All the necessary terminals for remote connection to Employer's panel shall be wired upto the cooler control cabinet.

1.2 The cooler control cabinet shall have two (2) sections. One section shall have the control equipment exclusively meant for cooler control. The other section shall house the temperature indicators, aux. CTs and the terminal boards meant for termination of various alarm and trip contacts as well as various bushing CT secondary. The Minimum size of the Cooler Control panel shall be 2200 mm x 1600mm x 800mm. Alternatively the two sections may be provided as two separate panels depending on the standard practice of the Bidder.

1.3 The temperature indicators shall be so mounted that the dials are about 1200 mm from ground level. Glazed door of suitable size shall be provided for convenience of reading.

1.4. **Local OLTC Control Cabinet:** The Local OLTC control cabinet shall house all necessary devices meant for OLTC control and indication. It shall be complete with the following:

i) A circuit breaker/contactor with thermal overload devices for controlling the AC Auxiliary supply to the OLTC motor.
ii) Cubicle light with door switch.
iii) Space heaters to prevent condensation of moisture.
iv) Padlocking arrangement for hinged door of cabinet.
v) Cable terminal glands for power and control cables to the OLTC gear.

5.5.21. Remote Tap Changer Control Panel.

The bidder shall supply a Remote Tap Changer Control (RTCC) panel suitable for remote operation of On load tap changing gear.

The auxiliary devices for remote electrical control of the OLTC and Cooler shall be housed in a separate panel to be placed in the Control room. The panel shall be made of sheet steel of not less than 14 SWG and it shall be duly finished with stove enamel paint. The size and of the control cubicle to be supplied by the bidder shall be 750 mm depth and 2312 mm height and colour opaline green shade no. 275 of B.S.271-C: 1948, respectively. The width of the cubicle to be as per manufacturer's practice. Control and signal devices required to be mounted in the RTCC Panel shall comprise of the following.

i. Local - Remote selector switch for OLTC .
ii. Actuating switch/push; button for electrical raise/lower control.

iii. Remote tap position indicator with tap number and corresponding; rated voltage marked on the; instrument. The tap position indicators shall be digital type.
iv. A four position selector switch having master follower, independent and off position.
v. Repeater dial of transformer winding temperature indicator.
vi. Name plate for each component.
vii. Initiating devices and contacts for alarm as well as for indications for discordance in the tap changer if any of the parallel operating transformer.
viii. Cubicle lamp actuated by door, switch, space heater power sockets etc. shall be provided inside RTCC panel.
ix. Annunciator (facia type) Scheme complete with accessories for the following:
(a) Tap changer out of step.
(b) Tap changer motor trip.
(c) Failure of AC supply to the OLTC local control Kiosk.
(d) Fan failure of each group.
(e) Control supplies failure main and standby.
(f) Cooler supply failure for each supply.
(g) Two spare windows
(h) OLTC at extreme positions i.e. lowest or highest tap.
x. **Signal lamps for:**
(i) Fan 'ON' for each group.
(ii) Standby fan 'ON' for each group.
(iii) Cooling system on manual.
(iv) Cooling system on automatic control.
(v) 415 volts cooler supply auto change over.
(vi) Healthy supply to control gear.
(vii) Tap change in progress.

xi. Emergency stop push button will be provided in local control cubicle as well as on remote tap changer control cubicle panel.
xii. 3 No. digital volt meter of 0.5 Accuracy Class (1 for HV,IV& LV) with selector switch should be provided. HRC cartridge fuse shall be provided for HV and IV PT secondary voltage.
xiii. One No. Ammeter of 0.5 accuracy class for delta winding circulating current (digital)

The RTCC panel shall house actuating switch for electrical raise/lower control, tap position indicator, signal lamps for "Tap change in progress" and "Tap changer out of step", and all other auxiliary devices for remote electrical control of the OLTC. For tap position indicator, the dual output type OLTC transducer shall be rovided in the RTCC panel. The one of the output of this transducer shall be used for local indication of tap position in RTCC panel and other output (0-10 mA or 4-20 mA) shall be used for RTUs.

5.5.22 Auxiliary Power Supply of OLTC, Cooler Control and Power Circuit

1.1 Two auxiliary power supplies, 415 volt (+)10%(-)20%, three phase four (4) wire shall be provided at cooler control cabinet for OLTC and cooler control and power circuit.
1.2 All loads shall be fed by one of the two feeders through an electrically interlocked automatic transfer switch housed in the cooler control cabinet for on load tap changer control and cooler circuits.
Design features of the transfer switch shall include the following:
a) Provision for the selection of one of the feeder as normal source and

other as standby.

b) Upon failure of the normal source, the loads shall be automatically transferred after an adjustable time delay to standby sources.

c) Indication to be provided at cooler control cabinet for failure of normal source and for transfer to standby source and also for failure to transfer.

d) Automatic re-transfer to normal source without any intentional time delay following re-energization of the normal source.

e) Both the transfer and the re-transfers shall be dead transfers and AC feeders shall not be paralleled at any time.

1.3 Power Supply for OLTC Circuits

a) AC feeder shall be brought to the local OLTC control cabinet by the Bidder after suitable selection at cooler control cabinet for which description is given in 3.11.2 above, for control power circuit of OLTC.

b) The Bidder shall derive AC power for OLTC control circuitry from the AC feeder as mentioned above by using appropriately rated dry type transformers. If the control circuit is operated by DC supply, then suitable main and standby converters shall be provided by the Bidder to be operated from AC power source.

1.4 Power Supply for Cooler Circuits

a. Control and power supplies are to be given for Cooler circuits after the selection as mentioned above.

b. The Bidder shall derive AC power for Cooler Control Circuitry from the AC feeder as mentioned above by using appropriately rated dry type transformer. If the control circuit is operated by DC supply then suitable main and standby convertors shall be provided by the Bidder, to be operated from AC power source.

c. Necessary isolating switches and HRC fuses shall be provided at suitable points as per Employer's approved scheme.

5.5.23 Fittings

1.1 The following fittings shall be provided with each three phase transformer covered in this specification :

1.1.1 Conservator for main tank with oil filling hole and cap, isolating valves, drain valve, magnetic oil level gauge with low level alarm contacts and dehydrating breather..

1.1.2 Conservator for OLTC with drain valve, oil surge Relay, filling hole with cap, prismatic oil level gauge and silicagel breather.

1.1.3 Oil preservation equipment.

1.1.4 Pressure relief devices with alarm/trip contacts.

1.1.5 Buchholz relay double float/reed type with isolating valves on both sides, bleeding pipe with pet cock at the end to collect gases and alarm and trip contacts.

1.1.6 Air release plug.

1.1.7 Inspection openings and covers.

1.1.8 Bushing with metal parts and gaskets to suit the termination arrangement.

1.1.9 Winding temperature indicators for local and remote mounting. One remote winding temperature indicator with a four point selector switch shall be provided for the three windings for three phase unit to have selection of any of the three windings.

1.1.10 Cover lifting eyes, transformer lifting lugs, jacking pads, towing holes andcore and winding lifting lugs.

1.1.11 Protected type mercury or alcohol in glass thermometer.

1.1.12 Bottom and top filter valves with threaded male adaptors, bottomsampling valve and drain valve.

1.1.13 Rating and diagram plates on transformers and auxiliary apparatus.

1.1.14 Flanged bi-directional wheels/Trolley for movement

1.1.15 Cooler control cabinet.

1.1.16 On load tap changing gear.
1.1.17 Cooling equipment.
1.1.18 Bushing current transformers.
1.1.19 Oil flow indicator.
1.1.20 Drain valves/plugs shall be provided in order that each section of pipe work can be drained independently.
1.1.21 Terminal marking plates.
1.1.22 Valves schedule plates.

1.2 The fittings listed above are only indicative and other fittings which generally are required for satisfactory operation of the transformer are deemed to be included.

5.6 Inspection and Testing

The bidder shall carry out a comprehensive inspection and testing programme during manufacture of the equipment.

1.1 Inspection

1.1.1 Tank and Conservator

1.1.1.1 Certification of chemical analysis and material tests of plates.
1.1.1.2 Check for flatness.
1.1.1.3 Electrical interconnection of top and bottom by braided tinned copper flexible.
1.1.1.4 Welder's qualification and weld procedure.
1.1.1.5 Testing of electrodes for quality of base materials and coatings.
1.1.1.6 Inspection of major weld preparation.
1.1.1.7 Crack detection of major strength weld seams by dye penetration test.
1.1.1.8 Measurement of film thickness of:
i) Oil insoluble varnish.
ii) Zinc chromate paint.
iii) Finished coat.
1.1.1.9 Check correct dimensions between wheels, demonstrate turning of wheels through 90^0C and further dimensional check.
1.1.1.10 Check for physical properties of materials for lifting lugs, jacking pads, etc. All load bearing welds including lifting lug welds shall besubjected to NDT.
1.1.1.11 Leakage test of the conservator.
1.1.1.12 Certification of all test results.

1.1.2 Core

1.1.2.1 Sample testing of core materials for checking specific loss,bendproperties, magnetisation characteristics and thickness.
1.1.2.2 Check on the quality of varnish if used on the stampings:
i) Measurement of thickness and hardness of varnish on stampings.
ii) Solvent resistance test to check that varnish does not react in hot oil.
iii) Check over all quality of varnish by sampling to ensure uniform shining colour, no bare spots, no over burnt varnish layer and no bubbleson varnished surface.
1.1.2.3 Check on the amount of burrs.
1.1.2.4 Bow check on stampings.
1.1.2.5 Check for the overlapping of stampings. Corners of the sheet are to bepart.
1.1.2.6 Visual and dimensional check during assembly stage.
1.1.2.7 Check for inter laminar insulation between core sectors before and afterpressing.
1.1.2.8 Check on completed core for measurement of iron loss and check for any hot spot by exciting the core so as to induce the designed value of flux density in the core.
1.1.2.9 Visual and dimensional checks for straightness and roundness of core,thickness of limbs and suitability of clamps.

1.1.2.10 High voltage test (2 kV for one minute) between core and clamps.
1.1.2.11 Certification of all test results.

1.1.3 Insulation Material

Sample check for physical properties of materials.Check for dielectric strength.Visual and dimensional checks.Check for the reaction of hot oil on insulating material.Dimension stability test at high temperature for insulating Material.Tracking resistance test on insulating material Certification of all test results.

1.1.4 Winding

Sample check on winding conductor for mechanical properties and electrical conductivity.
Visual and dimensional checks on conductor for scratches, dent marks etc.
Sample check on insulating paper for pH value, bursting strength and electric strength.
Check for the reaction of hot oil on insulating paper.
Check for the bonding of the insulating paper with conductor.
Check and ensure that physical condition of all materials taken for windings is satisfactory and free of dust.
Check for absence of short circuit between parallel strands. Check for brazed joints wherever applicable.
Measurement of voltage ratio to be carried out when core/yoke is completely restacked and all connections are ready.
Conductor enamel test for checking of cracks, leakage and pin holes. Conductor flexibility test
Heat shrink test for enamelled wire.

1.1.5 Certification of all test results.

Checks before Drying Process
Check condition of insulation on the conductor and between the windings.
Check insulation distance between high voltage connections, cables and earth and other live parts.
Check insulating distances between low voltage connections and earth and other parts.
Insulation of core shall be tested at 2 KV/minute between core to bolts and core to clamp plates.
Check for proper cleanliness and absence of dust etc. Certification of all test results.

1.1.6 Checks During Drying Process

Measurement and recording of temperature, vacuum and drying time during vacuum treatment.
Check for completeness of drying by periodic monitoring of IR and Tan delta.
Certification of all test results.

1.1.7 Assembled Transformer

Check completed transformer against approved outline drawings, provision for all fittings, finish level etc.
Test to check effective shielding of the tank.
Jacking test with oil on all the assembled transformers.
Dye penetration test shall be carried out after the jacking test.

1.1.8 Bought Out Items

The makes of all major bought out items shall be as per the List of Vendors given in this tender document.

The Bidder shall also prepare a comprehensive inspection and testing programme for all bought out/sub-contracted items and shall submit the same to the Employer for approval. Such programme shall include the following components:

a) Buchholz Relay.
b) Axles and wheels.

c) Winding temperature indicators for local and remote mounting.
d) Oil temperature indicators.
e) Bushings.
f) Bushing current transformers.
g) Cooler control cabinet.
h) Cooling equipment.
i) Oil pumps.
j) Fans/Air Blowers
k) Tap change gear.
l) Terminal connectors.

The above list is not exhaustive and the Bidder shall also include other required bought out items in his programme.

6.0 Tests

i) The type test reports of the transformer (as per latest version of IS: 2026) of offered or higher rating conducted at Govt. / Govt. approved laboratory or witnessed by Govt. / Govt. approved laboratory representative should be submitted. The type tests should not be older than **five years**.

ii) Copies of all routine test reports as per latest version of IS:2026 on offered or higher rating transformer conducted within five years on due date of opening should also be submitted with the bid.

iii) All routine and additional routine tests shall be carried out on each transformer. The type and special tests mentioned in clause-6.2 shall be carried out on one unit out of the lot. All routine & type tests shall be witnessed by representative of CSPTCL & ERDA/CPRI or any other agency authorized by CSPTCL.

iv) The charges for conducting each type test and special tests shall be indicated separately in the relevant schedule.

6.1 Routine tests:-

All standard routine tests in accordance with IS: 2026 (with latest amendment), with dielectric tests as per IS:2026 part-III (with latest amendment) shall be carried out on each transformer. Further some additional routine tests shall also be carried out on each unit.

The list of routine and additional routine tests shall be carried out on each unit according to the methods specified in IS:2026 (Part-I):2011 and IS:2026 (Part-III):2009. The details of the tests to be carried out are as given here under:

Sl.	Particulars
(A) Routine tests:	
1	Measurement of winding resistance at all taps
2	Measurement of voltage ratio at all taps and check of phase displacement
3	Measurement of Impedance voltage/ short circuit impedance (Principal tap) & load loss
4	No load loss and current (before & after HV & TR Routine Tests) at 90%, 100%,105 % and 110% of rated voltage with 3W, 3A, 3V meters methods.
5	Measurement of Insulation resistance
6	Dielectric routine tests as per IS:2026 (Part-III) i.e. a) lightning impulse tests on all phases of HV/IV/LV windings b) short duration induced AC withstand voltage tests c) separate source AC withstand voltage tests
7	Tests on load tap changers

(B) Addl. Routine Tests:	
1	Dimensional checks as per approved drawing & specification
2	Magnetic circuit test. After assembly ,core shall be tested for 1 minute for 2000 volts AC between all bolts, side plates & structures steel works
3	Polarisation index – IR value for 15 sec, 60 sec & 600 sec duration shall be recorded and PI for 600/60 sec and DAR i.e. ratio of IR values of 60/15 seconds shall be recorded. The PI value (600/60 sec) should be >=2 and DAR value (60/15 sec) should be >=1.3. These values should be recorded both before and after HV tests.
4	Tank oil leakage test – the complete transformer assly filled with oil shall be subjected to nitrogen pressure of 0.35 Kg/cm2 above the normal oil head for a period of 12 Hrs to ensure that there is no oil leakage.
5	Capacitance and tan delta measurement to determine capacitance between winding and earth. This test should be carried out before and after series of dielectric tests.
6	Tan delta & capacitance Test on bushings (Before and after HV tests)
7	**Checking of recording of IR values**
	(a) Between core & coil frame
	(b) Between core & tank
	(c) Between coil frame & main tank The measured IR values should be more than 1000 M Ohms.
8	Magnetic balance test at normal and extreme taps (Before and after HV tests)
	Magnetising Current Tests at normal and extreme taps on all three windings with LT voltage (Before and after HV tests)
9	Tests of PRDs for successful operation
10	Oil BDV test before & after HV tests
11	Sweep Frequency response analysis (SFRA) - SFRA shall be carried out at manufacturer's works with his own SFRA test set. The test shall be repeated at site with same test set.
12	Measurement of DEW point prior to dispatch of the unit filled with N_2 gas prior to dispatch - This test shall be carried out by manufacturer and results shall be submitted to CSPTCL for reference.
13	Cooler Control and RTCC Functional checks
14	Functional checks on Air cell
15	Ratio and polarity tests on Bushing Turret CTs
16	Functional checks on Buchholz Relay
17	High voltage withstand test shall be performed on auxiliary equipment and wiring after complete assembly.

Note: All testing equipments viz. CT,PT, ampere-meter, volt-meter, watt meter, frequency meter, power analyzer, Insulation resistance test kit, winding resistance test kit, winding turns ratio test kit, tan delta & capacitance measurement test kit, potential divider, temperature sensors, etc. shall be of appropriate class of accuracy and shall havevalid calibration certificates from NABL accredited labs.

6.2 Type Tests: Type/ special tests to be carried out on one transformer out of lot:

6.2.1 Temperature Rise Test:

This test as per clause 16.8 of IS:2026 (Part-I) and IS:2026 (Part-II) shall be conducted at the lowest voltage tap having maximum current with 10% over load condition (both ONAN and ONAF ratings). The supplier before carrying out such tests, shall submit detailed calculations showing the alternatives possible, on various taps and for different ratings (ONAN/ONAF), of the transformer and shall recommend the combination that results in highest temperature rise, for the test. Since 315 MVA transformer is an auto transformer, the temperature rise test shall be conducted for the condition of simultaneous loading of all three windings for their respective ONAF rating i.e. 400 KV and 220 KV winding corresponding to current of 315 MVA, and 33 KV winding for 105 MVA. Loading on two windings for 315 MVA transformer for the measured losses will not be accepted. Gas chromatographic analysis of oil shall be conducted before and after heat run test and the values shall be recorded in the test report. The sampling shall be in accordance with IEC-567. For the evaluation of the gas analysis in temperature rise test, a method will be proposed which is based on the rate of increase of particular gases and the permissible limits of minimum detectable value of gases and the maximum limit will be mutually discussed and agreed upon between the Purchaser and Supplier. This shall be treated as reference during maintenance of transformer in future.

The calibration of OTI and WTI shall be done by Transformer Manufacturer and these calibrated OTI, WTI shall be used during testing of transformer. The Sr.No.of WTI,OTI shall be recorded during testing of transformer and these indicators only shall be supplied with the transformer. During test the manufacturer selects suitable tap from CT based on gradient between the reading of WTI & OTI. This tap position is to be clearly recorded on test report so that selection of correct tap could be done at site to avoid discrepancy in temperature gradient recorded during factory test and the value recorded at site.

6.2.2 Tank vacuum test as per details given this clause subsequently.

6.2.3 Tank pressure test as per details given in this clause subsequently**.**

6.2.4 Measurement of capacitance and tan delta to determine capacitance between winding and earth.

6.2.5 Following special tests other than above mentioned tests shall also be carried out as per "IS: 2026 part-I and part-III (with latest amendment) as applicable on one unit out of the ordered lot.

