SECTION-IV

TECHNICAL SPECIFICATION

TOWARDS REPAIR OF

AUTO AND POWER TRANSFORMERS

SECTION-IV
TECHNICAL SPECIFICATION

1.**SCOPE:-**

The scope of this specification covers the repair, assembly, inspection and testing, loading and unloading, dragging, transportation from OPTCL'S site to repairer's workshop and back after due repairs to the OPTCL'S sites (transformer's plinth) or as will be directed by the engineer in charge of the destination S/S, it's supervision of erection, testing & commissioning as mentioned in the specification elsewhere.

The detail scopes of repair are enumerated as follows:-

1.1 REPAIRING (Jobs involving labour charges & providing materials, gaskets etc.)

Dismantling of transformer core & winding, cleaning of core laminations, tank, tap changer, conservator, breather, radiators and all other parts fitted with the transformer. Reassemble of core & windings with new conductors, providing with new bushings, new transformer oil, new phase barriers, spacers, all minor & major insulations excluding those provided in individual windings, perm wood etc. and other new parts in lieu of damaged ones including brazing , soldering, sleeving and insulating etc. if required, vacuum oven drying of assembled core & windings, changing of all gaskets by new ones, making terminal connections , welding of tank , radiators & other parts at the point of leakage, radiators, filling oil, filtration and dehydration, overhauling of cooling fans & pumps as necessary and testing including temperature rise test as per relevant ISS/IEC and OPTCL's specification. It also covers the works involved during Joint Inspection at OPTCL's site, initial inspection, stage and final inspection at repairer's workshop.

N.B: -

i) Dismantling includes removing all core laminations and rebuilding after cleaning and necessary treatment, if required. And addition of new core laminations if required, complete spray painting of transformer externally with two coats of high glossy heat resistible gray paint. (Paint to confirm with relevant ISS). Complete spray painting of Transformer internally with two coats of high glossy heat resistible gray paint. (Paint to confirm with relevant ISS)

ii) Any design modification, if needed in the repair transformer, then it will be mutually settled with the contractor/repairer after opening & verification of the transformer during the joint inspection of the transformer at contractor/repairer's factory.

1.2 TRANSPORTATION

Loading / Unloading and transportation of transformer (by road) including bushing , radiators , conservators , fans and all other necessary parts from OPTCL'S site to the repairer's workshop and back to OPTCL site (Transformer plinth) or as will be directed by the engineer in charge of the destination S/S. Obtaining of necessary road permits , clearances , approval from concerned authority , construction of road diversion if necessary, compliance of all statutory laws & regulations and all other documentation works required during the transportation shall be the responsibility of the repairer.

1.3 JOB INVOLVING MATERIALS WITH LABOUR

1) Providing HV Coils with new copper DPC conductor including all the major and minor insulations as necessary for complete HV winding providing new leads and trapping leads, inter-windings and inter coil connections etc.
2) Providing Tap Coils with new copper DPC conductor including all the major and minor insulations as necessary for complete Tap winding providing new leads and tapping leads, inter-windings and inter coil connections etc.
3) Providing L.V. Coils with new copper D.P.C. Conductor including all the major and minor insulations as necessary for complete L. V. winding providing new leads inter-winding and interconnections etc.
4) Providing Tertiary Coils(Where ever Required) with new copper D.P.C. Conductor including all the major and minor insulations as necessary for complete L. V. winding providing new leads inter-winding and interconnections etc.
5) Labour Charges for overhauling OLTC.
6) Supply of new Transformer oil (Napthenic base i.e. % of Naphthenic content in oil will be more than 40% & paraffinic contnt will be less than 56%) as per relevant upto date ISS for filling up of the complete Transformer including radiators, conservators etc. and 10% extra oil.
7) Replacement of damaged core laminations by new core CRGO Laminations.
8) Providing new insulation to CORE bolts.
9) H. V/ I.V Bushing – Total Replacement
10) H. V/ I.V Bushing rod-with accessories – Total Replacement
11) L. V. Bushing – Total Replacement
12) L. V. Bushing rod-with accessories – Total Replacement
13) Tertiary Bushing (Where ever required) – Total Replacement
14) Tertiary Bushing rod-with accessories – Total Replacement
15) H.V./ LV Neutral bushings – Total Replacement
16) PRD (Pressure Relief Device) - if necessary.

17) Oil drain valves of different size

a) 15 nb
b) 25 nb
c) 40 nb
d) 50 nb
e) 80 nb
f) 100 nb
g) 150 nb
h) Any other size

18) Radiator valves
19) Buchholz Relay
20) Oil Surge Relay
21) Dial thermometer (oil)
22) Dial thermometer (winding)
23) C.T. of necessary ratio alongwith all necessary parts/accessories for winding temp. Indicator
24) Breather with Silica Gel
25) Magnetic oil level guage for conservator
26) Tank nuts and bolts
27) Explosion vent with diaphgram
28) Radiator conforming to all parameters like size, length, no of fins etc. of the radiators fitted with the tendered transformer
29) Complete sets of gaskets
30) OLTC in complete shape, if necessary.
31) Barrier board between tank & OLTC, if necessary.
32) Air cell of conservator, if necessary.
33) Bottom Permawood ring, if necessary.
34) Marshalling Box
35) Cooling Fan
36) Cooling Pump

1.4 SUPPLY/REPLACEMENT OF PARTS/MATERIALS, IF NECESSARY

OLTC, Cooling Fan, Cooling Pump(wherever required), Marshalling Box, PRD (Pressure relief device), Oil drain valves, radiator, Radiator valve, Buchholz Relay, Oil Surge Relay, Dial thermometer (oil),Dial thermometer (winding), C.T. of necessary ratio alongwith all necessary parts/accessories for winding temperature indicator, Breather with silicagel, Magnetic oil level gauge for conservator, Tank nuts and bolts ,Explosion vent with diaphragm / PRV, Complete sets of

gaskets , Barrier board between tank & OLTC, Air cell of conservator, Bottom Permawood ring as per requirement.

