

**Annexure-II**

**PROFORMA FOR STAGE INSPECTION OF DISTRIBUTION TRANSFORMERS(LEVEL-2)**

**(A) GENERAL INFORMATION:**

1. Name of firm : M/s.
2. Order No. and Date :
3. Rating-wise quantity offered :
4. Details of offer
  - a) Rating
  - b) Quantity
  - c) Serial Numbers
5. Details of last stage inspected lot:
  - a) Total quantity inspected
  - b) Serial Numbers
  - c) Date of stage inspection
  - d) Quantity offered for final inspection of
    - (a) above with date

**(B) Availability of material for offered quantity:**

Details to be filled in

**(C) Position of manufacturing stage of the offered quantity:**

- a) Complete tanked assembly
- b) Core and coil assembly ready
- c) Coils ready for assembly
  - i) HV Coils
  - ii) LV Coils

**The stage inspection shall be carried out in case :-**

- (a) Firm shall send the inspection call for the stage inspection for **75 (minimum) transformers** only **when all the parts of the transformer such as core, coils, tank etc are ready**
- (b) Quantity offered for stage inspection should be offered for final Inspection within 15 days from the date of issuance of clearance for stage inspection, otherwise stage inspection already cleaned shall be liable for cancellation.

Sl. No.	Particulars	As offered	As observed	Deviation and Remark
(D)	<b><u>Inspection of Core:</u></b>			
	<b>(i) Core Material</b>			
	(1) Manufacturer's Characteristic Certificate in respect of grade of lamination used. (Please furnish test certificate)			
	(2) Remarks regarding Rusting and smoothness of core.			



	<b>(II) CONSTRUCTIONAL DETAILS</b>			
	(1) Size of Cross Sectional area of conductor for:			
	(a) HV winding			
	(b) LV winding			
	(2) Type of insulation for conductor of:			
	(a) HV winding			
	(b) LV winding			
	(3) Diameter of wire used for delta formation (mm)			
	(4) Diameter of coils in:			
	(a) LV winding			
	i) Internal dia (mm)			
	ii) Outer dia (mm)			
	(b) HV winding			
	i) Internal dia (mm)			
	ii) Outer dia (mm)			
	(5) Current Density of winding material used for:			
	(a) HV			
	(b) LV			
	(6) Whether neutral formation on top.			
	(7) HV Coils/Phase			
	(a) Number			
	(b) Turns/Coil			
	(c) Total/ turns			
	(8) LV Coils/Phase			
	(a) Number			
	(b) Turns/coil			
	(c) Total turns			
	(9) Method of HV Coil Joints			
	(10) Total weight of coils of			
	(a) LV winding (kg)			
	(b) HV winding (kg)			
<b>(F)</b>	<b>INSULATION MATERIALS:</b>			
	<b>(I) MATERIAL</b>			
	1) Craft paper			
	a) Make			
	b) Thickness (mm)			
	c) Test Certificate of manufacturer (enclose copy).			
	2) Press Board			
	a) Make			
	b) Thickness (mm)			
	c) Test Certificate o manufacturer (enclose copy).			
	3) Material used for top and bottom yoke and insulation			
	<b>(II) Type and thickness of material</b>			

	<b>used : (mm)</b>			
	a) Between core and LV			
	b) Spacers			
	c) Inter layer			
	d) Between HV and LV Winding			
	e) Between phases			
	f) End insulation			
<b>(G)</b>	<b>CLEARANCES : (mm)</b>			
	<b>(I) Related to core and windings</b>			
	1) LV to Core (Radial)			
	2) Between HV and LV (Radial)			
	3) (i) phase to phase between HV Conductor			
	(ii) Whether two Nos. Press Board each of minimum 1 mm thick provided to cover the tie rods.			
	4) Thickness of locking spacers between LV coils (mm)			
	5) Axial wedges between HV and LV coils / phase (Nos.)			
	6) No. of radial spacers per phase between HV coils			
	7) Size of duct between LV and HV winding (mm)			
	<b>(II) Between core- coil assembly - and tank : (mm)</b>			
	1) Between winding and body:			
	a) Tank lengthwise			
	b) Tank Breadth wise			
	2) Clearance between top cover and top yoke			
<b>(H)</b>	<b>Tank:</b>			
	(I) Constructional details:			
	1) Rectangular shape			
	2) Thickness of side wall (mm)			
	3) Thickness of top and bottom plate (mm)			
	4) Provision of slopping top cover towards HV bushing.			
	5) Tank internal dimensions (mm)			
	a) Length			
	b) Breadth			
	c) Height			
	(i) On Lv side			
	(ii) On LV side			
	<b>(II) General details :</b>			
	1) Inside painted by varnish/oil corrosion resistant paint (please specify which type of coating done.)			