(i) Measurement of zero Seq. Reactance.
(ii) Measurement of acoustic noise level.
(iii) Measurement of power taken by fans and oil pumps.
(iv) Measurement of harmonic level in no load current.
(v) Lighting impulse with chop on tail on all 3 phase of HV,IV and LV terminals.
(vi) One cooler cabinet and OLTC cabinet of the transformers (preferably for the first unit of the lot) shall be tested for IP:55 protection in accordance with IS: 2147. In case facility for this test is not available with the manufacturer or their vendor; the test has to be carried out at the laboratory of either CPRI or ERDA in presence of CSPTCL's representative and test report should be furnished.

6.2.6 Additional type tests

Following additional type tests other than type and routine tests shall also be carried out on one unit of each type:

Measurement of transferred surge on LV (tertiary) winding due to HV lightning impulse and IV lightning impulse.

6.3 Tank Tests

6.3.1 Routine Tests: Oil leakage test:

This test will be conducted on each transformer. All tanks and oil filled compartments shall be tested for oil tightness by completely filling with air or oil of a viscosity not greater than that of insulating oil conforming to IS: 335 at the ambient temperature and applying a pressure equal to the normal pressure plus 35 KN/sq m measured at the base of the tank. The pressure shall be maintained for a period of not less than 12 hours for oil and one hour or air during which time no leak shall occur.

6.3.2 Tests to be conducted on one tank out of lot:

(i) Vacuum Test

One transformer tank out of the whole lot shall be subjected to the specified vacuum. The tank designed for full vacuum shall be tested at an internal pressure of 3.33 KN/m 2 absolute (25 torr) for one hour. The permanent deflection of flat plate after the vacuum has been released shall not exceed the values specified below.

Horizontal length of flat plate (in mm)	Permanent Deflection (in mm)
Up to and including 750	5.0
751 to 1250	6.5
1251 to 1750	8.0
1751 to 2000	9.5
2001 to 2250	11.0
2251 to 2500	12.5
2501 to 3000	16.0
Above 3000	19.0

(ii) Pressure Test

One transformer tank of each size together with its radiator, conservator, vessel and other fittings shall be subjected to a pressure corresponding to twice the normal head of oil or to the normal pressure plus 35 KN/m 2 whichever is lower, measured at the base of the tank and maintained for one hour. The permanent deflection of flat plates after the excess pressure has been released, should be within the limits specified in the table given at (i) above.

6.4 Routine tests on bushings

The following tests shall be conducted on bushings

6.4.1 Test for leakage on internal fillings.

6.4.2 Measurement of creepage distance, dielectric dissipation factor &capacitance.

6.4.3 Dry power frequency test on terminal and tapping.

6.4.4 Partial discharge test followed by dielectric dissipation factor and capacitance measurement.

6.5 Type Tests on fittings:

All the following fittings shall conform to type tests and the type test reports shall be furnished by the bidder along with the drawings of equipment/ fittings. The list of fittings and the type test requirement is:

i) Bushing (Type Test as per IS: 2099/ IEC: 137)
ii) Buchholz relay (Type Test as per IS: 3637 and IP-55 Test on terminal box)
iii) OLTC (Temperature Rise of contact, Short circuit current test, Mechanical test and Dielectric Test as per IEC:214 and IP-55 test on driving mechanism box)
iv) Cooler Control cabinet (IP-55 test)
v) Pressure Relief device Test

The pressure Relief Device of each size shall be subjected to increase in oil pressure. It shall operate before reaching the test pressure specified in transformer tank pressure test. The operating pressure shall be recorded. The device shall seal off after excess pressure has been released.

The terminal box / boxes of PRD should conform to degree of protection as per IP-55 of IS: 13947.

vi) Magnetic Oil Level gauge & Terminal Box for IP-55 degree of protection.

vii) Air Cell (Flexible air separator) - Oil side coating, Air side under Coating, Air side outer coating and coated fabric as per IS: 3400/ BS: 903/ IS: 7016.

viii) OTI & WTI - Switch setting & operation, Switch differential, Switch rating.

ix) Oil pump - Vacuum Test at 250 torr maximum, oil pressure test at 1 kg/cm2 for 24 hrs, Temperature rise test by resistance method, IP-55 degree of protection for terminal box.

x) Cooling fan and motor assembly - Free air delivery, Temperature rise, sound level, running at reduced voltage, IP-55 degree of protection for terminal box.

xi) Tests on Assembled Transformer:

a) Check completed transformer against approved out line drawing, provision for all fittings, finish level etc.

b) Jacking test on the assembled Transformer.

6.6 Test reports:

(a) Copies of certified test reports and oscillograms shall be submitted for approval prior to dispatch of the equipment. The equipment shall be dispatched only when all the required type and routine tests have been carried out and test reports have been approved by the purchaser.

(b) Copies of the test reports for the tests carried out on the ancillary apparatus shall be furnished to the purchaser for approval prior to dispatch.

(c) All auxiliary equipment shall be tested as per the relevant standard. Test certificate shall be submitted for bought out items.

Apart from rejection due to failure of the transformer to meet the specified test requirements the transformer shall be liable for rejection on any one of the following reasons.

a) No load loss exceeds the permissible values mentioned in principal parameters.

b) Load loss exceeds the specified values mentioned in principal parameters.

c) Impedance voltage value exceeds the guaranteed value plus tolerance.

7.0 Inspection and Testing:

Inspection: CSPTCL shall have access at all times to the works and all other places of manufacture where the transformers are being manufactured and the tenderer shall provide all facilities for unrestricted inspection of the tenderers works, raw materials, manufacture of all the accessories and for conducting necessary tests as detailed herein.

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

No material shall be dispatched from its point of manufacture unless the material has been satisfactorily inspected and tested.

The acceptance of any quantity of Transformer & its accessories shall in no way relieve the bidder of his responsibility for meeting all the requirement of this specification and shall not prevent subsequent rejection if such equipments are later found to be defective.

Acceptance of condition regarding stage inspection at various stages, which will be intimated to bidder, shall be an essence of the contract to be placed against this tender.

7.1 Inspection programme:

The bidder shall chalk out a detailed inspection and testing programme for manufacturing activities for the various components. Stage inspection of core & winding and final inspection of the transformer shall be carried out at manufacturer's works in presence of CSPTCL's representative and representative of a third party i.e. CPRI/ ERDA or any other agency authorized by CSPTCL. The expenses on witness of tests by third party shall be borne by CSPTCL.

The routine tests on each transformer are to be carried out free of cost by the bidder. The rates for type & special tests for one transformer should be separately offered and the same shall be payable by CSPTCL.

7.2 Stage inspections:

7.2.1 The manufacturer shall indicate the inspections and checks carried out at various stages of the manufacture of the transformers. A complete record of stage inspection would be kept by the manufacturer and thus record should be made available for inspection by the representative of CSPTCL. The manufacturer should indicate the manufacturing programme and CSPTCL will have a right to depute its inspecting officers during the manufacture. Some of the inspecting stages are coil winding and core building, assembly of coil on core, the condition of the coil and core after the treatment in vacuum chamber, assembly within the transformer tank together with application of tap changer.

7.2.2 It may be noted that stage inspection for all the units at CSPTCL's discretion shall be done at manufacturer's works in presence of CSPTCL's representative and representative of third party authorized by CSPTCL at the following stages.

(a) **Fabrication stage of tank**: After fabrication, tank shall be inspected for measurement of its dimensions, thickness of sheets used and leakage test by applying requisite pressure/ vacuum.

(b) **Building up of core**: After the core is built but before its clamping, our representative will inspect the core to take complete weight of the core and also to measure approximate core loss. If necessary, a small strip of core shall also be taken for testing at CPRI/ ERDA or at any other testing laboratory of repute.

(c) **Preparation of winding:** Once the coils are prepared but before the same are fitted on to the core, stage inspection shall be done to take various measurements and also for weighment of total weight of coil of each voltage class. Measurement of resistance shall be taken and for this purpose, a small piece of conductor for each type of winding shall be made available by the manufacture. The magnetic balance test shall also be carried out during this stage inspection.

(d) **Core Coil Assembly.**

Apart from the above, CSPTCL also reserves the right to carry out stage inspections at other stages also, for which advance intimation shall be given and all necessary cooperation shall be rendered by the manufacturer.

7.3 Final inspection and testing:

(a). In one of the transformers out of the ordered lot all the routine, additional routine, type and special tests as mentioned in clause-6 shall be carried out as per IS:2026 (Part-I & III) at manufacturer's works in presence of CSPTCL's representative and/or representative of third party authorized by CSPTCL. At the time of final inspection, the bidder shall identify each and every item/accessories of the particular transformer under testing. Unless all the items are identified, the manufacture will not be treated as

complete. Serial number of bushings, serial number of tap changer and other details shall be entered into the test report to ensure that these items are not being applied to the subsequent transformer units while testing. Various tests stipulated in IS & IEC (Along with their Latest amendments) shall be performed in the presence of CSPTCL engineers or when the inspection waiver has been given, in such a case, the testing shall be done at the manufacturer's works as per IS stipulations and same should be confirmed by documentary evidence by way of Test Certificate which shall be got approved by CSPTCL.

(b). The WTI & OTI shall be calibrated during testing of transformer and serial Nos. of these instruments shall be recorded in test reports. The WTI & OTI used during testing shall be dispatched with the transformer so that installation of same OTI & WTI on transformer is done which are utilized during testing of transformer at manufacturer's works. The Bushings and Radiators on Transformer during testing of transformer at manufacturers works are required to be supplied with the same transformer to avoid any mismatch / misalignment etc. during assembly of transformer. This should be noted for strict compliance and confirmed specifically.

(c). Whenever inspection call for a particular transformer is given, the letter of inspection call will accompany the following:

i) List of various fittings and accessories which are ready at the works and will be offered for inspection. The Inspecting Officer will carry the list and check the items declared to have been offered for inspection.

ii) It is expected that before a transformer is finally offered for inspection, internal testing of the transformer for various important parameters like winding resistance, transformer losses, IR values etc. are already done. Routine test report for such tests shall also accompany the letter of inspection call so that the Inspecting Officer at the time of inspection may verify the parameters brought out in the preliminary report. Details of all tests should be clearly brought out.

iii) List of testing equipments and instruments which will be used during the inspection of the transformer with their makes, sl. No. and date of calibration, agency who conducted calibration and validity of calibration certificate should also be furnished along with the inspection call.

In case for any reasons inspection is not completed or equipment is not found to be complete with all accessories as per confirmation given with the letter of inspection call, CSPTCL will reserve the right to recover the complete cost of deputation of inspecting team to the works of the manufacturer.

7.4 Testing at an independent test laboratory:

CSPTCL at its discretion may get the transformer tested at a Govt. approved laboratory like CPRI/ ERDA for all the routine and type tests at the expenses of CSPTCL. In case, the test results are found to be deviating from the results during the inspection at manufacturer's works or the test results are found to be beyond the permissible limits as per the tender specifications and concerned standards, the whole lot of the transformer shall be liable for rejection.

7.5 Quality Assurance Plan:

The bidder shall invariably furnish following information along with his offer, failing which the offer shall be liable for rejection.

i) Statement giving list of important raw materials, names of sub-suppliers for the raw material, list of standards according to which the raw material are tested, list of

tests normally curried out on row material in the presence of bidder's representative, copies of test certificates.

ii) Information and copies of test certificates as in (I) above in respect of bought out items.

iii) List of manufacturing facilities available.

iv) Level of automation achieved and list of areas where manual processing exists.

v) List of areas in manufacturing process, where stage inspections are normally carried out for quality control and details of such tests and inspections.

vi) Special features provided in the equipment to make it maintenance free.

vii) List of testing equipment available with the manufacturer for final testing of equipment specified and test. Plant limitation, if any, vis-à-vis the type, special, acceptance and routine tests specified in the relevant standards. These limitations shall be very clearly brought out in "schedule of Deviations".

7.6 The bidder shall submit the following information to the purchaser.

i) Name of the raw material as well as bought out accessories and the names of sub-suppliers selected from those furnished along with the offer.

ii) Type test certificates of the raw material and bought out accessories.

iii) Quality Assurance Plan (QAP) with hold points for purchaser's inspection. The QAP and hold points shall be discussed between the purchaser and the bidder before the QAP is finalised.

8.0 CALCULATIONS REQUIRED :

Calculations/ design data required to be submitted for power transformer:

All the important data of the transformer i.e. net weight of bare copper in each winding, weight of core without clamping fixtures, weight of core and windings, Cross section of the core, Flux density calculations, Calculations for short circuit current and its duration, Current density during short circuit, Calculations showing withstand capability of windings for thermal & mechanical stresses during short circuit conditions, Mechanical design of transformer tank etc should be invariably submitted by the Bidder. After placement of detailed contract the final design calculations shall be submitted for our verification and records.

8.2 Short circuit withstands capability:

In order to ensure capability of transformer to withstand short circuit forces due to most severe fault in our inter connected net work the transformer should be designed on the basis that winding are connected to an infinite bus and fault current is limited by transformer impedance alone, ignoring system impedance. The calculations to prove dynamic and thermal short circuit withstand capability of transformer shall be submitted considering the above for transformer. The design of winding assembly which is to be furnished in the drawing should be commensurate with these calculations.

8.3 Design of tank:

Complete mechanical design of transformer tank including details of stiffeners shall be submitted. The tank shall be designed to withstand the following without permanent distortion.

(i) Mechanical shocks during transportation.

(ii) Vacuum filling of oil at 10 milli torr in transformer with all fittings.

(iii) Continuous internal pressure of 35 kN/m2 over normal hydrostatic pressure of oil.

(iv) Short circuit forces

(v) Under seismic condition /events both horizontal/vertical.

The calculations for tank stiffeners shall be submitted to prove no. &size of stiffeners are adequate to withstand full vacuum & pressure. Drawing of tank shall be submitted indicating stiffeners.

8.4 Design of static end rings (SER) and Magnetic shunts:

Details of Static End Rings (SER) and magnetic shunts, if provided, shall be submitted with calculations. A drawing indicating locations, size, material of SER and magnetic shunts shall be submitted.

8.5 Overfluxing capability:

A curve to prove suitability of transformer to withstand various Overfluxing conditions for the duration indicated in relevant clause without core saturation shall be furnished.

8.6 Cooling calculations:

Calculations of tank surface for heat dissipation, details of radiators and fans for ONAN & ONAF cooling shall be provided.

8.7 Design Data:

On the basis of offered flux density and current density, the Bidder shall furnish following design calculations & data. :

8.7.1 Core Data:

Details of core material i.e Name of manufacturer, manufacturer's type designation for core , thickness of core, curve for Loss Vs Flux density, No of steps of Core & No of limbs, gross core area, stacking factor, Net core area, height & width of core window, center to center distance of limb, voltage per turn, wt. of core material, working flux density , core loss in watts per kg marked on graph for grade of core material & selected flux density, building factor and calculated no load loss in watts, guaranteed no load loss.

Design data for core shall be submitted. A drawing indicating details of core i.e. limbed construction, step width & thickness, core belting, top & bottom yoke plate etc shall be submitted.

8.7.2 Winding Data:

Wt. of copper for windings i.e. for HV,IV, LV, tap, cross sectional area, current density, type of coil, ID/OD/mean dia of coils, size of winding conductor including parallels, no. of turns per phase, no of spacers, length of mean turn, weight of copper without paper covering, resistance per phase of winding at 75^oC, I^2R loss at 75^oC & normal tap, eddy current & stray loss at 75^oC, total copper loss at 75^oC, guaranteed transformer losses at 75^oC. Complete details of Insulation components i.e. Top & Bottom clamping rings, washers, Pressboard blocks & cylinders, Pressboard spacers & Phase barriers, Pressboard segments etc shall be submitted indicating qty , thickness in mm, width & height, wt. Design data for winding as per relevant clause shall be submitted. Dimensioned drawings indicating details of winding, ducts, insulation, take off arrangement, clamping ring, pressure points etc shall be submitted.

8.7.3 Quantity of oil:

Complete calculations of oil quantity to be utilized in transformer for first filling shall be submitted. The calculations shall indicate

(i) Volume of tank including turrets, conservator main & OLTC, volume of headers & Radiators, oil quantity in OLTC.
(ii) Oil displacement by Active parts i.e. core - coil assembly,

8.7.4 Capacity of conservator & size of air cell :

While furnishing details of conservator & air cell type sealing arrangement, the Bidder shall submit details & calculations for adequacy of size and capacity of air cell for the rating of the power transformer and also for the quantity of oil required. Catalogue of AIR

CELL should be enclosed clearly marking type designation of selected size of Air cell. A drawing indicating complete details of conservator with Air cell shall be submitted.

8.7.5 Capacity of pressure relief device:

Our specification calls for supply of pressure relief device for all power transformers. Bidders must submit calculation to prove that the capacity/ rating of pressure relief device and locations of the same for the transformer will adequately meet our requirement. Constructional and design details of pressure relief device must be furnished and it should be proved by calculation that the size and setting of pressure relief device is adequate considering the rating of the transformer and quantity of oil in the transformer.
A drawing indicating complete details of PRDs & their locations on tank shall be submitted.

8.7.6 Capacity of Silica gel breather:

The Bidder shall submit details & calculations for adequacy of size and capacity of silica gel breather for the oil quantity in the power transformer.

8.7.7 Rating of on load tap changer (OLTC):

It has been our experience that due to inadequate rating of OLTC elements, the failure of OLTC components or pitting of contacts have been observed before the claimed period for maintenance. To verify the adequacy and suitability of the OLTC components, it is necessary to furnish the calculations for selecting the proper rating of transition resistance as well as the normal current rating of OLTC. The calculations shall include the temperature rise of the OLTC diverter switch and also the short circuit current considered for calculation of temperature rise.

Calculations shall be submitted to prove that the current rating of OLTC is adequate for the rating of the transformer winding taking in to account the over loading capability as per IS 6600. The basis for selection of transition resistance and its current carrying capacity shall also be submitted. In this regard the circulating current in tap winding during tap change operation through transition resistance shall be taken in to consideration. Adequacy of insulation provided in the OLTC between various parts needs to be established with specific reference to the voltage between two taps. Confirmation shall be given that the OLTC is suitable for bidirectional flow of current. The through current capacity shall be adequate to handle on continuous basis the winding current including over loading as per IS 6600. The through current rating and the rating of transition resistance shall take in to account the short time current rating of the winding. Capability to handle short circuit current to be established by calculations and also by test reports. The above Calculations for OLTC shall be submitted.

8.7.8 Capacity of Nitrogen Cylinder, pressure in Nitrogen Cylinder to be used during transportation of transformer shall be submitted.