N.B:- The bidders are required to inspect the transformer(s) at site for ascertaining the detail of items required for repair of the transformer to make it operational and quote their prices accordingly. Basing upon above, they are also required to quote either the price for new OLTC or price for overhauling of existing OLTC as mentioned at clause no – 1.3 of this section. **Prior to quoting the prices, the bidders are requested to go through the Section – VI (Details of the transformers to be repaired) of the TS.**

1.5 **CREDIT FOR PARTS TO BE RETAINED BY REPAIRER.**

Salvage value of each item replaced by new-one including Copper Scrape (H.V/ I.V) or LV or Tertiary or all) and damaged core.

A. Copper Scrap (H.V. or L. V. or Tertiary or all)

B. Salvage value of each item

1) H. V/ I.V Bushing
2) H. V/ I.V Bushing rod-with accessories
3) L. V. Bushing
4) L. V. Bushing rod-with accessories
5) H.V./ LV Neutral bushings
6) Tertiary Bushing (Stabilizing)
7) Tertiary Bushing rod-with accessories
8) PRD (Pressure Relief Device) - if necessary.
9) Oil drain valves of different size
    a) 15 nb
    b) 25 nb
    c) 40 nb
    d) 50 nb
    e) 80 nb
    f) 100 nb
    g) 150 nb
    h) Any other size
10) Radiator valves
11) Buchholz Relay
12) Oil Surge Relay
13) Dial thermometer (oil)

14) Dial thermometer (winding)
15) C.T. of necessary ratio alongwith all necessary parts/accessories for winding temp. Indicator
16) Breather with Silica Gel
17) Magnetic oil level guage for conservator
18) Tank nuts and bolts
19) Explosion vent with diaphgram
20) Radiator conforming to all parameters like size, length, no of fins etc. of the radiators fitted with the tendered transformer
21) OLTC in complete shape, if necessary.
22) Barrier board between tank & OLTC, if necessary.
23) Air cell of conservator,if necessary.
24) Bottom Permawood ring, if necessary.
34) Marshalling Box
35) Cooling Fan
36) Cooling Pump

C. Salvage value of damaged core

2.0 Following are the list of documents constituting this specification:

[I]. Technical specification.

[ii]. Name plate details of defective transformer(s) to be repaired & its mandatory additional technical parameters. **[Please refer to Section – VI of the Tender Specification]**

[iii]. Scope of repair and price schedule **[Schedule-A]**

[iv]. Format for initial inspection and estimate Of Burnt Transformer [**Schedule-B]**

[v]. Format for stage inspection (initial Testing**) [Schedule-C]**

[vi]. Format for calibration status of testing equipments/meters Instruments **[Schedule-D].**

[viii]. Format for External joint inspection Report indicating condition of each item at OPTCL's site **[Schedule-E]**

[IX] Format for the Inventory of materials (list of parts) of the transformer to be lifted by the repairer **[Schedule-F]**

3.0 <u>PLACE OF AVAILABILITY:</u>

The defective transformer are lying at different **Grid sub-station of OPTCL (Section – VI of the TS may please be referred)**, which may be inspected by the Tenderers before submission of their bids. In this connection, the SDO of the respective Grid S/S may be contacted.

4.0 PLACE OF DISPATCH AFTER REPAIR :- After repairing of the transformers , the repairer shall deliver the repaired transformers at any Grid Sub-Station of OPTCL within the state of ODISHA, which will be intimated at the time of issue of dispatch clearance after final inspection. While making offer for loading, unloading, handling & transportation of the transformers, the repairer may take into account the places of availability indicated **above** and the places of dispatch after due repair as envisaged in this clause and clause 3.0 above.

5.0 JOINT INSPECTION OF DEFECTIVE TRANSFORMER AT OPTCL'S SITE:

Within 20 (Twenty) days from the date of issue of the LOI with successful tenderer, the contractor and the DGM of E.H.T. (O&M) Division who is concerned with respective Grid Sub-station and engineers from EMR, OPTCL (if required) shall jointly certify the defective transformer as per the format **[Schedule-E]** attached to this Specification and submit the same to this office as well as office of concerned Executive Director (E.D), OPTCL for approval.

6.0 LIFTING OF DEFECTIVE TRANSFORMER:-

After receipt of the approval of joint Inspection report from the concerned Executive Director (E.D), OPTCL, the Sr.GM CPC will intimate the contractor to lift the defective transformer along with radiators, bushings, cooling fans, conservator tank and other accessories to their works except the Transformer oils. The Transformer oil have to be drained out from the transformer & the transformer to be made ready for handing over to the repairer by the concerned AGM/SDO of the Grid S/S within 20 (Twenty) days from the date of issue of Sr.GM CPC's letter to the firm for lifting the transformer to their works. The repairer will lift the defective transformer within 20 (Twenty) days from the date of issue of Sr.GM CPC's letter for such lifting in consultation with the concerned DGM / AGM / MANAGER / DY.MANAGER of that S/S. Before lifting of defective transformer from OPTCL's site, the repairer shall furnish the list of components of transformer to be lifted for repair as per **Schedule - F** and other components which will be retained at the OPTCL site. Both the lists shall be signed by the representative of the repairer and the MANAGER / AGM / DGM of the E.H.T.(O&M) Division under whose jurisdiction the concerned Grid Sub-station falls as per Schedule-F enclosed & copies of the same shall be furnished to Sr.GM CPC & concerned Executive Director (E.D), OPTCL for their information &necessary action**.** But in any case, the repairer has to lift those accessories / components along with the transformer which will be used/required during heat-run & routine tests.

7.0 JOINT INITIAL INSPECTION AT REPAIRER'S SITE AND ESTIMATE

Within 20(Twenty) days from the date of receipt of defective transformer from OPTCL's S/S, the repairer shall give Clear 20 [Twenty] days notice (i.e. twenty days from the date of receipt of letter at Sr.GM, CPC's office) to Sr.G.M[CPC], OPTCL Bhubaneswar for deputing his representative[s] for initial inspection and estimate to assess the exact extent of repair to be executed. The initial

inspection and estimate shall be done in accordance with Schedule- A & B attached to this Specification. The repairer shall furnish enough evidence regarding their claim for prices quoted for any item / component of the transformer. Any delay beyond 15 days from the date of issue of the letter from Sr.GM, CPC's office seeking clarifications on prices in furnishing the satisfactory reply on prices of the components quoted by the repairer, will be treated as the delay due to the repairer himself & OPTCL may impose additional penalty on the repairer as per the penalty clause.

All Assistance shall be rendered to the Inspecting officer[s] to carry-out the initial Inspection and estimate.

8.0 PLACEMENT OF WORK ORDER:

Basing on the joint initial inspection, estimate prepared at the repairer's works as per actual & verification of the estimate at Sr.GM, CPC's office, OPTCL will place work order on the repairer as per the following conditions. But if any abnormality is found in the estimate the repairer will be asked for clarification & justification, who within 15 days form issue of such letter will furnish his justified reply with documentary evidence, if necessary.

i) If the evaluated repair cost (considering the actual quantity & the unit price quoted by the bidder) is less than the total repair cost offered by the bidder, then the evaluated repair cost shall be allowed for payment.

ii) If the evaluated repair cost (considering the actual quantity & the unit price quoted by the bidder), is more than the total repair cost offered by the bidder, then total repair cost offered by the bidder shall be allowed for payment.

iii) Maximum +10% variation on the total quoted repair cost/ evaluated repair cost, whichever is minimum shall be allowed for payment if it is required to replace the following items only-

1) Replacement of damaged core laminations by new core CRGO Laminations, if necessary.
2) Barrier board between tank & OLTC, if necessary.
3) Air cell of conservator, if necessary.
4) Bottom Permawood ring, if necessary.

iv) Any additional accessories / quantity of material (Other than the accessories / quantity of material quoted by the firm), if required for repair of the said transformer then the cost of the same shall be borne by the firm.

v) If during initial inspection it is observed that less quantity of material/accessories are required than that quoted by the firm, then actual quantity as per joint inspection report /estimate shall be allowed for payment.

9.0 QUALITY ASSURANCE PLAN:

The contractor shall submit the quality Assurance plan of the repairing process and the list of vendors, supplying different bought out items towards repair of the defective transformer within 15[fifteen] days from the date of issue of the work order. After receipt of the approval of the QAP and the list of vendors, the contractor shall carry out repairing of the transformer.

10. STAGE INSPECTION:-

On completion of assembly of HV,I.V, LV & Tertiary (Wherever applicable) Windings and the core & painting works of the tank, the contractor shall give clear 20[Twenty] days notice for stage inspection. The stage inspection and the weight etc. shall be carried out in the presence of OPTCL's representative as per the format, enclosed as **Schedule- C**. The stage inspection report shall be signed jointly by the contractor and the OPTCL's representative and submitted to Sr.G.M.[CPC] for approval. The possible electrical parameters like measurement of DC resistance of both HV ,I.V, LV & Tertiary (Wherever applicable) windings, determination of the turns of the windings, no load loss etc. shall be taken up in the presence of OPTCL's representative and submitted to Sr.G.M.[CPC] for necessary approval. The contractor shall submit the documentary evidence like invoices, challans, test reports etc. of the bought-out items/materials, used/to be used for repair of the transformers along with the calibration certificates of all testing instruments/meters/equipments to be used during testing. The calibration must have been done in Government approved laboratory[s] for which documentary evidence shall be furnished along with the stage inspection report. The delay in furnishing the valid calibration reports will delay the Final inspection & Delivery, & the repairer will be fully responsible for such delays.