8.7.9 The manufacturer shall carry out optimization of Dielectric design of insulation including electromagnetic design; overload & short circuit withstand capabilities. During design, transformer modeling shall be done & finite element software (FEM) may be used.
All these data shall be kept strictly CONFIDENTIAL

PLEASE NOTE THAT SUBMISSION OF ABOVE CALCULATIONS IS A MUST IN ABSENCE OF THE ABOVE, CSPTCL RESERVES THE RIGHT TO REJECT THE TECHNICAL BID. It is assured that these data will be kept strictly confidential by CSPTCL.

8.8 The following drawings and data are to be submitted by the bidder for approval:

(a) Outline dimensional drawings of transformer and its accessories including conservator complete with Bill of material and details of all parts, their quantity, rating & name of Vendors indicating clearances of transformer body from live terminals i.e. HV,IV,LV.

(b) Drawing of transformer tank with location of inspection windows, thickness of side/bottom/top of tank, details of stiffener.

(c) Drawing indicating limbed core construction with complete details of no., width and wt. of core laminations with size of steps; thickness of core laminations ; dimension of window; size of limbs; Gross and net core ; wt. of complete core.

(d) Drawing indicating core belting arrangement with details of belting, belting material etc.

(e) Large scale dimensioned drawings for HV,IV & LV windings of the transformer; size and no. of parallel of HV,IV, LV and of cooling ducts, coil clamping arrangement, no./size & location of pressure screws, clamping ring; top yoke arrangement etc. The details should commensurate with the short circuit calculations submitted by you for each rating of transformer

(f) Detailed drawing of transformer tank with complete core and winding indicating clearances inside transformer tank as also passage and space for free movement of at least two persons for inspection of active parts etc .

(g) Schematic diagram showing the flow of oil in the cooling system as well as each limb and winding. Longitudinal and cross-sectional views showing the duct sizes, cooling pipes etc. for the transformers/radiators drawn to scale .

(h) Drawings giving the weights for foundations.

(i) Combined Rating and diagram plate including tap changing, which should also include details of guaranteed and measured no load and load losses as also winding resistances and percentage impedances at all taps.

(j) Schematic control and wiring diagram for all auxiliary equipment and control cubicle.

(k) Drawing showing constructional details, dimensions, mechanical & technical particulars of bushings. Arrangement of terminals and details of connection of bushing shall also be indicated in drawing with their technical particulars.

(l) Transportation drawing of transformer.

(m) Details of fittings and cable box.

(n) Drawing showing arrangement and details of tap changing gear including selector switch, diverter switch and drive mechanism.

(o) Valve Schedule plate.

(p) Oil filling instruction plate for conservator fitted with Air cell breather arrangement including equalizing arrangement if any required at the time of taking full Vacuum at site.

(q) Drawing and instruction for fitting of Air Cell.

(r) Drawing of conservator indicating internal details of air cell MOG, oil level gauge and silica gel breather pipe fitting arrangement.

(s) Drawings of all HV, IV& LV bushings with complete details meeting TS requirement.

(t) Drawings of HV, IV,LV& neutral terminal connectors indicating plate thickness, no. of nut bolts with size and other details.

(u) Drawing of foldable & detachable ladder with its complete details and fitting arrangement on transformer/ conservator tank.

(v) Drawing for HV/IV neutral earthing arrangement indicating voltage rating of insulators and its fitting arrangements, size of copper strips, terminal connectors etc.

(w) Detailed drawing indicating two views of all valves provided in the transformer tank.

(x) Detailed internal drawing of transformer indicating transportation locking arrangement provided to avoid shifting of core assembly.

(y) Drawing showing weights of transformers, cooling fan structures, FCC structures with distance from central line of transformer for casting of civil foundation for transformer and associated equipments.

(aa) Drawing of Earthing terminal box showing earthing arrangement for core, end frame, tank giving details of voltage class and current rating of terminal bushings.
(ab) Drawing indicating insulation thickness details and other arrangement provided between core assembly and bottom yoke and base of bottom of tank.
(ac) Drawing indicating details of 'O' ring gasketting arrangement provided in transformer tank covers.
(ad) Detailed Drawing of jacks.
(ae) Drawing of stiffeners provided on top, each faces/sides of tank with their number and size.
(af) Drawing indicating number, location, size of shields/ magnetic shunts and its material if provided inside the tank
(ag) Drawing indicating internal details of transformer giving complete details of clearances from live parts.
(ah) Drawing of internal IV/LV winding termination arrangement indicating minimum clearance between core and IV/LV take off lead.
(ai) Drawing for Lead termination to bottom of HV & IV Neutral Bushings
(aj) Drawing for Lead termination to bottom of HV,IV& LV bushings**.**
(ak) Internal drawing & design of Core & Winding indicating all attachment with identification numbers, description including take-off arrangement of lead connection for Core & End frame and related Bill of Material
(al) Locking arrangement drawing for tank top cover, core & winding with complete dimension & details.
(am) Plan view of the bottom of Bell Tank for complete details of core coil resting arrangement, indicating clearly dimensional details, material of insulation, clamping arrangement with details of nuts/ bolts, clearance from all sides provided at bottom.
(an) Drawing indicating complete details, dimension & mounting arrangement of OLTC inside the tank with respect to End frame.
(ao) Drawing indicating complete details, dimensions & fixing arrangement of static end rings if used.
(ap) Other relevant drawings.

The manufacturer shall supply two (2) copies of the drawings as listed out above, which will describe the equipment in details for approval. Three sets of instruction books, operation and maintenance manuals and spare part bulletin, shall be supplied. In addition to above two sets of manuals and drawings with test certificates for each unit to be despatched as per despatch instructions.

It will be obligatory on the part of the manufacturer to ensure that the weight of core lamination, weight of copper, weight of steel, weight of transformer tank along with fitting and accessories, quantity of oil for first filling including wastage and 10 % extra of that quantity, total weight of core plus winding after assembly, total weight of transformer and other dimension of transformer are worked out carefully. It may be noted that at the time of submission of final drawings, variation in these weights beyond the limits of (±) 5% shall not be permitted

8.9 Pre-Shipment Checks at Manufacturer's Works

a) Check for inter changeability of components of similar transformers for dimensions.
b) Check for proper packing and preservation of accessories like radiators, bushings, dehydrating breather, rollers, buchholz relay, fans, control cubicle, connecting pipes, conservator etc.
c) Check for proper provision for bracing to arrest the movement of core and winding assembly inside the tank.
d) Gas tightness test to confirm tightness.
e) Derivation of leakage rate and ensure the adequate reserve gas capacity.

8.10 Storage, handling & shipping:

When the transformer is declared ready, the manufacturer has to identify each and every item associated with this unit and a complete packing list shall be prepared in advance. The equipments shall be stored and handling properly in shipping depot, while the same is under process of dispatch. The manufacturer should ensure dispatch of all the related items and accessories with a particular unit of transformer along with tank.

Tap changer, bushing, radiators and other accessories of the transformer should not be withheld for use subsequently on; units for testing purposes. If there are any items procured from sub-vendor which are to be directly installed like instrumentation, panels, control gear etc. test and inspection report for the same will be kept separately and made available to our inspecting officers.

It may be noted that "No change in any accessory or associated equipments after passing all the test successfully shall be allowed and if this is subsequently defected it shall be binding on the bidder to replace with the same item with which the initial test were conducted at his part failing which the entire test shall become null and void. The CSPTCL at its discretion may consider for rejection of the units thus supplied. The entire cost, for replacement of such rejected units thus supplied and for repeating acceptance test, shall be borne by the bidder.

8.11 Transportation:

The bidder shall include charges for fitting one Electronic impact recorder (on returnable basis) during transportation of transformers to measure the magnitude and duration of the impact in all three directions. The acceptance criteria and limits of impact in all three directions which can be withstood by the equipment during transportation and handling shall be submitted by the manufacturer during detailed engineering. The recording shall commence in the factory before dispatch and must continue till the unit is installed in its foundation. The data of electronic impact recorder(s) shall be down-loaded at site and a soft copy of it shall be handed over to engineer-in-charge. Further, within three weeks the manufacturer shall communicate the interpretation of the data. In the unlikely event of impact recorder output not available at site, the equipment shall be thoroughly internally inspected by the manufacturer's representative before erection at site to ensure healthiness of the equipment.

(A). In order to conduct low voltage field testing on power transformers before unloading/ commissioning at site to determine the internal condition, the transformer shall be transported with:

(a) Small bushing (12 KV) may be installed on the bushing cover plate to represent the actual bushing.
(b) Winding leads may be routed, secured and electrically isolated from the tank walls and active part.
(c) Temporarily tests leads may be used to connect the winding leads by the small bushings (which will be removed before erection of the main bushings).

(B). Further, the manufacturer shall mount vehicle tracking system (GPRS/ GPS/ GSM based) to track the exact position of the vehicle on which the power transformer is being loaded for transportation and during detailed engineering take approval for the equipment installed.

The details of arrangement for transport configuration of power transformer (which shall be adopted by manufacturer) shall be submitted by the manufacturer to CSPTCL for approval. The price quoted by the bidder should take into account this requirement.

8.12 Inspection and Testing at Site

The Bidder shall carry out a detailed inspection and testing programme for field activities covering areas right from the receipt of material stage upto commissioning stage. Sub-station bay equipment, which will be available in the respective sites and shall be referred by the bidder. However, it is bidder's responsibility to draw up and carry out such a programme duly approved by the Employer. Testing of oil sample at site shall be carried out.

8.13 Receipt and Storage Checks

a) Check and record condition of each package, visible parts of the transformer etc. for any damage.

b) Check and record the gas pressure in all the seven transformer tanks as well as in the gas cylinders.

c) Visual check for wedging of core and coils before filling up with oil and also check conditions of core and winding in general.

d) Check and record reading of impact recorder at receipt and verify the allowable limits as per manufacturer's recommendations.

8.14 Installation Checks

a) Inspection and performance testing of accessories like tap changers, cooling fans, oil pumps etc.

b) (i) Check the direction of rotation of fans and pumps.

(ii) Check the bearing lubrication.

c) Capacitance and tan delta measurement of bushing before fixing/connecting to the winding, bidder shall furnish these values for site reference.

d) Leakage test on bushing before erection.

e) Measure and record the dew point of nitrogen in the main tank before assembly.

8.15 Pre commissioning tests at site:

(i) Insulation resistance test and polarization index.

(ii) Ratio and polarity test

(iii) DGA of oil and di-electric, tan delta and moisture content test of oil.

(iv) OLTC operational test at each tap for lower and raise operation of tap changer.

(v) Magnetic balance tests and measurement of magnetizing current.

(vi) Vector group test

(vii) Short circuit current measurement at low voltage and at all taps

(viii) Measurement of winding resistance at all taps

(ix) Tangent delta and capacitance of Transformer

(x) Tangent delta, capacitance and insulation resistance tests of bushings

(xi) Leakage current between core & tank, core & end frame, end frame and tank and between short circuited links and neutral in grounded and ungrounded conditions.

(xii) Dew point measurement and recording of pressure of nitrogen gas.

(i) SFRA test.

(ii) PPM & BDV of Transformer Main Tank & OLTC oil

The SFRA test and Dew point measurement shall be carried out in presence of manufacturer's representative. The test kits shall be same as used for carrying out these tests in the factory and shall be brought by manufacturer's representative.

8.16 Pre-Commissioning checks at site:

a) Check the colour of silica gel breather.

b) Check the oil level in the breather housing, conservator tank, cooling system, condenser housing etc.

c) Check the bushings for conformity of connection to the line etc.

d) Check for correct operation of all protection and alarms.

i) Buchholz relay

ii) PRV

ii) Excessive winding temperature

iii) Excessive oil temperature

e) Low oil level indication

f) Check for adequate protection on electric circuit supplying the accessories.

g) Check for cleanliness of the Transformer and the surroundings.

h) Check for any other measure as prescribed by the manufacturer. Continuously observe the transformer after charging for its operation at no load for 24 hours.

i) Gradually put the transformer on load, check and measure increase in temperature in relation to the load and check the operation with respect to temperature rise and noise level etc.

i) **DGA of oil just before commissioning and after 24 hours energisation at site.**

ii) **Bidder shall prepare a comprehensive commissioning report including all commissioning test results and forward to CSPTCL for future record.**

9.0 Bushing Current Transformer

9.1 Current transformers shall comply with IS:2705/IEC-185.It shall be possible to remove the turret mounted current transformers from the reactor tank without removing the tank cover. Necessary precautions shall be taken to minimize eddy currents and local heat generated in the turret. Current transformer secondary leads shall be brought out to a weatherproof terminal box near each bushing.These terminals shall be wired out tocooler control cabinet/ marshalling box using separate cables for each core.Bushing Current transformer parameters indicated in this specification are tentative and liable to change within reasonable limits. The Bidder shall obtain Employer's approval before proceeding with the design of bushing current transformers.

9.2 **Technical Parameters**

9.2.1 In addition to WTI CT in middle phase of HV, IV & LV wdgs, following Current Transformer shall be provided for 3-ph 315 MVA,400/220/33 KV Auto Transformers bushings of 400 KV, 220 KV and Neutral

		HV Side	IV side	Neutral side
(a)	Ratio			
	Core -1	1000/1A	1000/1A	1000/1A
	Core – 2	1000/1A	1000/1A	1000/1A
(b)	Minimum knee point voltage and accuracy class :			
	Core – 1&2	2000V	2000V	2000V

	Class PS	Class PS	Class PS
(c) Maximum CT Resistance			
Core – 1&2	2.5 ohms	2.5 ohms	2.5 ohms
(d) Application			
Core-1&2	REF relay	REF relay	REF relay
(e) Maximum magnetisation Current (at kneepoint voltage)	30 mA	30 mA	30 mA

10. **NOTE**:
Accuracy class PS as per IS: 2705. Class (for the relevant protection and duties) as per IEC 185.Parameters of WTI CT for each winding shall be provided by the bidder.

11. IMPORTANT:- Please note that in the instant case the 315 MVA transformer is being procured for existing 400 KV Khedamara Substation. The existing foundation of 315 MVA at 400 KV Khedamara (Bhilai) Substation is fitted with 03 Nos rails for weight bearing of transformer. Therefore the design of base of the new transformer should be such that it can be placed on 03 Nos existing rails . The drawing of existing foundation of 315 MVA transformer at 400 KV Khedamara Substation is attached as per ANNEXURE–XV,page141.

SCHEDULE-I

GUARANTEED TECHNICAL PARTICULARS

01.	Name of the Manufacturers		
02.	Normal continuous rating of (MVA)		
	(a). With ONAN cooling		
	(b). With ONAF cooling		
	(c). With OFAF Cooling		
03.	a)Normal ratio of transformation		
	b)Service & duty		
04.	Phase connection:		
	a) HV winding		
	b) IV winding		
	c) LV winding		
	d) Vector group reference no. & symbol		
05.	Current at rated no load and on principal taps (Amps) - HV		
	- IV		
	- LV		
06.	Maximum temperature rise:		
	i) of oil by thermometer a) at full ONAN rating b) at full ONAF rating c) at full OFAF rating		
	ii) of winding by resistance a) at full ONAN rating b) at full ONAF rating c) at full OFAF rating d) by hot spot temperature indicator e) Ambient temp. Adopted		
07.	Temperature gradient between oil and winding		
08.	Voltage to earth for which the star point will be insulated (HV/IV)		
09.	**LOSSES:**		
(a)	**No Load Losses :**		
	i) Guaranteed no load losses at normal ratio, rated output, rated voltage & rated frequency at 75°C average winding temp. (KW) (no positive tolerance is permissible)		
	ii) No load losses at 110% of rated voltage		
(b)	**Load losses:**		
	Guaranteed load losses at normal ratio, rated voltage, rated out put rated frequency at 75°C average winding temp. at rated output (KW) (no positive tolerance is permissible)		
(c)	**Auxiliary losses:**		
	Auxiliary losses at rated output (no positive tolerance is permissible)		
10.	Guaranteed total losses at 75°C temp. (i.e. 9 (a)(i) + 9 (b)+9(c)		
11.	Efficiencies at normal ratio, rated voltage, rated frequency and average winding temp. for 75°C average winding temp. for outputs of	At UPF	0.8 PF Lagging

	(i) full load			
	(ii) ¾ full load			
	(iii) ½ full load			
	(iv) ¼ full load			
	(v) Maximum efficiency with load			
12.	Resistance per phase at normal tap of			
	(a) HV winding			
	(b) IV winding			
	(c) LV winding			
13.	Reactance per phase of (at normal tap of (in ohms.)			
	(a) HV winding			
	(b) IV winding			
	(c) LV winding			
	(d) Reactance at rated MVA base			
14.	Resistance voltage drop at 75 degree centigrade average winding temp. expressed as percent of rated voltage			
15.	Reactance voltage drop expressed as percent of rated voltage on rated winding MVA			
16.	Positive sequence Impedance on rated MVA base at rated current & freq. At 75 degree centigrade. Winding temp. between	Normal Tap	Highest Tap	Lowest Tap
	(a) HV – IV			
	(b) HV – LV			
	(c) IV - LV			
17.	Zero sequence Impedance at 75 degree Centigrade & at principle tap.			
18.	Impedence voltage at normal & 75 degree centigrade average winding temp. expressed as percentage of rated voltage.			
	(a) between HV & IV winding			
	(b) between IV & LV winding			
	(c) between LV & HV winding			
	(d) Positive sequence, HV			
	(e) Positive sequence, IV			
	(f) Positive sequence, LV			
19.	Regulation at full load and 75 degree centigrade temperature a. Unity power factor b. 0.8 power factor (lagging)			
20.	Type of transformer (core or shell)			
21.	Width of track gauge.			
22.	Time in minutes for which transformer can be run at full load without exceeding maximum permissible temp limits above ambient temp. when:			
	(a) Supply of fan group 1 is cutoff			
	(b) When supply to both groups of fans all cutoff.			
23.	**Permissible over loading**			
	(a) HV winding			
	(b) IV winding			
	(c) LV winding			
24.	**Terminal arrangement for**			
	(a) HV winding			
	(b) IV winding			

	(c) LV winding	
25.	**Insulation level:**	
	(a). Lightning Impulse withstand (KVp)	
	(b). Power frequency withstand for one minute (dry and wet.) (KV /rms)	
	(c) Switching impulse withstand (KVp)	
26.	Partial discharge level at 1.5xUm/ square root 3 KV RMS in pico coulomb.	
27.	Noise level when energised at normal voltage & frequency without load (db)	
28.	(a) External short circuit withstand capacity (KA) and duration (secs),	400 KV ------ KA for------- seconds 220KV -------– KA for ----- - seconds 33 KV -------– KA for ------- seconds
29.	Over fluxing capability of transformer at over fluxing factor.	
	(a). 1.7	
	(b). 1.4	
	(c). 1.25	
	(d). 1.10	
30.	**Details of core:**	
(a)	Type of core construction of no. of limbs in frame.	
(b)	Type of core joins.	
(c)	Flux density at rated voltage and frequency and at principle tap Tesla)	
(d)	Flux density at principal tap and at 10% over Voltage (Tesla)	
(e)	Magnetizing current at normal ratio and frequency.	
	(i) 85% of rated voltage	
	(ii) 100% of rated voltage	
	(iii) 105% of rated voltage	
(f)	Power factor of magnetizing current at normal voltage ratio and frequency.	
(g)	**Core lamination:**	
	(i) Material and grade	
	(ii) Thickness	
	(iii) Voltage per turn	
	(iv) Dia of circumscribing circle of core	
	(v) No. of steps in core	
	(vi) Dimensions of core	
	(vii) Net iron area	
	(viii) Specific Iron Loss in watts/Kg of core material at working flux density.	
	(ix) Total Iron loss, KW	
(h)	**Details of core Belting:-**	
	(i) Material, grade, type	
	(ii) Width	
	(iii) Thickness	
	(iv) Fixing method	
(i)	**Core clamping plate (YOKE):-**	
	(i) Material	
	(ii) Thickness	
	(iii) Insulation	
	(iv) Depth & height of Yoke	
	(v) Net Yoke area	