11. INSPECTION :

i. OPTCL shall have access at all times to the works and all other places of repairing where the transformers are being repaired and the repairer shall provide all facilities for unrestricted inspection of the repairer's necessary tests as may be required by OPTCL .

ii. The repairer shall keep OPTCL informed in advance of the time of starting and of the progress of repairing of transformer in its various stages so that arrangements could be made for inspection.

iii. The repairer shall give clear 20 (Twenty) days notice (i.e. Twenty days from the date of receipt of such letter at Sr.G.M, CPC's office) to Sr.GM,CPC,OPTCL for deputing OPTCL's representative for final inspection and testing of the repaired transformers (tests as enumerated at Cl.13.0 of this specification). The offer for final inspection shall be accompanied with the shop routine test certificates (except high voltage tests& heat-run tests). The Inspecting Officer will conduct inspection only if the calibration certificates and

shop routine test certificates of the transformer are found to be in order as per relevant ISS and OPTCL'S specification.

iv. The repaired transformers shall be dispatched from its point of repair only when it will be ascertained that the repaired transformer has been satisfactorily inspected, tested, test results complying to our specification and ISS and release order issued by Sr.G.M.(C PC), OPTCL, Bhubaneswar.

v. The acceptance of the repaired transformer on the basis of the Inspection Report and Test Report shall in no way relieve the repairer of his responsibility for meeting all the requirements of this specification during subsequent inspection and testing at site during erection as well as performance during its operation.

vi. Six (6) sets of Inspection & Test Reports shall be submitted to Sr.G.M.(CPC), OPTCL, Bhubaneswar after final inspection and testing for due scrutiny, approval and issue of dispatch clearance.

vii. If required, the repaired transformer shall be dispatched duly filled up with Nitrogen Gas of 95.5% purity with a pressure gauge to monitor nitrogen pressure inside the transformer at the repairer's cost. In that case new oil as per requirement shall be supplied separately in barrels /drums & additional nitrogen cylinder with gas has to be provided by the repairer for maintaining pressure of the gas inside the transformer till its erection & commissioning. Since supervision of erection & commissioning of the repaired transformer are to be carried out by the repairer, the repairer will be responsible for ingress of moisture if any inside the transformer, due to leakage of nitrogen gas from the transformer tank.

12.0 <u>TESTING:-</u>

[A] Type Test:- The temperature rise/heat-run test shall be carried out for each of the transformer on the tap giving the worst combination of loading on the transformer windings , as per up-to-date IS 2026 & IEC Publ.76.2 in the presence of OPTCL's representative. **The temperature rise of the windings and oil shall not exceed the values indicated in the latest IS-2026 for transformers.** DGA testing of oil shall be carried out before & after the temperature rise test & the results are to be furnished in the test report. Sampling of oil & analysis of gasses shall be in accordance with IEC 567 & IEC 599. During temperature rise test WTI , OTI ,radiator top , radiator bottom , three watt meter readings , three voltmeter & three ammeter readings are to be recorded in addition to other usual readings.

[B] Routine Test:- Following routine tests shall be carried out on each repaired transformer as per IS:2026 and this Technical specification in presence of OPTCL's representative.

[i]. Measurement of DC resistance of windings at principal and extreme taps.

[ii]. Measurement of voltage ratio and check of voltage vector relationship.

[iii]. Measurement of Insulation Resistance at 60 & 600 second intervals before & after all the tests.

[iv]. Dielectric Tests,

[a]. Power frequency over-voltage tests.

[b]. Induced over voltage Tests.

[v]. Operation and dielectric testing of OLTC as per IS: 2026 clause 16.9.

[vi]. Measurement of no load loss and no load current by 3 watt meter method.

[vii]. Measurement of load loss and Impedance voltage at principal tapping and extreme Taps by employing 3 watt meter method with low power factor watt-meters. The Load loss & Impedance voltage measurement shall be made preferably at 100% rated current but in no case shall not be less than 80% current of the rated current[principal tapping] or tapping current[in case of extreme taps.].

[viii]. Oil BDV Test.

[ix]. Measurement of capacitance and tan-delta of windings & bushings. The maximum Tan – Delta value at 20 Deg. C should be $\leq$ 0.007. This measurement shall be carried out before and after series of dielectric tests.

[x]. Determination P.I. value:- Polarization Index shall be measured in respect of all windings by taking insulation resistance for 10 mins & 1 min. This should not be less than 1.5 or more than 5. P.I. shall be measured before and after all the tests.

[xi]. Measurement of Neutral current during load loss test which should not exceeds 2% of the rated current.

[xii]. Magnetic Balance test.

[xiii]. DGA test of oil before and after all the tests.

[xiv]. Measurement of Zero sequence impedance of the primary and secondary windings.

[xv]. Measurement of power taken by fans.

[xvi]. Measurement of harmonic level on no load current.

[xvii]. Oil leakage test :- All tanks and oil filled compartments shall be tested for oil tightness by completely filling with oil of a viscosity not greater than that of insulating oil confirming to IS : 335 at the ambient temperature and applying a pressure equal to the normal pressure plus 35 KN/m measured at the base of the tank. The pressure shall be maintained for a period of not less than 12 hours during which time no leakage shall occur.

13.0 SUPERVISION OF ERECTION,TESTING & COMMISSIONING

The scope covers supervision of erection, testing & commissioning of the repaired transformers at any EHT GRID Sub-Stations in Odisha as per the requirement of concerned Executive Director (E.D), OPTCL However, the erection, testing & commissioning portion of the work shall remain valid for a period of one year after the actual date of delivery of repaired transformer at OPTCL's Sub-Station.