	(vi) Flux density in Yoke	
	(vii) Weight of Yoke	
(j)	Describe Location/ method of core grounding	
(k)	Details of oil ducts in core	
31.	**Details of windings:**	
(a)	Type of winding	
(b)	Material of the winding conductor	
(c)	Maximum current density of windings (at rated current and conductor area)	
	(i) Conductor Area (sq. cm)	
	(ii) Current density (A/sq. cm.)	
(d)	Whether HV windings are interleaved	
(e)	Whether winding are preshrunk	
(f)	Whether adjustable coil clamps are provided for HV, IV and LV windings	
(g)	Whether steel rings used for the windings, If so, whether they are split.	
(h)	Whether electro-static shields are provided to obtain uniform voltage distribution in the HV windings	
(i)	**Insulating material used for:**	
	(a) HV winding	
	(b) IV winding	
	(c) LV winding	
(j)	**Insulating material used between**	
	(a) HV and IV winding	
	(b) IV and LV winding	
	(c) LV winding and core	
	(d) Regulating winding and earth	
(k)	**Type of axial coil supports**	
	(a) HV winding	
	(b) IV winding	
	(c) LV winding	
(l)	**Type of Radial coil supports**	
	(a) HV winding	
	(b) IV winding	
	(c) LV winding	
(m)	(i) Maximum allowable torque on coil clamping bolts:-	
	(ii) clamping ring details	
	- Thickness of ring	
	- Dia of ring	
	- No.& size of pressure screw	
(n)	Power frequency Test voltage for 1 minute withstand test on	
	(a) HV winding	
	(b) IV winding	
	(c) LV winding	
(o)	Impulse test on windings 1.2/50 micro sec. Full wave withstand.	
	(a) HV	
	(b) IV	
	(c) LV	
(p)	Switching surge test	
	(a) HV	
	(b) IV	
	(c) LV	

32	**BUSHINGS**	
(a)	Type & make	
(b)	Rated voltage class & rated current	
(c)	Dry & Wet flashover voltage	
(d)	Power frequency withstand test voltage for 1 minute for wet & Dry (KV rms)	
(e)	Visible corona discharge voltage (KV rms)	
(f)	Partial discharge level	
(g)	Under oil flashover or puncture withstand test voltage (Power frequency)	
(h)	Full wave impulse withstand test voltage (1.2/50 micro sec.wave.)	
	(i) Positive	
	(ii) Negative	
(i)	Switching withstand test voltage (KVp)	
(j)	Creepage distance in air (mm)	
(k)	Protected Creepage distance (mm)	
(l)	Recommended gap setting.	
(m)	Weight of assembled bushing, kg.	
(n)	Qty.of oil in ltrs.	
(o)	Whether test tap is provided.	
(p)	Cantilever & Torsional force withstand values.	
(q)	Type of connection lead arrangement & length of condenser portion.	
(r)	Flange PCD & Details of bolts.	
(s)	**Details of bushing current transformers:**	
	(i) Quantity	
	(ii) No. of cores	
	(iii) Ratio	
	(iv) V.A. burden	
	(v) Accuracy	
	(vi) Knee point voltage	
	(vii) Magnetizing current at Knee point voltage	
	(viii) Secondary resistance.	
	(ix) Free space required at top for removal of bushing (mm)	
33.	Minimum clearance (mm)	
	(a) HV	
	(b) IV	
	(c) LV	
34.	**Approx. weight of following :**	
(a)	Core excluding clamping	
(b)	Core with clamping	
(c)	Coil with insulation	
(d)	Wt. of steel	
(e)	Core and winding	
(f)	Fittings and parts	
(g)	Oil required for first filling including 10% extra.	
(h)	(i) Transportation wt. excluding accessories.	
	(ii) Shipping details:	
	- Approx. wt. Of heaviest package	
	- Approx. dimension of largest package	
(i)	Un-tanking weight	
(j)	Total weight of transformer with oil and	

	fittings	
35.	**Details of Tank**	
(a)	Type of tank	
(b)	Approx. thickness of sheet	
	(i) Sides	
	(ii) Bottom	
	(iii) Cover	
	(iv) Details of stiffener & under carriage	
(c)	Vacuum recommended for hot oil circulation (torr.)	
(d)	Vacuum to be maintained during oil filling in transformer tank (torr.)	
(e)	Vacuum to which the tank fitted with bushing sets can be subjected to without distortion (torr.)	
(f)	No. of bi-directional wheels provided	
(g)	Please note that only bell tank design is acceptable. Please confirm that offered transformers are of bell tank design.	
36.	**Conservator:**	
	(a) Thickness of sheet	
	(b) Size	
	(c) Total volume (Liters)	
	(d) Volume between the highest and lowest visible oil levels (Ltrs)	
	(e) Power required by heaters (if provided) (KW)	
37.	Details of oil preserving equipment offered (Air Cell) please indicate type, make & size.	
38.	**Radiator:**	
	(a) overall dimensions, lxbxh (mm)	
	(b) Total weight with oil (Kg)	
	(c) Total weight without oil (Kg)	
	(d) Thickness of Radiator tube (mm)	
	(e) Types of mounting	
	(f) Vacuum withstand capability	
39.	**Cooling System**	
	(a) Make and type	
	(b) No. of connected units	
	(c) No. of standby units	
	(d) Rated power input	
	(e) Capacity (cu. m/min or litres/min	
	(f) Rated voltage (volts)	
	(g) Locked rotor current	
	(h) Efficiency of motor at full load (percent)	
	(i) Temperature rise of motor at full load (degree centigrade)	
	(j) BHP of driven equipment	
	(k) Temperature range over which control is adjustable	
	(l) Whether the fan and/or pumps suitable for continuous operation at 85% of their rated voltage	
	(m) Estimated time constant in hours for i) Natural cooling ii) Forced air cooling	

	(n) Period of continuous working at full load with out fans (in min.)	
	(o) Continuous MVA rating without fans, MVA	
40.	Gas and oil operated relay (make, type, rang of setting etc.)	
41.	**Temperature indicator**	
	(a) Make and type	
	(b) Permissible setting rang for alarm & trip	
	(c) Number of contacts	
	(d) Current rating of each contact	
	(e) Whether remote indicators provided. If so whether equipment required at purchaser's control room is included	
42.	Approximate over all dimension of transformer in mm.	
	(i) Length	
	(ii) Breadth	
	(iii) Height	
43.	Minimum clearance height for lifting core and winding from tank	
44.	Minimum clearance height for lifting core and winding from tank	
45.	Please confirm transformer will be transported with oil/nitrogen gas	
46.	**Lifting jacks**	
	(i) Governing standard	
	(ii) No. of jacks on one set	
	(iii) Type and make	
	(iv) Capacity (tonnes)	
	(v) Pitch (mm)	
	(vi) Lift (mm)	
	(vii) Height in closed position (mm)	
	(viii) Mean diameter of thread (mm)	
47.	Marshalling kiosk	
	(i) Make and type	
	(ii) Details of apparatus proposed to be housed in the kiosk	
48.	Details of anti earthquake device provided, if any	
49.	Tap changing equipment (these details refer to the basic rating of OLTC. As guaranteed by manufacturer)	
	(i) Make	
	(ii) Type	
	(iii) Power flow direction /bi-directional / restricted bi- directional	
	(iv) Rated voltage to earth (kv)	
	(v) Rated current (amps.)	
	(vi) Step voltage (volt)	
	(vii) Number of steps	
	(viii) Control manual /Local electrical /remote electrical	
	(ix) Voltage control automatic /non automatic	
	(x) Line drop compensation provided /not provided	
	(xi) Parallel operation	

	(xii) Protective devices	
	(xiii) Auxiliary supply detail	
	(xiv) Time for complete tap change (one step) in sec.	
	(xv) Divertor selector switch transient time (cycles)	
	(xvi) Value of maximum short circuit current (amps)	
	(xvii) Maximum impulse withstand test voltage with 1.2/50 micro-seconds full wave between switch assembly and ground (kv peak)	
	(xviii) Maximum impulse frequency test voltage between switch assembly and earth (kv rms)	
	(xix) Maximum impulse withstand test voltage with 1.2/50 microseconds across the tapping range (kv peak)	
	(xx) Approximate overall dimensions of tap changer (hxwxd)	
	(xxi) Approx. overall weight (kg)	
	(xxii) Approx. mass of oil (kg)	
	(xxiii) Particulars of the O.L.T.C. control cubicle	
50.	Driving mechanism box (a) Make and type (b) Details of apparatus proposed to be housed in the box.	
51.	Please enclose list of accessories and fittings being provided on transformer. Please confirm these are as stipulated in tender.	
52.	Whether the transformer covered have been fully type tested and if so, whether copies of type test certificates enclosed with tender.	
53.	Valves: indicate details of valves, their type, sizes and no. required/ fitted	
54.	a) type and make of pressure relief devices	
	(b) No. of each type pf devices per transformer	
	(c) Minimum pressure at which device operates.	
55.	Please give details of PRV like make, rating etc.	
56.	Characteristics of Insulating oil to be used	
(a)	Density in gms/cu. Cm	
(b)	Kinetic viscosity in cst	
(c)	Interfacial Tension at 27^{o}C in N/M	
(d)	Flash point in ^{o}C	
(e)	Pour point in ^{o}C	
(f)	Acidity (Neutralization/Value)	
(g)	Corrosive Sulphur in %	
(h)	Electric strength Breakdown	
	a) As received Voltage (KV rms)	
	b) After treatment (KV rms)	
(i)	Dielectric dissipation factor (tan delta) at 90 ^{o}C	

(j)	Saponification value in mg of KOH/gm	
(k)	Water content in ppm	
(l)	Specific resistance	
	(i) at 90 °C ohm/cm	
	(ii) at 27 °C ohm/cm	
(m)	N-dm Analysis CA % CM % CP %	
(n)	Oxidation stability	
	(i) Neutralization value after oxidation	
	(ii) Total sludge after oxidation.	
(o)	Aging characteristic as per Border 140 h/110 °C	
(p)	Saponification value in mg of KOH/gm	
(q)	Dielectric loss after 90 °C	
(r)	Aging characteristics as per NEMA 164 H/110 °C	
(s)	Neutralization value in mg of KOH/gm	
(t)	Sludge content weight %	
(u)	Pemitivity at 60 °C	
(v)	Specific heat at 60 °C	
(w)	Thermal conductivity at 60 °C	
(x)	Mean coefficient of expansion	
57.	Details of online DGA monitoring device:	
	(i) Make	
	(ii) Name of gases which will be monitored	
	(iii) Please confirm that necessary soft wares has been provided	
58	Details of Nitrogen injection fire protection system device	
a)	Make & model	
b)	Auxiliary supply required	
c)	Size & capacity of storage tank proposed to be provided	
59	Frequency	
60	Tap changing gear	
a)	Tap range & steps	
b)	Tap control	
61	Minimum air core reactance of HV winding	
62	Tan delta of winding	
63	Type of winding insulation	
a)	HV/IV windings	
b)	LV winding	
64	Cooling equipments :-No of Banks with adequate no of fans /oil pumps, standby fans & oil pumps etc with oil flow indication	

Date
Place

SIGNATURE OF BIDDER
NAME
DESIGNATION
(SEAL)

SCHEDULE – II (A)
SCHEDULE OF PRICES & QUANTITY

Sl. No	Description	Qty (in no.)	Unit ex-works price inclusive of packing forwarding (in Rs/No)	Unit Freight Charges inclusive of insurance (in Rs/No)	GST on (Ex-works Price + Freight charges) @ -----%	Unit FOR Desti-nation price (Rs/No)	Total amount (in Rs)
		a	b	c	d=GST % on (b+c)	e=(b+c+d)	f= (a*e)
1	315 MVA, 400/220/33 KV Auto transformer complete with EHV TYPE II transformer oil, OLTC, RTCC panel, NIFPS, air cell breathing arrangement, pressure relief devices, On line DGA monitor and all other accessories as described under section II of tender specification, including testing charges as per tender specification. .	**1No**					

NOTE:- While offering the prices please note and confirm the following :

(i) Prices are variable on the basis of IEEMA PV formula given in Annexure-I of the Tender with base indices issued one month prior to the due date of opening i.e. **base date as 01.08.2021**. In case of any extension of due date the base date for working out the price variation shall be as per the original due date only.

(ii) The applicable rate of GST are indicated for each item quoted by the tender

(iii) The total price should take into account type and special testing on one transformer without any additional cost i.e. all test as per clause - 6.2, shall be carried out on one unit of the ordered lot without any additional payment.

Name and seal of the tendering Company

SCHEDULE-II (B)

PRICES FOR UNLOADING, ERECTION, TESTING & COMMISSIONING

Sl. No.	Description	Qty (in jobs)	Unit price (in Rs/No)	GST on (Unit Price) @ ----- %	Total Unit price(in Rs/No)	Total Amount (in Rs)
		a	b	c	d =(b+c)	e=a*d
1	Erection, testing & commissioning charges of transformer including all activities viz. assembly, oil filtration, oil filling, testing, commissioning of On Line DGA ,NIFPS alongwith MS Tank and all other accessories etc.	1				

NOTE:

(i) The rate should be offered on FIRM basis exclusive of applicable GST.

(ii) The applicable rate of GST is to be indicated by the bidder. Price bid shall be processed/ evaluated with applicable GST at the time of opening of Techno Commercial bid.

(iii) GST shall be paid extra at the rates applicable during contractual period of Commissioning. In case commissioning is delayed by the supplier and service tax goes upward revision, GST applicable during contractual completion period shall only be payable.

(iv) Manpower and tools & plants for erection, testing & commissioning shall be provided by the bidder.

(v) 1 job means completed erection, testing & commissioning of 1 No. 315 MVA transformer to the full satisfaction of CSPTCL.

Name and seal of the tendering Company

SCHEDULE – III

SCHEDULE OF TENDERER'S EXPERIENCE

Bidder shall furnish here a list of similar jobs executed by him. A reference may be made by the purchase to them in order be considers such a reference necessary.

Sl. No.	MVA and HV/LV KV rating of the transformers supplied to power utilities in India	Order No. & date	Actual date of supply of transformer as per MRC	Date of commissioning of transformer	Name of order placing organization	Mention whether copy of order/ MRC and performance certificate has been furnished. (Mention reference page No. / flag)

Signature of Tenderer

Name :

Company :

SCHEDULE– IV

Name of the manufacturer, place of manufacturer, testing & inspection

S.No.	Description	Manufacturer	Place of manufacturer	Date of testing and inspection

Signature of bidder

Name :

Company :

SCHEDULE-V
COMMERCIAL INFORMATION

*** Strike-off, whichever is not applicable**

1.i)	Whether tender document purchased from this office or down loaded ?	Yes / No
ii)	If down loaded, whether tender cost furnished? Details of MICR DD for tender cost.	
iii)	Earnest Money details	Bank draft/ Banker's cheque/ Cash with Manager (RAO:HQ), CSPTCL, Raipur
iv)	Amount of EMD and full details	Rs.
v)	If exempted, state whether bidder is	SSI Unit of CG/ Small scale unit registered with NSIC/ Fully owned State Central Govt. Unit.
vi)	Reference of documentary evidence regarding exemption enclosed	Yes/No
vii)	**GST** Number registration certificate	GST Number & Registration certificate Enclosed
2.	Whether the offer is valid for 180 days from the date of opening of commercial/technical bid	Yes/No (If no, state validity period)
3.	State whether the quoted prices are variable as per IEEMA PV formula as per Annex-I with base indices issued by IEEMA one month prior to due date of opening i.e. **base date as 01.08.2021**	
4.	(a)Rate of applicable GST@	
	(b) Document furnished in support of applicable GST.	Yes/No
5.	Other taxes applicable, if any, should be clearly mentioned.	Yes/No
6.	PAYMENT TERMS:- Whether CSPTCL's terms of payment is acceptable to the tenderer (if no state conditions)	Yes/No
7.	DELIVERY PERIOD:-	
(a)	Commencement of supplies from date of order	
(b)	Completion & supply rate from the date of Order.	
8.	PENALTY CLAUSE Whether agreeable to CSPTCL's Penalty clause	Yes/No
9.	GUARANTEE/ EXTENDED GUARANTEE PERIOD :- Whether agreed to guarantee / extended guaranteed period clause of the tender specification.	Yes/No
10. (a).	SECURITY DEPOSIT Whether agreeable to furnish CSPTCL's Standard security deposit @10% of value of order for satisfactory execution of the order and to cover guarantee period	Yes/No
(b).	If not, indicate deviation specifically	
11.	EXTENSION ORDER:- Whether you are agreeable to accept extension order for 50% of quantity on the same rates, terms & condition if any extension order is placed within 6 months from the date of placement of detailed order with price reduction clause.	Yes/No
12.	Please mention whether rates offered are applicable	Yes/No

	for part quantities.	
13.	**Pre contract Integrity Pact** in prescribed format **(Schedule-XV)** on non-judicial stamp paper worth Rs.300.00 enclosed.	Yes/No
	Details regarding pre qualifying requirements:	
14.	(a)Mention turnover of the firm for last five financial years (Enclose notarized copies of balance sheets in support) (i) 2015-16 (ii) 2016-17 (iii) 2017-18 (iv) 2018-19 (v) 2019-20 (b) Please confirm whether the bidder is a holding company. In such case confirm that the turnover figures are of the holding company only (i.e. excluding its subsidiary/ group companies). In case bidder is a subsidiary of holding company, the turnover figures are of subsidiary company only (excluding its holding company). (c) Please indicate net worth for the years (i) 2017-18 (i) 2018-19 (ii) 2019-20 Furnish calculation sheets in support as per the audited balance sheets.	
16.	Year of start of manufacture of offered or higher rating of transformer	
17.	No. of 315 MVA or higher rating transformers so far manufactured	
18.	Highest MVA rating transformer manufactured so far.	
19.	Please confirm whether your firm has part of parent company located elsewhere or have valid ongoing collaboration with a company located elsewhere. In this case, the bidder should furnish undertaking & licensing agreement with the parent company (Principals). (mention reference page No. or flag)	

Place:- SIGNATURE OF BIDDER
NAME IN FULL
Date:- DESIGNATION/STATUS & SEAL OF FIRM

SCHEDULE-VI-A

SCHEDULE OF COMMERCIAL DEVIATIONS

We/I have carefully gone through the commercial requirement of the specification and the General condition of contract and we/I have satisfied ourselves/myself and hereby conforms to the requirement of technical specification and General Conditions of contract except for the deviations, which are given below:-

Sl. No.	Descriptions & Clause No. of The specification page No.	Stipulation in specification	Deviation offered	Remarks Regarding justification of the deviation.