The repairer shall have to depute their Engineer for Supervision of erection, testing & commissioning of repaired transformer at the site. One set of gaskets for accessories & Bushings shall be supplied free of cost for fitting at site. Supervision of Erection, testing & commissioning work will be taken up by the repairer within 15 days from the date of issue of letter by the OPTCL's Authorities, under intimation to Sr. GM, CPC.

In the event of alternation of installation site during 12 months from the date of receipt of transformer, the cost of loading, unloading transportation and the handling of transformer inside the concerned Sub-Station shall be beyond the scope of this repair contract. However supervision of erection, testing & commissioning at the designated site shall be mandatory as stated above within one year from the date of handing over of materials in good condition at site.

14. Details of Power & Auto Transformers having Sl No/Make/ & its available Location for repair:

Sl. No	Description of Auto & Power Transformer	Name and Contact Number of Sub-Divisional Officer
Lot-I	40 MVA, 132/33 KV Areva make Power Transformer (Serial No. D-9411) **Available at 132/33 KV Grid S/S, BARIPADA.**	Sri M. C. Besra , A.G.M (El), **9438907275** Under EHT (O&M) Division-Baripada.
Lot-II	40 MVA, 132/33 KV Areva make Power Transformer (Serial No. B-9476) **Available at 132/33 KV Grid S/S, CHAINPAL.**	Sri A. K.Nath, D.G.M (El), **9438907179.** Under EHT(O&M) Division- Chainpal
Lot-III	40 MVA, 220/33KV, BHEL-Make Power transformer (serial No.-2042106). **Available at 220/33KV Grid S/S, INFOCITY-II**	Smt Sujata Mahalik, A.G.M(El), **9438907986.** Under EHT (O&M) Division-Bhubaneswar.
Lot-IV	20 MVA, 220/33KV CGL make Power Transformer (Serial No. BH09296/1). **Available at 220/33 KV Grid S/S, BALIMELA.**	Sri A. K. Sethi, D.M(El), **9438907092** Under EHT(O&M) Division-Malkangiri
Lot-V	20 MVA, 220/33KV BHEL make Power Transformer.**Available at 220/33 KV Grid S/S, KASHIPUR.**	Sri Iswar Chandra Sing. D.M(El) 9438907326 Under EHT(O&M) Division, Therubali

Lot-VI	160MVA, 220/132/33 KV BHEL make Auto Transformer (Serial No. 2017901) **Available at 220/132/33 KV Grid S/S, BUDHIPADAR**	Sri S.K. Patel, D.M(El), **9438907828** Under EHT (O&M) Division-Jharsuguda.

SCHEDULE – A

SCOPE OF REPAIR & SCHEDULE OF PRICES

SCHEDULE OF PRICES

SCHEDULE –I (Part-A)

PRICE SCHEDULE INDICATING DETAILS OF TOTAL REPAIR CHARGES FOR

40MVA, 132/33 KV (M/s Areva make) POWER TRANSFORMER

S. No.	Particulars	Qty.	Unit charges for repair of transformer	GST @	Total Unit rate incl. GST	Amount in Rs.
1	2	3	4	5	6	7= (3x6)
1	Dismantling of transformer including core. Cleaning of all healthy parts, including coils, laminations, tap changer, radiator tubes, conservator, breather etc. Rebuilding of core laminations after replacement of required laminations, preparation of new windings. Re-assembly of core and new windings including brazing, soldering and insulating. vapour phase drying. Re-assembly of complete transformer. Changing of all gaskets and fitting of accessories of transformer. Oil filling and filtration	1				
2.1	Fitting of new OLTC, if required.	1				
2.2	Over hauling of OLTC	1				
3	Internal painting & external spray painting of transformer with radiators, conservator and connecting pipes.	1				
Sub Total (Part-A)						

Seal & signature of bidder

SCHEDULE-I (Part-B) TESTING CHARGES AFTER REPAIRS OF 40MVA, 132/33 KV (M/s Areva make) POWER TRANSFORMER

S. No.	Particulars	Qty.	Unit charges for repair of transformer	GST @	Total Unit rate incl. GST	Amount in Rs.
1	2	3	4	5	6	7= (3x6)
1	Testing of repaired transformer as per technical specification.	1				

Seal & signature of bidder

SCHEDULE-I (Part-C)

COST ON THE BASIS OF COPPER CONTENT/LAMINATION OF TRANSFORMERFOR REPAIRS OF 40MVA, 132/33 KV (M/s Areva make) POWER TRANSFORMER

Sl. No.	Particulars	Unit charge Rs/Kg	Total qty	GST @	Total Rs/Kg
1	Cost of new copper coil with insulation of all the limbs of power transformers including series, common, regulating & tertiary windings of 40MVA transformer. (Rs./ Kg)				
2	Scrap salvage value of series, common, regulating & tertiary windings copper with insulation, which will be retained by Bidder. (Rs./ Kg)				
3	Cost of lamination that may be required to be replaced. (Rs./ Kg)				
4	Scrap salvage value of core lamination which will be retained by bidder. (Rs./ Kg)				

Note:

The bidder should offer rates on per Kg basis. For evaluation purpose, weights of windingsand lamination as mentioned in clause-11 of Section-I shall be considered. However, in final order quantum shall be based on actual replacement.

Seal & signature of Bidder

SCHEDULE-I (Part-D)

TRANSPORTATION CHARGES

Sl. No.	Particulars	Qty.	Unit charge	GST @_____	Total unit charge incl. GST	Amount in Rs.
1	2	3	4	5	6	7= (3x6)
1	To & Fro transportation charges inclusive of the following:	1				
	Loading, Unloading, Transportation & insurance of Transformer including bushings, radiators, conservators, fans, pumps and all other necessary parts at site (At Transformer plinth). (Unloading and loading at repairer's work will be of free of charge to OPTCL)					
	Sub Total (Part-D)					

SIGNATURE OF BIDDER

NAME AND SEAL OF THE TENDERING COMPANY

SCHEDULE-I (Part-E)

SCHEDULE OF PRICES AND QUANTITY OF SPARES & ACCESSORIES

Sl. No.	Particulars	Qty. (No./ set)	Unit Ex-works price	Freight	GST @	Unit FORD price
1	170 KV Bushing condenser type OIP, 1250 Amps.	3				
2	72.5 KV Bushing condenser type OIP, 1250 Amps (for LV)	3				
3	52 KV Bushing condenser type OIP, 1250 Amps (for neutral)	2				
4	Silica gel breather for main tank	1				
5	Silica gel breather for OLTC tank	1				
6	Pressure Relief Valve (PRV) of adequate capacity with 2 No. contacts	1				
7	Buchholz Relay (Main Tank)	1				
8	Oil Surge Relay for OLTC	1				
9	Air cell	1				
10	Cooling fans 0.24 Kw, 415volt, 3-ph, 915 mm size, RPM-550	8				
11	OLTC with diverter switch in driving mechanism complete	1 set				
12	Repeater dial of transformer winding temperature indicator	2				
13	Repeater dial of transformer oil temperature indicator	2				
14	Bushing CTs for HV, IV & neutral bushings as per specifications given for REF protection	7				
15	Terminal connectors for bushings	1 set				
16	36 KV post insulator for support of neutral copper strip	1 set				

Note:

(i) The quantities for spares are tentative and may vary as per actual requirement. The order shall be placed as per the requirement on the basis of report of initial joint inspection.

(ii) The makes of accessories shall be strictly as per vendor list given in Annexure-IV.

Signature of bidder

Name and seal of the tendering company

SCHEDULE –II

ERECTION, TESTING & COMMISSIONING

OF 40MVA, 132/33 KV (M/s Areva make) POWER TRANSFORMER

Sl. No.	Particulars	Unit charge	GST@	Total
1	Erection, testing & commissioning of the transformer after its repair at any sub-station site within Chhattisgarh state with your manpower and T&P etc.			
TOTAL				

Seal & signature of bid

Signature of the repairing Firm

Signature of the OPTCL's representative(s)

SCHEDULE – B

FORMAT FOR INITIAL INSPECTION & ESTIMATE OF BURNT TRANSFORMER

i) On receipt of the burnt transformer in the repairer's workshop, the repairer has to intimate by fax / speed post to Sr. G.M., CPC,OPTCL to depute his authorized representative (s) for initial inspection and estimate.

ii) The core and coil assembly as a whole is to be untanked in the presence of OPTCL'S representative for initial inspection and estimate.

iii) The repairer will measure the resistance of the healthy windings (H.V., L.V & Tertiary) in the presence of OPTCL'S representative and record the resistance readings along with the ambient temperature.

iv) The repairer will determine the No. of Tertiary/ L.V./H.V. turns/phase in the presence of OPTCL'S representative both by ratio measurement method and by unwinding one of each windings in a winding machine and by recording the counter reading.

v) The repairer will remove the top core and dismantle HV , LV & Tertiary windings in the presence of OPTCL'S representative for details of measurement of core, HV , LV & Tertiary windings etc. in the following format.

Sl. No	Particullars	LV	HV	HV Regulating	Tertiary
A	**WINDINGS:**				
1.	Rated current per phase[1 ph] Amp.				
2.	Conductor Bare (mm)				
3.	Conductor Insulated (mm)				
4.	Type of Conductor Insulation				
5.	No. of Conductors in Parallel				
6.	Bare Conductor's sectional area				
7.	Current density (A/mm^2)				
8.	Rated volts per phase (volts)				
9.	Turns per phase (T)				
10.	Type of winding				
11.	No ,of discs (Nos.)				
12.	No. of turns/disc.				
13.	Inside diameter (mm)				
14.	Outside diameter (mm)				
15.	Winding depth (mm)				
16.	Winding length (mm)				
17.	Gap between discs (mm)				
18.	No. of spacers in one circle				
19.	Size of the spacer (mm)				
20.	Length of mean turn in meter				
21.	Weight of winding (Kg/ each) (Weight of winding includes the weight of insulated conductor, spacers, runners and other insulations as has been completely required to make the winding.)				