Date
Place

SIGNATURE OF BIDDER
NAME
DESIGNATION
(SEAL)

SCHEDULE-VI-B

SCHEDULE OF TECHNICAL DEVIATIONS

We/I have carefully gone through the Technical specification and the General condition of contract and we/I have satisfied ourselves/myself and hereby conform to the requirement of technical specification and General Conditions of contract except for the deviations, which are given below:-

S.No.	Descriptions & Clause No. of The specification page No.	Stipulation in specification	Deviation offered	Remarks Regarding justification of the deviation.

Date
Place

SIGNATURE OF BIDDER
NAME
DESIGNATION
(SEAL)

SCHEDULE - VII

LIST OF FITTINGS AND ACCESSORIES TO BE PROVIDED WITH TRANSFORMER

Sl no.	Particulars	Qty	Rating	Make

Date
Place

SIGNATURE OF BIDDER
NAME
DESIGNATION
(SEAL)

SCHEDULE-VIII

DETAILS OF TENDER & CONTRACT DRAWINGS SUBMITTED WITH TENDER

Sl. No.	Particular	Particulars of Drawings

Date
Place

SIGNATURE OF BIDDER
NAME
DESIGNATION
(SEAL)

SCHEDULE-IX

DETAILS OF INSPECTION WINDOWS PROVIDED ON TRANSFORMER

Sl no.	Place where inspection Window/ Manhole provided	Size of Windows/ Manhole	Qty

Date
Place

SIGNATURE OF BIDDER
NAME
DESIGNATION
(SEAL)

SCHEDULE-X

INSPECTION PROGRAMME WITH DETAILS OF STAGE INSPECTION PROCEDURE AND TESTING

Date
Place

SIGNATURE OF BIDDER
NAME
DESIGNATION
(SEAL)

SCHEDULE-XI

VALVE SCHEDULE

Sl No.	Particulars	Details of valve			
		Type	Size	Material	Make

Date
Place

SIGNATURE OF BIDDER
NAME
DESIGNATION
(SEAL)

SCHEDULE-XII

LIST OF VENDORS

Sl.no.	Particulars	Name and Address of Venders

Date
Place

SIGNATURE OF BIDDER
NAME
DESIGNATION
(SEAL)

SCHEDULE-XIII

LIST OF PLANT MACHINERY AND TESTING INSTRUMENTS

Date
Place

SIGNATURE OF BIDDER
NAME
DESIGNATION
(SEAL)

SCHEDULE-XIV

LIST OF TYPE TEST REPORTS FOR TRANSFORMER

Date
Place

SIGNATURE OF BIDDER
NAME
DESIGNATION
(SEAL)

SCHEDULE-XV
PRE-CONTRACT INTEGRITY PACT

1. GENERAL

1.1 This pre-bid contract Agreement (hereinafter called the Integrity Pact) is made on.....day of the month .....20..., between the CSPTCL acting through Shri.....Executive Director (Store & Purchase) (hereinafter called the "BUYER", which expression shall mean and include, unless the context otherwise requires, his successors in the office and assigns) and the First Party, proposes to procure (name of the Stores/Equipment/Work/Service) and M/s. .... represented by Shri.....Chief Executive Officer (hereinafter called the "BIDDER/Seller", which expression shall mean and include, unless the context otherwise requires, his successors on permitted assigns) and the Second Party, is willing to offer/has offered.

1.2 WHEREAS the BIDDER is a Private Company/Public Company/ Government undertaking/Partnership/Registered Export Agency, constituted in accordance with the relevant law in the matter and the BUYER is a power company an undertaking of Govt. of CG, performing its function on behalf of the Government of Chhattisgarh.

2. **OBJECTIVES**

NOW, THEREFORE, the BUYER and the BIDDER agree to enter into this pre-contract agreement, hereinafter referred to as Integrity Pact, to avoid all forms of corruption by following a system that is fair, transparent and free from any influence/prejudiced dealings prior to, during and subsequent to the Contract to be entered into with a view to:-

2.1. Enabling the BUYER to obtain the desired Stores/Equipment/Work/Service at a competitive price in conformity with the defined specifications by avoiding the high cost and the distortionary impact of corruption on public procurement, and

2.2. Enabling BIDDERs to abstain from bribing or indulging in any corrupt practices in order to secure the contract by providing assurance to them that their competitors will also abstain from bribing any corrupt practices and the BUYER will commit to prevent corruption, in any form, by its official by following transparent procedures.

3. **COMMITMENTS OF THE BUYER**

The BUYER commits itself to the following:-

3.1 The BUYER undertakes that no official of the BUYER, connected directly or indirectly with the contract, will demand, take promise for or accept, directly or through intermediaries, any bribe, consideration, gift, reward, favour or any material or immaterial benefit or any other advantage from the BIDDER, either for themselves of for any person, organization or third party related to the contract in exchange for an advantage in the bidding process, bid evaluation, contracting of implementation process related to contract.

3.2 The BUYER will, during the pre-contract stage, treat BIDDERs alike, and will provide to all BIDDERs the same information and will not provide any such information to any particular BIDDER which could afford an advantage to that particular BIDDER in comparison to the other BIDDERs.

3.3 All the officials of the BUYER will report the appropriate Government office any attempted or completed breaches of the above commitments as well as any substantial suspicion of such a breach.

In case any such preceding misconduct on the part of such official(s) is reported by the BIDDER to the BUYER with the full and verifiable facts and the same prima facie found to be correct by the BUYER, necessary disciplinary proceedings, or any other action as deemed fit, including criminal proceedings may be initiated by the BUYER and such a person shall be debarred from further dealings related to the contract

process. In such a case while an enquiry is being conducted by the BUYER the proceedings under the contract would not be stalled.

4. **COMMITMENTS OF BIDDERS**

The BIDDER commits itself to take all measures necessary to prevent corrupt practices, unfair means and illegal activities during any stage of its bid or during any pre-contract or post-contract stage in order to secure the contract or in furtherance to secure it and in particular commit itself to the following:-

4.1. The BIDDER will not offer, directly or through intermediaries, any bribe, gift, consideration, reward, favour, any material or immaterial benefit or other advantage, commission, fees, brokerage or inducement to any official of the BUYER, connected directly or indirectly with the biding process, or to any person, organization or third party related to the contract in exchange for any advantage in the bidding, evaluation, contracting and implementation of the contract.

4.2. The BIDDER further undertakes that it has not given, offered or promised to give, directly or indirectly any bribe, gift, consideration, reward, favour, any material or immaterial benefit or other advantage, commission, fees, brokerage, or inducement to any official of the BUYER or otherwise in procuring the Contract of forbearing to do or having done any act in relation to the obtaining or execution of the contract or any other contract with the CSPTCL for showing or forbearing to show favour or disfavour to any person in relation to the contract or any other contract with the CSPTCL.

4.3. The BIDDER further confirms and declares to the BUYER that the BIDDER in the original Manufacture/Integrator/Authorized government sponsored export entity of the stores and has not engaged any individual or firm or company whether Indian or foreign to intercede, facilitate or in any way to recommend to the BUYER or any of its functionaries, whether officially or unofficially to the award of the contract to the BIDDER, nor has any amount been paid, promised or intended to be paid to any such individual, firm or company in respect of any such intercession, facilitation or recommendation.

4.4. The BIDDER, either while presenting the bid or during pre-contract negotiations or before signing the contract, shall disclose any payment he has made, is committed to or intends to make to officials of the BUYER or their family members, agents, brokers or any other intermediaries in connection with the contract and the details of services agreed upon for such payments.

4.5. The BIDDER will not collude with other parties interested in the contract to impair the transparency, fairness and progress of the bidding process, bid evaluation, contracting and implementation of the contract.

4.6. The BIDDER will not accept any advantage in exchange for any corrupt practice, unfair means and illegal activities.

4.7. The BIDDER shall not use improperly, for purpose of competition or personal gain, or pass on to others, any information provided by the BUYER as part of the business relationship, regarding plans, technical proposal and business details, including information contained in any electronic data carrier. The BIDDER also undertakes to exercise due and adequate care lest any such information is divulged.

4.8. The BIDDER commits to refrain from giving any compliant directly or through any other manner without supporting it with full and verifiable facts.

4.9. The BIDDER shall not instigate or cause to instigate any third person to commit any of the acts mentioned above.

5. **PREVIOUS TRANSGRESSION**

5.1. The BIDDER declares that no previous transgression occurred in the last three years immediately before signing of this Integrity Pact with any other company in any country in respect of any corrupt practices envisaged hereunder or with any

Public Sector Enterprise in India or any Government Department in India that could justify BIDDER's exclusion from the tender process.

5.2. If the BIDDER makes incorrect statement on this subject, BIDDER can be disqualified from the tender process or the contract, if already awarded, can be terminated for such reason.

6. **EARNEST MONEY (SECURITY DEPOSIT)**

6.1. Every BIDDER while submitting commercial bid, shall deposit an amount as specified in RFP as Earnest Money/Security Deposit, with the BUYER through any of the following instruments:

(i) Bank Draft or Pay Order in favour of.....

(ii) A confirmed guarantee by an Indian Nationalised Bank, promising payment of the guarantee sum to the .....(BUYER).....on demand within three working days without any demur whatsoever and without seeking any reasons whatsoever. The demand for payment by the BUYER shall be treated as conclusive proof of payment.

(iii) Any other mode or through any other instrument (to be specified in the RFP).

6.2. The Security Deposit shall be valid up to complete conclusion of the contractual obligations to the complete satisfaction of both the BIDDER and BUYER, including warranty period.

6.3. In the case of successful BIDDER a clause would also be incorporated in the Article pertaining to Performance Bond in the Purchase Contract that the provisions of Sanctions for violation shall be applicable for forfeiture of Performance Bond in case of a decision by the BUYER to forfeit the same without assigning any reason for imposing sanction for violation of this Pact.

6.4. No interest shall be payable by the BUYER to the BIDDER on Earnest Money/Security Deposit for the period of its currency.

7. **SANCTIONS FOR VIOLATIONS**

7.1. Any breach of the aforesaid provisions by the BIDDER or any one employed by it or acting on its behalf (whether with or without the knowledge of the BIDDER) shall entitle the BUYER to take all or any one of the following actions, wherever required:-

(i) To immediately call off the pre contract negotiations without assigning any reason or giving any compensation to the BIDDER. However, the proceedings with the other BIDDER(s) would continue.

(ii) To forfeit fully or partially the Earnest Money Deposit (in pre-contract stage) and/or Security Deposit/Performance Bond (after the contract is signed), as decided by the BUYER and the BUYER shall not be required to assign any reason therefore.

(iii) To immediately cancel the contract, if already signed, without giving any compensation to the BIDDER.

(iv) To recover all sum already paid by the BUYER, and in case of the Indian BIDDER with interest thereon at 2% higher than the prevailing Prime Lending Rate while in case of a BIDDER from a country other than India with Interest thereon at 2% higher than the LIBOR. If any outstanding payment is due to the BIDDER from the BUYER in connection with any other contract such outstanding payment could also be utilized to recover the aforesaid sum and interest.

(v) To encash the advance bank guarantee and performance bond/warranty bond, if furnished by the BIDDER, in order to recover the payments, already made by the BUYER, along with interest.

(vi) To cancel all or any other contracts with the BIDDER and the BIDDER shall be liable to pay compensation for any loss or damage to the BUYER resulting

from such cancellation/rescission and the BUYER shall be entitled to deduct the amount so payable from the money(s) due to the BIDDER.

(vii) To debar the BIDDER from participating in future bidding processes of the CSPTCL for a minimum period of five years, which may be further extended at the discretion of the BUYER.

(viii) To recover all sum paid in violation of this Pact by BIDDER(s) to any middlemen or agent or broken with a view to securing the contract.

(ix) In cases where irrevocable Letters of Credit have been received in respect of any contract signed by the BUYER with the BIDDER, the same shall not be opened.

(x) If the BIDDER or any employee of the BIDDER or any person action on behalf of the BIDDER, either directly or indirectly, is closely related to any of the officers of the BUYER, or alternatively, if any close relative of an officer of the BUYER has financial interest/stake in the BIDDER's firm, the same shall be disclosed by the BIDDER at the time of filling of tender. Any failure to disclose the interest involved shall entitle the BUYER to rescind the contract without payment of any compensation to the BIDDER.

The term 'close relative' for this purpose would mean spouse whether residing with the Government servant or not, but not include a spouse separated from the Government servant by a decree or order of a competent court; son or daughter or step son or step daughter and wholly dependent upon Government servant, but does not include a child or step child who is no longer in any way dependent upon the Government servant or of whose custody the Government servant has been deprived of by or under any law; any other person related, whether by blood or marriage, to the Government servant or to the Government servant's wife or husband and wholly dependant upon Government servant.

(xi) The BIDDER shall not lend to or borrow any money from or enter into any monetary dealings or transactions, directly or indirectly, with any employee of the BUYER, and if he does so, the BUYER shall be entitled forthwith to rescind the contract and all other contracts with the BIDDER. The BIDDER shall be liable to pay compensation for any loss or damage to the BUYER resulting from such rescission and the BUYER shall be entitled to deduct the amount so payable from the money(s) due to the BIDDER.

7.2. The decision of the BUYER to the effect that a breach of the provisions of this pact has been committed by the BIDDER shall be final and conclusive on the BIDDER. However, the BIDDER can approach the Monitor(s) appointed for the purpose of this Pact.

8. **INDEPENDENT MONITORS**

8.1. The BUYER will appoint Independent Monitors (hereinafter referred to as Monitors) for this Pact.

8.2. The task of the Monitors shall be to review independently and objectively, whether and to what extent the parties comply with the obligations under this Pact.

8.3. The Monitors shall not be subject to instructions by the representatives of the parties and perform their functions neutrally and independently.

8.4. Both the parties accept that the Monitors have the right to access all the documents relating to the project/ procurement, including minutes of meetings. The Monitor shall be under contractual obligation to treat the information and documents of the BIDDER/ Subbidder(s) with confidentiality.

8.5. As soon as the Monitor notices, or has reason to believe, a violation of this Pact, he will so inform the Authority designated by the BUYER.

8.6. The Monitor will submit a written report to the designated authority of BUYER/Secretary in the department/within 8 to 10 weeks from the date of reference or intimation to him by the BUYER /BIDDER and, should the occasion arise, submit proposal for correcting problematic situations.

9. FACILITATION OF INVESTIGATION

In case of any allegation of violation of any provision of this fact or payment of commission, the BUYER or its agencies shall be entitled to examine all the documents including the books of Account of the BIDDER and the BIDDER shall provide necessary information of the relevant documents and shall extend all possible help for the purpose of such examination.

10. LAW AND PLACE OF JURISDICTION

This pact is subject to Indian Law, the place of performance and jurisdiction shall be the seat of the BUYER.

11. OTHER LEGAL ACTIONS

The actions stipulated in this integrity Pact are without prejudice to any other legal action that may follow in accordance with the provisions of any other law in force relating to any civil are criminal proceeding.

12. VALIDITY

12.1 The validity of this integrity Pact shall be from the date of its signing and extend up to 2 years or the complete execution of the contract to the satisfaction of both the BUYER and the BIDDER/Seller whichever is later. In case BIDDER is unsuccessful, this Integrity Pact shall expire after six months from the date of the signing of the contract.

12.2. If one or several provision of this pact turn out to be invalid; the reminder of this pact shall remain valid. In such case, the parties will strive to come to an agreement to their original intention.

13. The parties hereby sign this integrity Pact at .....on.....

BUYERBIDDER

Name of Officer CHIEF EXECUTIVE OFFICER
Destination Department/PSU

Witness Witness

1)..... 1) .....

2)..... 2) .....

SCHEDULE-XVI

ANNUAL TURNOVER

Annual Turnover Data	
Year	**Amount in Rs.**
2015-2016	
2016-2017	
2017-2018	
2018-2019	
2019-2020	
Total Turnover	

The information supplied should be the Annual Turnover of the Bidder for each year for contracts in progress or completed.

Date:

Signature :

Name :

Status :

Seal of the Tendering Co.:

SCHEDULE–XVII

PROFORMA FOR BANK GUARANTEE TOWARDS SECURITY DEPOSIT

(To be executed on non-judicial stamp paper of Rs. 250/- and Revenue stamp may be affixed on Bank Guarantee)

Bank Guarantee No…… Dtd……

In consideration of the Chhattisgarh State Power Transmission Company Limited, Raipur (A successor company of Chhattisgarh State Electricity Board, Raipur hereinafter referred to as 'CSPTCL') having agreed to accept this Bank Guarantee in lieu of cash deposit by way of Security for due and faithful performance required from M/s. _____ _____ _____ _____ (herein after referred to as "Bidders", the Bank of _____ hereby agrees unequivocally and unconditionally to pay within 48 hours on demand in writing from the Chhattisgarh State Power Transmission Company Limited or any officer authorized by it in this behalf of any amount upto and not exceeding Rs……..……(in words) …… only to the said Chhattisgarh State Power Transmission Company Limited on behalf of the aforesaid M/s …….. who have tendered and contracted for the supply of materials, equipments or services to the said the Chhattisgarh State Power Transmission Company Ltd, against order No…….. dtd……. for the order value of Rs…….

The beneficiary of this Bank Guarantee shall be Chhattisgarh State Power Transmission Company Limited, Raipur (A Successor company of CSEB Raipur). The proceeds / encashment of this Bank Guarantee would go in the name of Chhattisgarh State Power Transmission Company Limited, Raipur (A Successor company of CSEB Raipur).

This agreement should be valid and binding on this bank upto and including _____ of for such further period as may hereunder be mutually fixed from time to time in writing by the Chhattisgarh State Power Transmission Company Ltd. and the bidder and shall not be terminable by notice or any change in the constitution of the aforesaid bank or the firm of Bidders or by any others reasons whatsoever and the Banker's liability hereunder shall not be impaired or discharged by any extension of time or variations or alteration made, given conceded or agreed to with or without the Bank knowledge or consent by or between the Chhattisgarh State Power Transmission Company Ltd. and bidder in the existing and / or further tenders and / or contracts.