22.	Weight of winding (Kg/ each) (Here Weight of winding includes only the weight of insulated conductor without spacers,runners & other insulations.)				
23	Mention the winding(s) which has been cut and damaged.				
B	**INSULATION.**				
1.	Between Core & L.V. Winding (Details like thickness (mm), length(mm), type of insulation etc. to be mentioned).				
2.	Between H.V. & L.V. Winding (Details like thickness (mm), length(mm), type of insulation etc. to be mentioned).				
3.	Between H.V. & L.V. & Tertiary Winding (Details like thickness (mm), length(mm), type of insulation etc. to be mentioned				
4.	Between windings to top yoke (Details as above to be mentioned)				
5.	Between windings to bottom yoke (Details as above to be mentioned)				
C.	**CORE.**				
1.	Core Diameter in mm =				
2.	Window Height in mm =				
3.	Distance between core leg center in mm =				
4.	Widths of window in mm =				

5. OTHER PARAMETERS OF CORE

No of steps	1	2	3	4	5	6	7	8 etc.
Width in mm								
Stack in mm								
Cross sectional area of stack								

6. Total gross cross sectional area of the core in mm² =
7. Net core iron area = gross C/S area x 0.97=
8. Maximum flux density (Bm) in Wb/sq.mm =
9. Total core weight in Kg by weighment =
10. Thickness of core lamination in mm =
11. No of core bolts / phase =
12. Diameter of each core bolt hole in mm =
13. Weight of burnt core lamination if any =
14. Weight of the core laminations needed to replace the burnt core in kg
[To be calculated from the size of the laminations, volume etc.].
The drawing of the required laminations along with all dimensions
Details of calculation of weight to be furnished.

D Condition of the Tank:

E Weight of scrap Insulated conductor recovered from winding by
(I) Weightment in the presence of OPTCL's representative.[In kg] [HV/LV/Tertiary].
(II) Weight of scrap bare conductor by weighment in the presence of OPTCL's representative by stripping off the insulation from the Conductor [In kg][HV/LV/ Tertiary].

F Any other items which have not been covered above required for Repair of the defective transformer may be discussed to finalize Jointly by the OPTCL's representative and by the repairer during Initial inspection which will be finally finalized by the Sr.G.M.,CPC if facts justify.

FOR OPTCL	FOR REPAIRER.
Name:	Name of Repairer:
Designation:	Designation.
Date:	Date:
Place:	Place

CERTIFICATE

Certified that the windings, i.e HV , LV , STABILISING (Tertiary) [mention corresponding phase], the copper conductor have been cut & damaged by gas cutting machines at crossover points of each disc, penetrating all the turns of all the discs and photographs showing projected cut portions of the conductors at each discs have been taken and produced alongwith the initial inspection report.

Also Certified that the estimated quantity & cost of repair amounting to Rs----, as calculated & furnished herewith as" Estimate for repair of ----MVA---KV----(Make)----Transformer with Sl no.---" has been verified & found Correct.

Signature of the repairing Firm Signature of the OPTCL's representative(s)

SCHEDULE-C

FORMAT FOR STAGE INSPECTION

Sl. No	Particulars	LV	HV	HV Regulating	Tertiary
A	**WINDINGS:**				
1.	Conductor Bare (mm)				
3.	Conductor Insulated (mm)				
4.	Type of Conductor Insulation				
5.	No. of Conductors in Parallel				
6.	Bare Conductors in Parallel				
7.	Current density (A/mm 2)				
8.	Rated volts per phase (volts)				
9.	Turns per phase (T)				
10.	Type of winding				
11.	No ,of discs (Nos.)				
12.	No. of turns/disc.				
13.	Inside diameter (mm)				
14.	Outside diameter (mm)				
15.	Winding depth (mm)				
16.	Winding length (mm)				
17.	Gap between discs (mm)				
18.	No. of spacers in one circle				
19.	Size of the spacer (mm)				
20.	Length of mean turn in meter				
21.	Weight of winding (Kg/ each) (Weight of winding includes the weight of insulated conductor, spacers, runners and other insulations as has been complete required to make the winding).				
B	**INSULATION.**				
1.	Between Core & L.V. Winding (Details like thickness (mm), length(mm), type of insulation etc. to be mentioned).				
2.	Between H.V. & L.V. Winding (Details like thickness (mm), length(mm), type of insulation etc. to be mentioned).				
3.	Between H.V. & L.V.& Tertiary Winding (Details like thickness (mm), length(mm), type of insulation etc. to be mentioned				
4.	Between windings to top yoke (Details as above to be mentioned)				
5.	Between windings to bottom yoke (Details as above to be mentioned)				

C.	**CORE.**				
1.	Core Diameter in mm =				
2.	Window Height in mm =				
3.	Distance between core leg center in mm =				
4.	Widths of window in mm =				

5.0 OTHER PARAMETERS OF CORE :-

No of steps	1	2	3	4	5	6	7	8 etc.
Width in mm								
Stack in mm								
Cross sectional area of stack								

6. Total gross cross sectional area of the core in mm =
7. Net core iron area = gross C/S area x 0.97
8. Maximum flux density (Bm) in Wb/sq.mm =
9. Total core weight in Kg by weighment =
10. Thickness of core lamination in mm =

D. Condition of the Tank.:

FOR OPTCL	FOR REPAIRER.
Name:	Name of Repairer:
Designation:	Name of Repr. Designation.
Date:	Date:
Place:	Place

SCHEDULE-D

CALIBRATION STATUS OF TESTING EQUIPMENTS & INSTRUMENTS

Name of the test	Meters & equipments required for the corresponding test with range, accuracy, make, sl. No.	Date of calibration	Due date of calibration	Name of the calibrating agency	Whether calibrating agency is govt approved	Whether document relating to of the calibrating agency furnished. govt approval

Whether meter/ equipment fulfill the accuracy class as per calibration report	Whether calibrating agency has put any limitation towards the use of the particular meter/ equipment. If yes state the limitations.	Whether green sticker or blue sticker or Yellow sticker has been affixed on the body of the particular equipment/meter. State colour of the affixed sticker.	In spite of the imposed limitations, whether the particular meter/equipment can still be used? Justify it's use for corresponding test(s).	Remarks