It is agreed by the Bank with the CSPTCL that if for any reason a dispute arises concerning the Bank's liability to pay the requisite amount to the CSPTCL under the terms of this guarantee the competent court at Raipur alone shall have the jurisdiction to determine the said dispute and that this shall be without prejudice to the liability of the Bank under the terms of this guarantee being unequivocal and unconditional as mentioned above.

The liability under this guarantee is restricted to Rs…… (In words) …… only. This guarantee shall remain in force until ……. Unless a demand to enforce a claim under the guarantee is made under this Bank Guarantee by the CSPTCL to the Bank within six months from that date the rights of the Chhattisgarh State Power Transmission Company Ltd under this guarantee shall be forfeited and Bank shall be relieved and discharged from all liabilities there under.

WITNESSES: - SIGNATURES

Authorized Signatories of Bank

1. …… Signed._ _ _ _ _ _ _

2. …… for _ _ _ _ _ _ _ _ _ _ _ Bank

SCHEDULE-XVIII
CHECK LIST

S.No	ITEMS	REFERENCE	Whether submitted / not submitted
1	Earnest money enclosed	Covering letter *(As per clause 4.1)*	Yes/No
2	GTP	Schedule-I	Yes/No
3	Bidders experience	Schedule-III	Yes/No
4	Manufacturer's details	Schedule-IV	Yes/No
5	Commercial Information	Schedule-V	Yes/No
6	Commercial Deviation	Schedule-VI-A	Yes/No
7	Technical Deviation	Schedule-VI-B	Yes/No
8	Fittings & accessories	Schedule-VII	Yes/No
9	Contract drawings	Schedule-VIII	Yes/No
10	Inspection window	Schedule-IX	Yes/No
11	Inspection programme	Schedule-X	Yes/No
12	Valve schedule	Schedule-XI	Yes/No
13	List of vendors	Schedule-XII	Yes/No
14	Plant, machinery & test instruments	Schedule-XIII	Yes/No
15	Type & short circuits	Schedule-XIV	Yes/No
16	Pre-contract integrity pact	Schedule-XV	Yes/No
17	CA certified Annual turnover	Schedule-XVI	Yes/No
18	Bank guarantee Performa for Security	Schedule-XVII	Yes/No
19	NSIC/DIC/ Factory registration	As per PQR 5 (A)	Yes/No
20	For 5 years experience in supply –Copy	As per PQR 5 (A)	Yes/No
21	For 3 year satisfactory performance –	As per PQR 5 (A)	Yes/No
22	Type test certificate not older than 5	As per PQR 5 (A)	Yes/No
23	Financial data for previous 5 years	As per PQR 5 (B)	Yes/No
24	CA certified Net worth certificate	As per PQR 5 (B)	Yes/No
25	Declarations	As per PQR 5 (C)	Yes/No
26	Power of Attorney	As per clause 15 Section-I	Yes/No
To avoid rejection, please read tender document carefully and refer tender document for submission of any Further document/schedule/ annexure which is not covered in point 01 to 26			

Signature & Seal of the Bidder

ANNEXURE-I

CIN No. U99999MH1970GAPO14629

ieema
your link to electricity

Indian Electrical & Electronics Manufacturer's Association
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IEEMA/PVC/PWR TRF_upto 400 KV/2015

Effective from: 1st April 2015

PRICE VARIATION CLAUSE FOR POWER TRANSFORMERS AND REACTORS COMPLETE WITH ALL ACCESSORIES AND COMPONENTS of ratings above 10 MVA or voltage above 33 kV up to 400 kV Of supplied against domestic contracts

This price variation clause is applicable for 'Power Transformers', ratings above 10 MVA or voltage above 33 kV up to 400 kV. The clause is to be used for domestic contracts. A separate price variation IEEMA/PVC/PWR TRF_upto 400 KV/DE/2015has been evolved for above types of Transformers supplied against export/deemed export contracts under special imprest licensing scheme.

The price quoted/confirmed is based on the input cost of raw materials/components and labour cost as on the date of quotation and the same is deemed to be related to prices of raw materials and all India average consumer price index number for industrial workers as specified in the price variation clause given below. In case of any variation in these prices and index numbers, the price payable shall be subject to adjustment, up or down in accordance with the following formula:

$$P = \frac{P_0}{100}\left(10 + 29\frac{C}{C_0} + 27\frac{ES}{ES_0} + 7\frac{IS}{IS_0} + 5\frac{IM}{IM_0} + 7\frac{TO}{TO_0} + 15\frac{W}{W_0}\right)$$

Wherein,

P = Price payable as adjusted in accordance with the above formula.

P_0 = Price quoted/confirmed.

C_0 = Average LME settlement price of copper wire bars (refer notes)
This price is as applicable for the month, **ONE** month prior to the date of tendering.

ES_0 = Price of CRGO Electrical Steel Lamination (refer note)
This price is as applicable on the 1st working day of the month, **ONE** months prior to the date of tendering.

IS_0 = Average price of steel Plates 10 mm thick (refer notes)
This price is as applicable on the 1st working day of the month, **ONE** month prior to the date of tendering.

IM_0 = Price of Insulating Materials (refer notes)
This price is as applicable on the 1st working day of the month, **ONE** months prior to the date of tendering.

TO_0 = Price of Transformer Oil (refer notes)
This price is as applicable on the 1st working day of the month, **ONE** month prior to the date of tendering.

W_0 = All India average consumer price index number for industrial workers, as published by the Labour Bureau, Ministry of Labour, Govt. of India (Base: 2001 = 100)
This index number is as applicable on the first working day of the month, **THREE** months prior to the date of tendering.

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For example, if date of tendering falls in June 2015, applicable prices of Copper Wire Bars (C_0), Transformer Oil (TO_0), Steel Plates 10 mm thick (IS_0), CRGO Electrical Steel Laminations (ES_0) and Insulating material (IM_0) should be as on 1st May 2015 and all India average consumer price index no. (W_0) should be for the month of 1st March 2015.

The above prices and indices are as published by IEEMA vide circular reference number IEEMA(PVC)/PWR_TRF/_/_ **ONE** month prior to the date of tendering.

C = Average LME settlement price of copper wire bars (refer notes)

This price is as applicable for the month, **TWO** months prior to the date of delivery.

ES = Price of CRGO Electrical Steel Lamination (refer note2)

This price is as applicable on the 1st working day for the month, **TWO** months prior to the date of delivery.

IS = Average price of Steel Plates 10 mm thick (refer notes)
This price is as applicable on the 1st working day of the month, **ONE** month prior to the date of prior to the date of delivery.

IM = Price of Insulating Materials (refer notes)

This price is as applicable on the 1st working day of the month, **TWO** months prior to the date of delivery.

TO = Price of Transformer Oil (refer notes)

This price is as applicable on the 1st working day of the month, **ONE** month prior to the date of delivery.

W = All India average consumer price index number for industrial workers, as published by the Labour Bureau, Ministry of Labour, Govt. of India (Base: 2001 = 100)

This index number is as applicable on the first working day of the month, **THREE** months prior to the date of delivery.

For example, if date of delivery in terms of clause given below falls in December 2015, applicable prices of Copper Wire Bars (C), Insulating material (IM), CRGO Electrical Steel Lamination (ES) should be as on 1st October 2015 and Transformer Oil (TO), Plates 10 mm thick (IS) should be 1st November 2015 and all India average consumer price index no. (W) should be for the month of September 2015.

The date of delivery is the date on which the transformer is notified as being ready for inspection/despatch (in the absence of such notification, the date of manufacturer's despatch note is to be considered as the date of delivery) or the contracted delivery date (including any agreed extension thereto), whichever is earlier.

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IEEMA/PVC/PWR TRF_upto 400 KV/2015

Effective from: 1st April 2015

Notes: (a) All prices of raw materials are exclusive of modvatable excise/CV duty amount and exclusive of any other central, state or local taxes, octroi etc. transformers manufacturers import major raw materials like Copper, CRGO Steel Sheets and Plates etc. The landed cost of these imported raw materials includes applicable custom duty but exclusive of modvatable CVD.

(b) All prices are as on first working day of the month.

(c) The details of prices are as under:

1. The LME price of Copper Wire Bars (in Rs./MT) is the LME average settlement price of Copper Wire Bars converted into Indian Rupees with applicable average exchange rate of SBI of the month. This price is the landed cost, inclusive of applicable customs duty only but exclusive of countervailing duty.
2. The price of CRGO is the price of CRGO Electrical Steel Lamination in Rs./MT suitable for Transformers of rating above 10 MVA or voltage above 33 kV up to 400 kV
3. Price of steel is the average retail price of steel plates 10 mm thick as published by Joint Plant Committee (JPC) in Rs./MT as on 1st working day of the month.
4. The price of Insulting materials (in Rs./Kg) of pre-compressed pressboards of size 10 mm thick, 3200 mm x 4100 mm is the average C&F price in free currency per MT converted into Indian Rupees with applicable exchange rates prevailing as on 1st working day of the month as quoted by primary suppliers. This price is the landed cost, inclusive of applicable customs duty only but exclusive of countervailing duty.
5. The price of Transformer Oil (in Rs./K.Ltr) is the average price on ex-refinery basis as quoted by primary producers for supply in drums.

(d) Some purchasers are purchasing oil immersed Transformers from manufacturers without first filling of oil. Oil for first filling is procured and filled by the purchasers. For such supplies PVC formula, excluding Oil will apply as under:

$$P = \frac{P_0}{93}\left(10 + 29\frac{C}{C_0} + 27\frac{ES}{ES_0} + 7\frac{IS}{IS_0} + 5\frac{IM}{IM_0} + 15\frac{W}{W_o}\right)$$

Where description of P, P_0, C, ES, IS, IM, W etc. remains same as mentioned earlier.

Deputy Director General

IEEMA/PVC/PWR TRF_upto 400 KV2015/3/3

ANNEXURE-II

LIST OF FITTINGS AND ACCESSORIES TO BE PROVIDED WITH EACH POWER TRANSFORMER.

Each transformer shall be provided with the following accessories.

(i) Dial type Thermometers for oil: - A dial type indicating thermometer with repeater of robust pattern mounted on the side of the transformer at a convenient height to read the temperature in the hottest part of the oil and fitted with alarm and trip contacts. Remote oil temperature indicator shall also be mounted on RTCC panel.

(ii) 3 no. Winding temperature indicator for HV , IV & LV winding:- It shall be indicating type with repeater responsible to the combination of top oil temperature and winding current, calibrated to follow the hottest spot temperature of the transformer winding,. The winding temperature indicator shall operate a remote alarm before the hottest spot temperature approaches a dangerous value and it shall automatically actuate the cooling fan Motors.

(iii) Remote winding temperature indicator is to be installed in the indoor control panel i.e. fan control cubicle with its repeater on remote tap charger control cubicle.

(iv) a. One magnetic type oil level gauge with low level alarm contacts and dial showing minimum, maximum and normal oil levels. The gauge shall be readable from the gauge transformer base level.

b. One plain oil level gauge of over lapped type on other side of conservator.

(v) Minimum 3 no. pressure relief valves : The quantity of these valves should commensurate with the quantity of oil in the transformer and also location of valves should be properly designed to adequately release the excessive pressure.

(vi) A set of air release valves on the top and on the radiators and also at appropriate place on X-mer tank top and turret

(vii) One thermometer pocket for mercury in glass type thermometer.

(viii) One double float gas detector relay (Buchholz relay) with alarm and tripping contacts to detect accumulation of gas and sudden changes of oil pressure, complete with shutoff valves and flanges couplings to permit easy removal without lowering oil level in the main tank, a blend valve for gas venting, and test valve. Make of buchholz relay shall be as per our approved list of vendors.

(x) Heat exchangers or radiators complete with shut of valves and with facility for oil draining arrangement.

(xi) a/ Two oil conservator, with required accessories, one for main tank and other for OLTC.

b/ Air cell type breathing arrangement with oil preserving equipment complete in all respects.

(xii) Eye bolts and lugs on all parts for easy handling.

(xiii) Two grounding earth terminals at diagonally opposite corner of tank.

(xiv) One rating and diagram plate.

(xv) A set of minimum 4 nos. flanged bi-directional wheels for rail mounting (for 1676mm rail gauge).

(xvi) A set of fans required for ONAF cooling of the transformer with following information.

a. Number of Radiator Banks.

b. No. of cooling fans of adequate voltage & rpm) provided in each bank to ensure 100% ONAF rating of the transformer. As per our specification, for each bank one additional cooling fan is to be included which will be duly wired-up.

(xvii) Suitable jacking lugs and haulage holes.

(xviii) Inspection window & main holes with bolted cover as per Annexure-IV.

(xix) Lifting arrangement for the complete transformer, core coil assembly and also tank.

(xxi) One foldable ladder on main tank.
(xxi) For the purpose of taking earthing connection from the neutral bushing, adequate number of brackets with small support insulators shall be provided on the body of the tank so that earthing could be arranged by us near the earthing pit of transformer itself.
(xxii) A separate weather proof FCC (Fan/Cooler control) cubicle shall be provided containing dial type thermometer and winding temperature indicator and terminals of dial, type thermometer, winding temperature indicator, buchholz relay, MDG, control of fans etc. The cooler control cubicle shall be mounted outside oil soak pit.

Please note provision of separate Fan Control Cubicle (FCC) is a must. FCC shall be suitably dimensioned to accommodate following:-

(a) The wiring from RTCC shall be brought to marshalling box and for terminating the same adequate number of suitably rated terminal connectors shall be provided.
(b) Necessary cable glands shall be included in the scope of supply.
(c) Arrangement for terminating the connecting leads of OTI, WTI, buchholz, magnetic oil level gauge etc. shall be made in the marshalling box. It should be possible to read OTI and ETI readings without opening the box through suitable glass window. All trip alarm and repeater signals will be transferred to control room for which arrangement will have to be made.
(d) Starters for cooling fans shall be housed in marshalling box and necessary switches for local operation of fans shall be provided.
(e) Local remote control switch for OLTC shall be provided.
(f) Space heater with switch, cubicle illumination lamp, fuses, links overload protection arrangement for motors and other accessories shall be included in the scope of supply.

(xxiii) One set of indoor RTCC (Remote tap changer control) cubicle complete with provision for remote operation of OLTC, as independent or master/follower scheme, with oil and winding temperature repeater, tap position indicator with annunciation for fan group ON/OFF and cooler supply fail indicator and Tap changer in progress.
(xxiv) One set of erection manual/relevant drawing/leaflets should be secured permanently inside the RTCC cubicle as a guideline for site erection and commissioning.
(xxv) Three separate connection i.e. connection from core, connection from end frame and connection from tank shall be brought out on to a terminal box with cover. Arrangement for inter connecting these terminals in the terminal box shall also be provided. This arrangement shall facilitate verification of core, end frame and tank insulation.
(xxvi) In no case, the radiators should be projected above the main tank height.
(xxvii) All transformers shall be supplied with a full outfit of tools, spanners, jacks, special tools for assembly and all spanners shall be single ended and of very good quality of "Gedore" or "Taparia" make.

2. The equipments and accessories furnished with the transformer shall be suitably mounted on the transformer for ease of operation, inspection and maintenance and the mounting details shall be subject to the approval of the purchaser. All valves shall be provided either with blind companion flanges or with pipe plugs for protection.
3. Indication, alarm and relay equipment shall have contacts suitable for operation with 220V/110V DC supply. Any other accessories or appliances recommended by the manufacturer for the satisfactory operation of the transformer shall also have same DC Supply.
4. (a) OLTC and its controls shall be as per Clause-5.5.20, Section-II of specification.

(b) All cabinets & panels shall be conforming to stipulations under relevant clause of specifications.

(c) All 400/220/33KV Tertiary and neutral bushings shall be of OIP condenser type and as per Clause-5.5.16 Section-II of specifications.

5. NIFP system as per clause-5.5.11
6. On line DGA Monitoring device as per clause-5.5.10

Accessories, which are not included in the above schedule but details of which are given in tender specification and which are necessary for satisfactory operation of Transformer shall be deemed to have been included in the accepted price without any extra cost to the CSPTCL.

*** * * * ***

ANNEXURE-III

LIST OF TRANSFORMER ACCESSORIES & TEST CERTIFICATES REQUIRED FOR THEM

S.No	Accessory	Test-certificates required
1.	Condenser Bushing	1. Appearance, construction and dimensional check. 2. Test for leakage of internal filling at a pressure of 1.0 Kg/cm for 12 hours. 3. Insulation resistance measurement with 2000V megger. 4. Dry/wet power frequency voltage withstand test. 5. Dry/wet power frequency voltage withstand test for test tap insulation 6. Partial discharge measurement upto 1.5 UN 3Kv. 7. Measurement of tangent delta and capacitance.
2.	Pressure Gauges/ Differential Pressure Gauges	1. Appearance, construction and dimensional check. 2. Calibration test. 3. Alarm contact setting test.
3.	OLTC.	1. Oil tightness test for the diverter switch oil chamber at an oil pressure of 0.5 Kg/cm2 at 100 degree centigrade for 1 hour. 2. Mechanical operation test. 3. Operation sequence measurement 4. Insulation resistance measurement using 2000V megger. 5. Power frequency voltage withstand test on diverter switch to earth and between even and odd contacts. 6. Power frequency voltage withstand test on tap selector- between stationary contacts, between max. and min. taps, between phases and supporting frames, between phases. 7. Operation test of complete tap changer. 8. Operation and dielectric test of driving mechanism.
4.	Winding & Oil Temperature Indicator	1. Calibration test. 2. Dielectric test at 2 KV for one minute. 3. Accuracy test for indication and switch setting scales. 4. Test for adjustability of switch setting. 5. Test for switch rating. 6. Measurement of temperature rise with respect to the heater coil current.
5.	PRV	1. Functional test with Compressed air to check bursting pressure, indicating flag operation and switch operation. 2. Dielectric test at 2 Kv for one minute. 3. Switch contact test at 5A, 240 Volt AC.
6.	Cooling fans	1. Insulation resistance measurement. 2. Dielectric test at 2 KV between winding and body for one minute. 3. Operation check. 4. Appearance, construction and dimensional check.
7.	Buchholz relay	1. Leak test with transformer oil at a pressure of 3 Kg/cm2 for 30 minutes at ambient temperature for relay casing. 2. Insulation resistance measurement with 500V megger. 3. Dielectric test at 2KV for 1 minute. 4. Elements test at 1.75 Kg/cm2 for 15 minutes using transformer oil at ambient temperature. 5. Loss of oil and surge test. 6. Gas volume test. 7. Mechanical strength test. 8. Velocity calibration test. 9. Appearance construction and dimensional check.

8.	Oil level indictor	1. Test for oil levels. 2. Switch operation for low level alarm. 3. Switch contact test at 5A 240V AC. 4. Dielectric test at 2 KV for 1 minute. 5. Appearance, construction and dimensional check.
9.	Pressed steel radiators	1. Air pressure test at 2 kg/cm2 under water for 15 minutes. 2. Appearance, construction and dimensional check.
10.	OLTC control cubicle/ cooler control cabinet	1. Appearance, construction and dimensional check. 2. Electric operation. 3. Insulation resistance measurement using 500V megger at ambient temperature. 4. Dielectric test at 2 KV for 1 minute.
11.	Bushing current transformer	1. Appearance, construction and dimensional check. 2. Polarity check. 3. Measurement of insulation resistance. 4. High voltage power frequency test. 5. Determination of ratio error and phase angle of measuring and protection BCTs. 6. Determination of Turns ratio error for PS class BCT. 7. Determination of composite error for protective class BCT. 8. Interturn insulation withstand test. 9. Exciting current characteristic test. 10. Secondary winding resistance measurement. 11. Knee-Point voltage, measurement for PS class BCT.

Date
Place

SIGNATURE OF BIDDER
NAME
DESIGNATION
(SEAL)

ANNEXURE-IV

SCHEDULE OF INSPECTION WINDOW

Sl. No.	Particulars	Qty (in no.)
01.	Main hole	01
02	Inspection cover to facilitate full inspection and tightening of all connections of divertor switch of OLTC fitted in position. This inspection window can also be used as main hole at S.No. 1 above.	01
03.	Inspection cover for facilitating inspection/ connections of R, Y & B phase HV bushings.	02
04.	Inspection cover to facilitate inspection and connection of R, Y & B phase LV bushings.	02
05.	Inspection cover to facilitate inspection and connection of HVN & LVN bushings.	02
06.	Inspection cover to facilitate inspection and connection of delta formation.	01
07.	Inspection cover considered necessary for inspection of active parts/ connections etc. as per manufacturer's design.	Qty. as per requirement

Date	SIGNATURE OF BIDDER
Place	NAME
	DESIGNATION
	(SEAL)

ANNEXURE-V
LIST OF VENDORS FOR MAJOR ITEMS OF TRANSFORMER

S. No.	Name of Item	Supplier
1.	CRGO	M/s. Nippon steel corporation, Japan M/s. Kawasaki Corp., Japan (M/s JFE, Japan) M/s. Armco, USA, M/s. Covefi, France M/s. Salzgittar, Germany M/s. S Usinor, France M/s Transfer, France M/s Mitsubishi, Japan. M/s AST Terni, Italy M/s. EBG India Pvt Limited, (Indian Agent) for M/s GELSE NKIRCHEN, Germany M/s British Steel Corporation , UK M/s Thyseen Krupp Group of Companies M/s. POSCO, Korea M/s A.K.Steel USA
2. (a)	Winding conductor	M/s Invex Filli Isolati Speciali s.p.a. Italy M/s. Asta M/s. Smit Draad, Holland M/s. Incab Industries, Jamshedpur M/s. Sterlite Industries, Mumbai M/s. Bhandari Conductor, Mumbai/ Mandideep. M/s. Shakti Insulated Wires, Mumbai M/s KSH International Pvt Limited, Taloja M/s Delta-Trans Conductor, Mumbai M/s Vijay Electricals, Hyderabad M/s RIMA Transformers & Conductors (P) Ltd, Bangalore. M/s Lacroix and Kress (GMBH) Germany M/s Pirellicavi Italy M/s Shree Cable & Conductors M/s. Hindalco M/s. Chandra Metals M/s. BCPL Conductors
(b)	CTC Conductor	M/s Sam Dong Korea M/s Invex Filli Isolati Speciali s.p.a. Italy M/s Loc Roix AND KRESS – Germany M/s. KSH International (P) Ltd. M/s. Chandra Metals
3.	Precompressed press Board & press Board components	M/s. H. Weidmann, Switzerland M/s. Fige Holms Brruk, Swedan M/s. Senapathy Whiteley, Banglore M/s. Raman Board, Mysore
4.	Insulating Material	M/s. Dupont, USA M/s. Senapathy Whiteley, Banglore M/s. H. Weidmann, Switzerland M/s. Munksio M/s Amotfors, Sweden M/s Krammerer
5.	Air Cell	M/s PRONL, France, M/s. Swastik M/s. Unirub M/s. Rubber Products M/s Sukrut Udyog
6.	Gaskets	M/s. Talbros, Faridabad M/s. Cortica, Chennai M/s. Packing & Jointing, Chennai

S. No.	Name of Item	Supplier
		M/s Indian Rubber Products, Haridwar M/s Bombay Oil Seal Mfg. Mumbai M/s MGM Rubber Kolkata M/s Bharat Corrub Industries, Vadodara. M/s Indian work Industries M/s Works Product Pvt Ltd
7.	OIP Condensor bushing	M/s. BHEL M/s. CGL M/s. TELK M/s ASEA-MICAFIL M/s. Trench M/s. Alstom (earlier M/s. Areva) M/s. Vijai Electricals Ltd. M/s ABB
8.	Terminal Connector	M/s. Best & Crompton, Chennai M/s. PeeVee Engg., Bangalore M/s. Milind Engg., Mumbai M/s. Nootan, Baroda M/s Utsav, Baroda M/s Vinayak and Co., Mumbai M/s Megha Engg. Enterprises, Chennai M/s Klemmen Engg. Corporation , Chennai
9.	OTI/WTI with repeater	M/s. Accurate Control,UK M/s. AKM, Swedan M/s. Perfect Control, Chennai, India M/s. Preci Measure, Banglore M/s Radix Electrosystems Pvt. Ltd/ Radix Pyrotech India
10.	Magnetic oil gauge	M/s. Sukrut Udyog, Pune M/s. Yogya, Jhansi
11.	Buchholz Relay & Oil surge relays	M/s. Fukuda Instrument, Japan M/s. Atvus,Calcutta M/s. English Electric, Chennai M/s. Prayog; M/s BHEL M/s Instrument and Control, Vadodara
12.	Pressure Relief Device	M/s. Qualtrol, USA M/s. GE, USA; M/s. Sukrut Udyog, Pune
13.	Fan & Motor	M/s. Alstom (earlier Areva) M/s. CGL, Mumbai M/s. Khaitan, Calcutta. M/s EPC, Calcutta M/s Marathan
14.	Un-impregnated Densified laminated wood	M/s. Permali Wallace Bhopal M/s. Kit ply Assam M/s. Mysore Polymers Banglore M/s Narmada Forest Ind. Pvt. Ltd. Bhopal. M/s Western India Plywood , Kerala M/s Rochling Detonite
15.	Valves	M/s. Leader M/s. Bombay Metal & Alloys M/s. Audco M/s. Petson M/s. Manixon M/s. Creseant M/s Precision Engg. Kottayam, M/s Eapen Joseph, Kottayam M/s Apex Piping Systems, Jalandhar M/s Liberty Engg., Mumbai

S. No.	Name of Item	Supplier
		M/s Niton Valves, Mumbai M/s Eapen Joseph & Co., Coimbatore M/s Oswal Agra M/s Neo Engg. Ahamedabad M/s CG Valve Udaipur
16.	MCB	M/s. Sieman M/s. MDS M/s. S&S M/s. Havell's
17.	Fuse	M/s. Siemens/ S&S / Areva / Havell's
18.	Tank Steel	M/s. SAIL/Jindal/Essar steel
19.	OLTC Complete	M/s. BHEL M/s. CTR M/s. TELK M/s Easun, Madras
20.	Terminal Blocks	M/s. ELMEX M/s. Technoplast, M/s. Tosha
21.	Silica gel Breather	M/s. Yogya Enterprises, Jhansi. M/s. Anusen Industries, Pune. M/s Instruments & Controls , Vadodara, India
22.	Transformer oil	M/s Apar Limited, Mumbai M/s Savita Oil Technologies M/s. Raj Petrochemicals
23.	Radiator	M/s CTR Manufacturing Industries, Pune M/s Thermal Transformer Product, Bangalore M/s Exotherm, Bangalore. M/s P.E. Engg. Hyderanad. M/s Hitech Switchgear, Mumbai M/s Mahindra Electrical works M/s Triveni Electroplast
24.	On line DGA monitor	M/s. GE Kelman-Transfix M/s. Morgan Schaffer M/s. A-E Berley
25.	NIFP System	M/s. CTR,M/s Easun MR Tap changers(P) Ltd

Note: The bidders should submit their offer considering the above mentioned vendors only. Any change in vendor of any item shall be permitted by CSPTCL only in case of justified reasons. No alteration in vendor without the approval of CSPTCL is permissible.

Date
Place

SIGNATURE OF BIDDER
NAME
DESIGNATION
(SEAL)

ANNEXURE-VI

TENDER AND CONTRACT DRAWING, CALCULATIONS TO BE FURNISHED FOR POWER TRANSFORMER

The following drawings and data are to be submitted by the bidder for approval:

(a) Outline dimensional drawings of transformer and its accessories including conservator complete with Bill of material and details of all parts, their quantity, rating & name of Vendors indicating clearances of transformer body from live terminals i.e. HV,IV,LV.

(b) Drawing of transformer tank with location of inspection windows, thickness of side/bottom/top of tank, details of stiffener.

(c) Drawing indicating limbed core construction with complete details of no., width and wt. of core laminations with size of steps; thickness of core laminations ; dimension of window; size of limbs; Gross and net core ; wt. of complete core.

(d) Drawing indicating core belting arrangement with details of belting, belting material etc.

(e) Large scale dimensioned drawings for HV,IV & LV windings of the transformer; size and no. of parallel of HV,IV, LV and of cooling ducts, coil clamping arrangement, no./size & location of pressure screws, clamping ring; top yoke arrangement etc. The details should commensurate with the short circuit calculations submitted by you for each rating of transformer

(f) Detailed drawing of transformer tank with complete core and winding indicating clearances inside transformer tank as also passage and space for free movement of at least two persons for inspection of active parts etc .

(g) Schematic diagram showing the flow of oil in the cooling system as well as each limb and winding. Longitudinal and cross-sectional views showing the duct sizes, cooling pipes etc. for the transformers/radiators drawn to scale .

(h) Drawings giving the weights for foundations.

(i) Combined Rating and diagram plate including tap changing, which should also include details of guaranteed and measured no load and load losses as also winding resistances and percentage impedances at all taps.

(j) Schematic control and wiring diagram for all auxiliary equipment and control cubicle.

(k) Drawing showing constructional details, dimensions, mechanical & technical particulars of bushings. Arrangement of terminals and details of connection of bushing shall also be indicated in drawing with their technical particulars.

(l) Transportation drawing of transformer.

(m) Details of fittings and cable box.

(n) Drawing showing arrangement and details of tap changing gear including selector switch, diverter switch and drive mechanism.

(o) Valve Schedule plate.

(p) Oil filling instruction plate for conservator fitted with Air cell breather arrangement including equalizing arrangement if any required at the time of taking full Vacuum at site.

(q) Drawing and instruction for fitting of Air Cell.

(r) Drawing of conservator indicating internal details of air cell MOG, oil level gauge and silica gel breather pipe fitting arrangement.

(s) Drawings of all HV, IV& LV bushings with complete details meeting TS requirement.

(t) Drawings of HV, IV,LV& neutral terminal connectors indicating plate thickness, no. of nut bolts with size and other details.

(u) Drawing of foldable & detachable ladder with its complete details and fitting arrangement on transformer/ conservator tank.

(v) Drawing for HV/IV neutral earthing arrangement indicating voltage rating of insulators and its fitting arrangements, size of copper strips, terminal connectors etc.

(w) Detailed drawing indicating two views of all valves provided in the transformer tank.

(x) Detailed internal drawing of transformer indicating transportation locking arrangement provided to avoid shifting of core assembly.

(y) Drawing showing weights of transformers, cooling fan structures, FCC structures with distance from central line of transformer for casting of civil foundation for transformer and associated equipments.

(aa) Drawing of Earthing terminal box showing earthing arrangement for core, end frame, tank giving details of voltage class and current rating of terminal bushings.

(ab) Drawing indicating insulation thickness details and other arrangement provided between core assembly and bottom yoke and base of bottom of tank.

(ac) Drawing indicating details of 'O' ring gasketting arrangement provided in transformer tank covers.

(ad) Detailed Drawing of jacks.

(ae) Drawing of stiffeners provided on top, each faces/sides of tank with their number and size.

(af) Drawing indicating number, location, size of shields/ magnetic shunts and its material if provided inside the tank

(ag) Drawing indicating internal details of transformer giving complete details of clearances from live parts.

(ah) Drawing of internal IV/LV winding termination arrangement indicating minimum clearance between core and IV/LV take off lead.

(ai) Drawing for Lead termination to bottom of HV & IV Neutral Bushings

(aj) Drawing for Lead termination to bottom of HV,IV& LV bushings.

(ak) Internal drawing & design of Core & Winding indicating all attachment with identification numbers, description including take-off arrangement of lead connection for Core & End frame and related Bill of Material

(al) Locking arrangement drawing for tank top cover, core & winding with complete dimension & details.

(am) Plan view of the bottom of Bell Tank for complete details of core coil resting arrangement, indicating clearly dimensional details, material of insulation, clamping arrangement with details of nuts/ bolts, clearance from all sides provided at bottom.

(an) Drawing indicating complete details, dimension & mounting arrangement of OLTC inside the tank with respect to End frame.

(ao) Drawing indicating complete details, dimensions & fixing arrangement of static end rings if used.

(ap) Other relevant drawings.

The manufacturer shall supply two (2) copies of the drawings as listed out above, which will describe the equipment in details for approval. Three sets of instruction books, operation and maintenance manuals and spare part bulletin, shall be supplied. In addition to above two sets of manuals and drawings with test certificates for each unit to be despatched as per despatch instructions.

It will be obligatory on the part of the manufacturer to ensure that the weight of core lamination, weight of copper, weight of steel, weight of transformer tank along with fitting and accessories, quantity of oil for first filling including wastage and 10 % extra of that quantity, total weight of core plus winding after assembly, total weight of transformer and other dimension of transformer are worked out carefully. It may be noted that at the time of submission of final drawings, variation in these weights beyond the limits of (±) 5% shall not be permitted

ANNEXURE- VII

DETAILS OF INSPECTION PROGRAMME

(A). Inspections to be performed at manufacturer's works in presence of CSPTCL's representative and/ or a representative of NABL accredited third party.

1.0 Stage Inspection:

It may be noted that stage inspection for all the units at CSPTCL's discretion shall be done at manufacturer's works in presence of CSPTCL's representative and representative of third party authorized by CSPTCL at the following stages.

1.1 After the core is built but before its clamping, CSPTCL's representative will inspect the core to take complete weight of the core and also to measure approximate core loss. If necessary, a small strip of core shall also be taken for testing at ERDA/ CPRI at our discretion.

1.2 Once the coils are prepared and are fitted on to the core, stage inspection of the core coil assembly shall be done to take measurements of HV/ LV windings. A small piece of conductor for each type of winding shall be made available by the manufacture. The magnetic balance test shall also be carried out during this stage inspection.

Apart from the above, the CSPTCL also reserves the right to carry out stage inspections at other stages also, for which advance intimation shall be given and all necessary cooperation shall be rendered by the manufacturer.

2.0 Final inspection:

After satisfactory stage inspections, ovening of core coil assembly and tanking thereafter shall be carried out by the manufacturer. Call for final inspection of the transformer shall be given after readiness of transformer in all respects. During the final inspection, all routine and additional routine tests shall be carried out on each unit according to the methods specified in IS:2026 (Part-I):2011 and IS:2026 (Part-III):2009. These tests shall be witnessed by CSPTCL's representative and representative of third party authorized by CSPTCL The details of the tests to be carried out are as given here under:

Sl.	Particulars
(A) Routine tests:	
1	Measurement of winding resistance
2	Measurement of voltage ratio and check of phase displacement
3	Measurement of Impedance voltage/ short circuit impedance (Principal tap) & load loss
4	Measurement of no load loss at 90%, 100% & 110% of rated voltage and no load current
5	Measurement of Insulation resistance
6	Dielectric routine tests as per IS:2026 (Part-III) i.e. lightning impulse tests on all phases of HV/LV windings, short duration induced AC withstand voltage tests, separate source AC withstand voltage tests
7	Tests on load tap changers
(B) Addl. Routine Tests:	
1	Dimensional checks as per approved drawing & specification
2	Magnetic circuit test. After assembly ,core shall be tested for 1 minute for 2000 volts AC between all bolts, side plates & structures steel works
3	Polarisation index – IR value for 15 sec, 60 sec & 600 sec duration shall be

	recorded and PI for 600/60 sec and DAR i.e. ratio of IR values of 60/15 seconds shall be recorded. The PI value (600/60 sec) should be >=1.5 and DAR value (60/15 sec) should be >=1.3. These values should be recorded both before and after HV tests.
4	Tank oil leakage test – the complete transformer assly filled with oil shall be subjected to nitrogen pressure of 0.35 Kg/cm2 above the normal oil head for a period of 12 Hrs to ensure that there is no oil leakage.
5	Capacitance and tan delta measurement to determine capacitance between wingding and earth. This test should be carried out before and after series of dielectric tests by ANSI II method.
6	Test on bushings and tan delta capacitance and IR values
7	**Checking of recording of IR values**
	(a) Between core & coil frame
	(b) Between core & tank
	(c) Between coil frame & main tank The measured IR values should be more than 1000 M Ohms.
8	Magnetic balance and magnetizing current (3 phase & 1 phase at normal tape) test
9	Tests of PRDs for successful operation
10	Oil BDV test before & after HV tests
11	Sweep Frequency response analysis (FRA)- SFRA shall be carried out at manufacturer's works with his own SFRA test set. The test shall be repeated at site with same test set.

Further, following type & special tests as per clause 6.2, Section-II of tender specifications shall be carried out on one unit out of the lot.

(i) Temperature rise test as per IS:2026 (part-I) & clause 4 of IS:2026 (part-II) on both ONAN/ONAF ratings.

(ii) Tank vacuum test and tank pressure test

(iii) Test on pressure relief devices

(iv) Measurement of zero Seq. Reactance.

(v) Measurement of acoustic noise level.

(vi) Measurement of power taken by fans.

(vii) Measurement of harmonic level in no load current.

(viii) Lighting impulse with chop on tail on all 3 phase of HV and LV terminals.

(ix) One cooler cabinet and OLTC cabinet of the transformers (preferably for the first unit of the lot) shall be tested for IP:55 protection in accordance with IS: 2147. In case facility for this test is not available with the manufacturer, the test has to be carried out at the laboratory of either CPRI or ERDA in presence of CSPTCL's representative and test report should be furnished.

Tests on Assembled Transformer:

a) Check completed transformer against approved out line drawing, provision for all fittings, finish level etc.

b) Jacking test on the assembled Transformer.

3.0 Tests to be conducted at destination site of CSPTCL:

On delivery / receipt, after erection at site, the transformer shall be subject to the following tests, in presence of supplier's engineer.