SCHEDULE – E

EXTERNAL JOINT INSPECTION REPORT INDICATING CONDITION OF EACH ITEM

RATING---------MVA, RATIO----------KV, MAKE----------, SR.No.----------
L.O.I. No & Date :
Date of inspection :
Location :
Name of OPTCL'S Representative :

Name of Repairer's Representative :

Item No.	**Brief Description**	**External Condition** **R-Phase**	**Y-Phase**	**B-Phase**	**Neutral**
1.	H.T . Bushing				
2.	H.T. Terminal rod				
3.	H.T. Bushing cap stating metal used				
4.	L.T. Bushing				
5.	L.T. Terminal rod				
6.	L.T. Bushing cap stating metal used				
7.	Stabilizing / Tertiary Bushing				
8.	Stabilizing / Tertiary Terminal Rod				
9.	Stabilizing / Tertiary Bushing Cap				

Sl.No.	**Description**	**Particular with status**
10.	Bucholz Relay on Main Tank	
11.	Bucholz Relay on OLTC	
12	Pressure Release Device if any	
	Condition of Explosion Vent Diaphragm	
13.	Valves (Number & size to be indicated as per valve diagram of name plate	
14.	Oil level Indicators	
	(I) Main Tank	
	(II) Type	
	(III) O.L.T.C.	
	(IV) Type	
15.	Marshalling Box On Tank	
	(I) Oil Temperature Indicator	
	(II) Winding Temperature Indicator	
	(III) Other Items as per Schematic Diagram	
16.	Radiator Cooling Fans , Pumps	
	(I) Numbers, sl.number, make, kw ,voltage, CT rating of each	
	(II) Status Numberwise	

17.	OLTC Type , make, sl.no	
	Status of Item Which can be Externally Checked	
18.	Radiator Valves (nos)	
	Quality	
	Condition	
19.	No of Radiator Banks & fins	
	Quality	
	Condition	
20.	Location of Spots Of Leakages	
	Conservator	
	Inter Connecting Pipes	
	Main Tank	
	Connection to Cooling System	
	Radiators (The leakage can only be verified after filling the oil,when Transformer is repaired)	
21.	Wheels.	
	Quantity	
	Condition	
22.	Bushing Blanking Plates.	
	H.V	
	L.V	
	Tertiary	
23.	Tank Hardware	
24.	Quantity of Oil.	
25.	Technical Documents handover.	
26.	Copy of Manufacturers Test Report.	
27.	Items not listed above but externally inspected.	
28.	Remarks of Repairer.	
29.	Remarks and Instructions of OPTCL.	

FOR OPTCL

Name:

Designation:

Date:

Place:

FOR REPAIRER.

Name of Repairer:

Designation.

Date:

Place

SCHEDULE-F

INVENTORY OF MATERIALS LIFTED BY REPAIRER

RATING---------MVA, RATIO----------KV, MAKE----------, SR.No.----------
L.O.I. No & Date :
Date of inspection :
Location :
Name & Designation of OPTCL'S Representative :

Name & Designation of Repairer's Representative :

Sl.No.	Item	Receipt / Non receipt & Make,voltage,current ratings
1.	H.T .Bushing	
2.	H.T. Terminal rod	
3.	H.T .Bushing cap stating metal used	
4.	L.T .Bushing	
5.	L.T. Terminal rod	
6.	L.T . Bushing cap stating metal used	
7.	Tertiary Bushing	
8.	Tertiary Terminal Rod	
9.	Tertiary Bushing Cap	
10.	Bucholz Relay on Main Tank	
11.	Bucholz Relay on OLTC	
12	Pressure Release Device if any	
	Condition of Explosion Vent Diaphragm	
13.	Valves (Number & size to be indicated as per valve diagram of name plate	
14.	Oil level Indicators	
	(I) Main Tank	
	(II) Type	
	(III) O.L.T.C.	
	(IV) Type	
15.	Marshalling Box On Tank	
	(I) Oil Temperature Indicator	
	(II) Winding Temperature Indicator	
	(III) Other Items as per Schematic Diagram	
16.	Radiator Cooling Fans & Pumps (Numbers , Ratings , Make, sl no.& etc)	
	(I) Number	
	(II) Status Number wise	
17.	OLTC Type	
	Status of Item Which can be Externally Checked	

18.	Radiator Valves	
	Quantity	
	Condition	
19.	Radiators Banks	
	Quantity	
	Condition	
20.	Location of Spots Of Leakages	
	Conservator	
	Inter Connecting Pipes	
	Main Tank	
	Connection to Cooling System	
	Radiators (The leakage can only be verified after filling the oil,when Transformer is repaired)	
21.	Wheels.	
	Quantity	
	Condition	
22.	Bushing Blanking Plates.	
	H.V	
	L.V	
	Tertiary	
23.	Tank Hardware	
24.	Quantity of Oil.	
25.	Technical Documents handover.	
26.	Copy of Manufacturers Test Report.	
27.	Items not listed above but externally inspected.	
28.	Remarks of Repairer.	
29.	Remarks and Instructions of OPTCL.	

FOR OPTCL

Name:
Designation:
Date
Place

FOR REPAIRER.

Name of Repairer:
Designation.
Date
Place