3.1 **Tests on reaching at site:**

(i) Immediately upon receipt of transformer at site and before unloading of transformer from trailor, core earthing, end frame earthing and tank earthing shall be checked. Only after satisfactory verification that there is not multiple core earthing in transformer, unloading of transformer shall be undertaken.

(ii) After receipt of transformer at site physical inspections shall be done for checking any physical damage to transformer tank and accessories. Further, data of impact recorder shall be analyzed for any changes before unloading of transformer.

3.2 **Pre commissioning tests:**

(i) Insulation resistance test and polarization index.
(ii) Ratio and polarity test
(iii) DGA of oil and di-electric, tan delta, resistivity & moisture content test of oil.
(iv) OLTC operational test at each tap for lower and raise operation of tap changer.
(v) Magnetic balance tests and measurement of magnetizing current.
(vi) Vector group test
(vii) Percentage impedance test at all taps
(viii) Short circuit current measurement at low voltage and at all taps
(ix) Measurement of winding resistance at all taps
(x) Tangent delta, capacitance and insulation resistance tests of bushings
(xi) Measurement of IR values between core & coil frame, core & tank end coil frame and tank.
(xii) Dew point measurement and recording of pressure of nitrogen gas.
(xiii) SFRA test.

The SFRA test and Dew point measurement shall be carried out in presence of manufacturer's representative. The test kits shall be same as used for carrying out these tests in the factory and shall be brought by manufacturer's representative.

(B). Checks to be performed by the manufacturer during various stages of manufacturer of transformer. The in house test reports may be reviewed by CSPTCL's representative during stage / final inspection.

1. Tank and conservator:

a) Certification of chemical analysis and material tests of plates.

b) Welder's qualification and weld procedure.

c) Testing of electrodes for quality of base materials and coatings.

d) Inspection of major weld preparation and joint.

e) Crack detection of major strength weld seams by 'dye penetration test'.

f) Measurement of film thickness of:

i) Oil insoluble varnish.
ii) Zinc chromate paint.
iii) Finished coat.

g) Check correct dimensions between wheels, demonstrate turning of wheels through 90 degrees and further dimensional check.

h) Check for physical properties of materials for lifting lugs, jacking pads etc. All load bearing welds including lifting lug welds shall be subjected to NDT.

i) Tank vacuum & Tank pressure tests as per CBIP manual on transformer & as per this specification.

j) Leakage test of the conservator and tank.

k) Measurement of thickness of tank plates i.e. top, Bottom & Sides.

l) All double welds shall be tested for leaks with dry nitrogen, at the pressure not less than 7 kg/sq.cms. (atm)

m) All tanks, single welds, cooling coils, radiators valve and other parts necessary for complete transformer shall be tested for leaks and strength by applying pressure not less than 0.7 atm for a period of 24 hrs or not less than 1 atm for a period of 06 hours. If leaks occur, the tests shall be conducted after all leaks have been stopped.

n) Certification of all test results.

2. Core:

a) Sample testing of core material for checking thickness of lamination, special loss, bend properties, magnetization characteristics (B-H Curve) and Epstein curve.

b) Check on the quality of varnish, if used on the stampings.

i) Measurement of thickness and hardness of varnish on stampings.

ii) Solvent resistance test to check that varnish does not react in hot oil.

iii) Check overall quality of varnish by sampling to ensure uniform shining colour, no bare spot, no over burnt varnish layer and not bubbles on varnished surface.

c) Check on the amount of burrs.

d) Bow check on stampings.

e) Check for the over lapping of stampings, Corners of the sheets are to be apart.

f) Visual and dimensional check during assembly stage.

g) Check on completed core for measurement of iron loss characteristic and check for any hot spot by exciting the core so as to induce the designed value of flux density in the core.

h) Visual and dimensional checks for straightness and roundness of core, thickness of limbs and suitability of clamps. Weightment of core with belting after building up.

i) High voltage test of 2KV for one minute between core and clamps.

j) Certification of all test results.

3. Insulating material:

a) Sample check for physical properties of materials.

b) Check for dielectric strength, .

c) Visual and dimensional checks.

d) Check for the reaction of hot oil on insulating materials.

e) Dimensional stability test at high temperature for insulating material.

f) Tracking resistance test on insulating material.

g) Certification of all test results.

4. Winding:

a) Sample check on winding conductor for mechanical properties and electrical conductivity.

b) Check insulating distance between high voltage/low voltage connection, cable and earth and other live parts.

c) Check for proper cleanliness and absence of dust.

d) Visual dimensional checks on conductor for scratches, dent marks etc.

e) Sample check on insulating paper for PH values bursting strength and electric strength.

f) Check for bonding of insulating paper on conductor and absence of short circuit between parallel strands.

g) Check for brazed joints wherever applicable.

h) Measurement of voltage, when yoke/core is completely restocked and all connection are ready.

i) Measurement of no. of turns in each winding and cross sectional area of windings. Weightment of windings.

j) Certification of all test results.

5. Checks before drying process:

Weight of complete core, winding and insulation.

a) Check condition of insulation of the conductor and between windings, Insulation gap between HV connection, cables, earth and other live parts. Similarly check for LV/IV connections.

b) Insulation of core shall be tested at 2KV /min between core to bolts and core to clamp plates.

c) Check for proper cleanliness and absence of dust etc.

d) Certification of all test results.

6. Checks after drying process:

a) Record measurement of temperature, vacuum and drying time during vacuum treatment.

b) Check for completeness of drying by measuring IR values and Tan Delta.

c) DP test shall be carried out after jacking test.

7. Pre - shipment check at manufacturer's works:

a) Check for inter changeability of components of similar transformers for mounting dimensions.

b) Check for proper packing and preservation of accessories like radiators, bushings, explosion vent, dehydrating breather, rollers, buchholz relay, fans, control cubicle, connecting pipes, conservator etc.

c) Check for proper provision of bracing to arrest the movement of core and winding assembly inside the tank.

d) Gas tightness test to conform tightness.

e) Derivation of leakage rate and ensure adequate reserve gas capacity.

f) Measurement of dew point prior to dispatch of the unit filled with N2 gas. Results of this test shall be submitted to CSPTCL for reference.

Note:

(i). **Further tests:**
The Purchaser reserves the right to having other reasonable, tests carried out at his own expenses either before shipment or at site to ensure that the transformer complies with the requirements of this specifications.

(ii). **Test reports:**
After all tests have been completed seven certified copies of each test report shall be furnished. Each report shall supply the following information:

(i) Complete identification data including serial number of the transformer.

(ii) Method application, where applied duration and interpretation of results for each test.

(iii) Temperature data corrected to 75 degree centigrade including ambient temperature.

Date
Place

SIGNATURE OF BIDDER
NAME
DESIGNATION
(SEAL)

ANNEXURE- VIII

LIST OF HAND TOOLS & JACKS FOR SUPPLY ALONG WITH TRANSFORMER

A. One tool box consisting of the following hand tools of reputed make shall be supplied with each transformer.

No.	Spanners of different sizes	
1	a) Open jaw double ended	08 No.
	b) Cranked ring double ended	03 No.
	c) Tubular Box double ended	01 No.
2	**Tommy Bar (for Tabular Box spanner)**	
3	Adjustable wrenches	02 No.
4	Pipe wrench	01 No.
5	Screw Drivers of different sizes	05 No.
6	Flat Nose, Round Nose, Side Cutting Pliers	03 No.
7	Gasket punches	10 No.
8	Filkeswith Handles	02 No.
9	Hammers with Handles	02 No.
10	Knife with Handles	02 No.
11	Adjustable Hacksaw	01 No.
12	Cold Chisel	01 No
B	Hydraulic jack of minimum 100 T capacity with 150 mm lift. The bidder should however offer jack based on wt of transformer quoted by them.	04 No.

Date	SIGNATURE OF BIDDER
Place	NAME
	DESIGNATION
	(SEAL)

ANNEXURE – IX

PROFORMA TO BE FILLED UP DURING THE INSPECTION OF THE TRANSFORMER

TECHNICAL SPECIFICATIONS:

(1). Transformer sl. No. :

(2). Rated capacity (MVA) : ONAN ONAF

	HV	IV	NV
(3). Rated voltage (KV)			
(4). Rated current (Amp)			
(5). Power frequency test voltage (KVrms)			
(6). Insulation level (KV)			
(7). Terminal notations			
(8). Connections			
(9). Vector group			
(10). Type of tap changer			
(11). Voltage variation			
(12). Frequency (HZ)			

*****

ANNEXURE - X

COMPARISION OF MEASURED & GUARANTEED VALUES

Sl. No.	Item		Measured	Guaranteed	Tolerance
1	No load loss at 100% excitation (KW) & rated frequency				
2	No load current at 100% excitation (%), & rated frequency				
3	Load loss at principal tap corrected to 75 °C at 315.00 MVA base & rated voltage & rated frequency (KW)				
4	Cooler losses (KW)				
5	Total losses (KW)				
6	Efficiency at normal ratio & rate UPF (%)				
7	Impedance voltage between HV and IV at 75 °C and 315.00 MVA base	Tap 1			
		Tap 9			
		Tap 17			
8	Impedance voltage between IV and LV at 75 °C and 315.00 MVA base at tap 9 (%)				
9	Impedance voltage between HV and LV at 75 °C and 315.00 MVA base (%)				
10	Regulation at normal ratio and CMR at 75 °C				
	At UPF (%)				
	At 0.8 pg lag (%)				
	At 0.9 pf lag (%)				

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ANNEXURE-XI

ROUTINE AND ADDITIONAL ROUTINE TESTS

Sl. No.	Particulars	Remarks (mention specific comments regarding tests results as per standards or not)
(A) Routine tests:		
1	**Measurement of winding resistance** – The measurement of resistance of HV, IV & LV windings should be carried out at different taps and values at the ambient temperature & converted values at 75 deg C should be recorded in a separate sheet.	
2	**Measurement of voltage ratio and check of voltage vector relationship** – The measurement of HV to IV ratio at all taps and HV to LV and IV to LV ratio at normal taps should be recorded and ratio error should be mentioned in a separate sheet. The voltage vector relationship should also be recorded to ensure the vector group of the transformer.	
3	**Measurement of Impedance voltage/ short circuit impedance (Principal tap) & load loss** – Tests to be carried out at normal, highest & lowest tap	
4	**Measurement of no load loss & current –** The values of no load loss and no load current at normal tap at 90%, 100% & 110% of rated voltage should be recorded before and after dielectric test.	
5	**Measurement of Insulation resistance –** The insulation resistance between HV + IV/ tank, LV/tank & HV+IV/LV should be recorded with 5KV megger for 15 seconds, 60 seconds & 600 seconds. The values and PI of 60^{th} / 15^{th} & 600^{th} / 60^{th} should be mentioned in a separate sheet. The values should be recorded before & after HV tests.	
6	**Dielectric tests –** Separate sources voltage withstand tests, induced over voltage withstand test and lighting impulse withstand tests on all phases of HV, IV & LV as per IS: 2026 should be carried out in following sequence: (i) One reduced full wave impulse (ii) Three 100% full impulse (iii) The test voltages should be as per tender specification. Results should be indicated in separate sheet with Oscillograms output should be enclosed.	
7	**Tests on load tap changers -** The testing of OLTC should be done as per clause 16.9.1 of IS:2026 part-I. After the tap changer is assembled on the transformer, the following tests should be performed at 100% of rated auxiliary supply voltage. (i) Eight complete operating cycles with transformer not energized. (ii) One complete operating cycle with transformer not energized with 85% of rated auxiliary supply voltage. (iii) One complete operating cycle with the transformer energized at rated voltage and frequency at no load loss. (iv) Ten tap change operations with +/- two steps on either side of the normal tap with as far as possible rated current of the	

	transformer with one winding short circuited.			
(B)	**Addl Routine Tests:**			
1	**Dimensional checks as per approved drawings & specifications** – All dimensions as per approved drawing should be checked.			
2	Magnetic circuit test. After assembly ,core shall be tested for 1 minute for 2000 volts AC between all bolts, side plates & structures steel works			
3	Tank oil leakage test – the complete transformer assly filled with oil shall be subjected to nitrogen pressure of 0.35 Kg/cm2 above the normal oil head for a period of 12 Hrs to ensure that there is no oil leakage.			
4	Capacitance and tan delta measurement to determine capacitance between wingding and earth. This test should be carried out before and after series of dielectric tests.			
5	Test on bushings: All tests on bushings including capacitance, creepage distance, Dry/wet p.f. on terminals and tapping, partial discharge test, ten delta measurement & oil leakage at pressure of 1.5 Kg/cm2 for 12 hours.			
6	Checking of recording of			
(A)	IR values			
	(a) Between core & coil frame			
	(b) Between core & tank			
	(c) Between coil frame & main tank The measured IR values should be more than 1000 M Ohms.			
(B)	Measurement & recording of currents with application of 400V 3 phase AC supply on HV side & LV side shorted			
	(a) Between core & coil frame			
	(b) Between core & tank			
	(c) Between coil frame & main tank			
7	Magnetizing current measured with LT supply (before and after HV tests)			
	Particulars	With single phase supply		
		Volts	Amp	
8	Magnetic balance test (before and after HV tests)			
9	Tests of PRDs for successful operation			
10	Oil BDV test before & after HV tests			
11	Frequency Response Analysis (FRA)			

***

ANNEXURE - XII

TYPE AND SPECIAL TESTS

(TO BE PERFORMED ON ONE UNIT OUT OF THE LOT)

The following type tests shall be performed:

(i) Temperature rise tests as per clause 4 of IS: 2026 part-II. – The temperature rise of oil & winding should not be more than the limits specified in the tender specifications.

(ii) **Tank vacuum tests:**
One transformer tank out of the whole lot shall be subjected to the specified vacuum. The tank designed for full vacuum shall be tested at an internal pressure of 3.33 KN/m 2 absolute (25 torr) for one hour. The permanent deflection of flat plate after the vacuum has been releases shall not exceed the values specified below.

Horizontal length of flat plate (in mm)	Permanent Deflection (in mm)
Up to and including 750	5.0
751 to 1250	6.5
1251 to 1750	8.0
1751 to 2000	9.5
2001 to 2250	11.0
2251 to 2500	12.5
2501 to 3000	16.0
Above 3000	19.0

(iii) **Tank Pressure Test**
One transformer tank of each size together with its radiator, conservator, vessel and other fittings shall be subjected to a pressure corresponding to twice the normal head of oil or to the normal pressure plus 35 KN/m 2 whichever is lower, measured at the base of the tank and maintained for one hour. The permanent deflection of flat plates after the excess pressure has been released after conducting vacuum test should not be more than the values specified above.

(iv) Measurement of zero sequence reactance as per clause 16.10 of IS: 2026 part-I.

(v) Measurement of acoustic noise level as per clause 16.12 of IS: 2026 part-I.

(v) Measurement of harmonics of the no load current as per clause 16.13 IS: 2026 part-I.

(v) Measurement of power taken by the fans as per clause 16.14 of IS: 2026 part-I.

(vii) Lightning impulse tests with chop on tail as per clause 14 of the IE: 60076. The sequence to be followed for routine lightning impulse tests and chopped lightning impulse tests for this particular unit shall be as mentioned here under:

- One reduced level full impulse;
- One full level full impulse;
- One or more reduced level chopped impulse(s);
- Two full level chopped impulses;
- Two full level full impulses.

(viii) One cooler cabinet and one OLTC cabinet of the transformer shall be tested for IP:55 protection in accordance with IS:2147. This test may be conducted either at manufacturer’s works or any other Govt. approved laboratory.

ANNEXURE –XIII

ILLUSTRATIVE EXAMPLE FOR CAPITALISTION OF LOSSES

Particulars	Range prescri-ded (KW)	Quoted by bidders					
		M/s. A	M/s. B	M/s. C	M/s. D	M/s. E	M/s. F
For 315 MVA Transformer							
No Load loss (KW) offered	81-90	82	83	81	91	82	83
Load loss (KW) offered	427.5-475	428.5	429.5	434.5	428	480	470
Aux loss (KW) offered	18-20	18	18.2	18.1	18	19	22
Diff No Load loss		1	2	0	Bid non responsive due to excessive No load loss	Bid non responsive due to excessive load loss	Bid non responsive due to excessive auxiliary loss
Diff Load loss		1	0	7			
Diff Aux loss		0	0.2	0.1			
Capitalization for no load loss (Diff loss x 4,01,840.00)		401840	803680	0			
Capitalization for load loss (Diff lossx 2,13,780.00)		213780	0	1496460			
Capitalization for no load loss (Diff loss x 1,60,700.00)		0	32140	16070			

ANNEXURE –XIV

Details of Single phase Unit and Three Phase unit of BHEL make 400/220/33KV Xmers at 400KV Substation Khedamara

Sl No.	Perticulars of Xmer	Percentage impadance of existing Xmer						
1	Xmer make- M/s BHEL	HV/POSITION -1 IV	HV/POSITION-13 IV (Normal)	HV/POSITION-17 IV	HV/LV	IV POSITION-1/LV	IV POSITION-13/LV	IV POSITION-17/LV
	Single phase unit (ICT bank-I) Year of Manufacture- 1981-82							
	Maker's Sl No.							
a	6004372 (unit-I)	10.14%	11.97%	13.21%	45.77%	31.31%	29.52%	29.12%
b	6004373 (unit-II)	9.65%	12.24%	13.42%	44.76%	30.65%	29.05%	29.74%
c	6004374 (unit-III) (after repaired)	9.82%	12.95%	14.64%	44.36%	31.66%	30.20%	30.01%
d	6004379 (unit-IV) spare	9.80%	12.49%	13.78%	46.41%	31.00%	28.40%	27.40%
	Single phase unit (ICT bank-II) Year of Manufacture- 1982-83							
a	6004381 (unit-V)	9.84%	12.32%	13.12%	48.34%	31.49%	28.40%	27.83%
b	6004378 (unit-VI)	9.84%	12.33%	13.12%	48.26%	31.49%	28.40%	27.76%
c	6004382 (unit-VII)	9.65%	12.50%	13.39%	45.--%	29.91%	30.00%	28.01%
	Three phase unit (ICT) Year of Manufacture- 1995							
	Maker's Sl No.		HV/IV POSITION-9		HV/LV		IV POSITION-9/LV	
	600521 2 (DEFECTIVE)		11.78%		43.85%		27.46%	
	Details of single phase unit							
	MVA rating HV		42 /63 /105					
	MVA rating IV		42 /63 /105					
	MVA rating LV		12.6 /18.9 /31.5					
	Voltage rating		HV/IV/LV					
			400/√3/220/√3/33KV					
	Details of three phase unit		ONAN/ONAF/OFAF					
	MVA rating HV & LV		189 /252 /315					
	MVA rating LV		63 /84 /105					
	Voltage rating		HV/IV/LV					
			400/220/33KV					

ANNEXURE XV

EXISTING FOUNDATION DRAWING OF 315 MVA AT 400 KV KHEDAMARA