	2) Gasket between top cover and tank			
	i) Material			
	ii) Thickness (mm)			
	iii) Jointing over laps (mm)			
	3) Reinforcement of welded angle (specify size and No. of angle provided) on side walls of tank.			
	4) Provision of lifting lugs:			
	a) Numbers			
	b) Whether lugs of 8 mm thick MS plate provided.			
	c) Whether reinforced by welded plates edge wise below the lug upto re-enforcing angle of the done.			
	5) Pulling lug of MS Plate			
	a) Nos.			
	b) Thickness (mm)			
	c) Whether provided on breadth side or length side			
	6) Provision of Air release lug.			
	7) Provision of galvanized GI nuts Bolts with 1 no. Plain and 1 no. spring washer.			
	8) Deformation of length wise side wall of tank when subjected to:			
	a) Vacuum of (-) 0.7 kg/sq cm for 30 minutes.			
	b) Pressure of 0.8 kg/sq cm for 30 minutes.			
<b>(I)</b>	<b>RAIDATORS:</b>			
	1. Fin Radiators of 1.25 mm thick sheet			
	a) Dimension of each fin (L×B× T)			
	b) Fins per radiator			
	c) Total No. of radiators			
	2. Verification of manufacturer's test certificate regarding Heat dissipation (excluding Top and Bottom) in w/sq m			
	3. Verification of position of radiator with respect to bushing.			
<b>(J)</b>	<b>CONSERVATOR:(63 kva &amp; above only)</b>			
	1. Dimensions (L× D) (in mm)			
	2. Volume (m <sup>3</sup> )			
	3. Inside dia of Conservator tank pipe (mm)			
	4. Whether conservator outlet pipe is projected approx. 20 mm inside the conservator tank.			

	5. Whether arrangement made so that oil does not fall on the active parts.			
	6. Whether die cast metal oil level gauge indicator having three positions at (-5 <sup>0</sup> C, 30 <sup>0</sup> C and 98 <sup>0</sup> C) is provided.			
	7. Whether drain plug and filling hole with cover is provided.			
	8. Inner side of the conservator Tank painted with-			
<b>(K)</b>	<b>BREATHER</b>			
	1. Whether Die cast Aluminium body breather for silica gel provided.			
	2. Make			
	3. Capacity			
<b>(L)</b>	<b>TERMINALS :</b>			
	1. Material whether of Brass Rods/ Tinned Copper.			
	a) HV			
	b) LV			
	2. Size (dia in mm)			
	a) HV			
	b) LV			
	a. Method of Star connection formed on LV side 6 mm thick (Should use Al./Cu. Flat bolted/brazed with crimped lugs on winding alternatively for 63 and 100 kVA ratings brazing is done covered with tubular sleeve duly crimped). - Please state dimensions of Al/ Cu flat or tubular sleeve used. (mm)			
	4. Method of Connection of LV winding to LV Bushing (end of winding should be crimped with lugs (Al/Cu) and bolted with bushing stud).			
	5. Method of connection of HV winding to HV bushing (Copper joint should be done by using silver brazing alloy and for Aluminium, brazing rod or with tubular connector crimped at three spots).			
	6. Whether SRBP tube/insulated paper used for formation of Delta on HV.			

	7. Whether Empire sleeves used on the portion of HV winding joining to HV bushing.			
	8. Whether neutral formation is covered with cotton tape			
<b>(M)</b>	<b>BUSHINGS :</b>			
	1. Whether HV bushings mounted on side walls.			
	2. Whether sheet metal pocket used for mounting bushing ( pipe are not acceptable)			
	a) HV			
	b) LV			
	3. Whether arrangement for studs for fitting of HV Bushing area in diamond shape (so that Arcing Home are placed vertically).			
	4. Position of mounting of LV bushing.			
	5. Bushing Clearance: (mm)			
	a) LV to Earth			
	b) HV to Earth			
	c) Between LV Bushings			
	d) Between HV Bushings			
<b>(N)</b>	<b>TANK BASE CHANNEL/ ROLLERS:</b>			
	1. Size of channel (mm)			
	2. Whether channels welded across the length of the tank			
	3. Size and type of roller (mm)			
<b>(O)</b>	<b>OIL:</b>			
	1. Name of Supplier			
	2. Break down voltage of oil: (kV)			
	i) Filled in tanked transformer			
	ii) In storage tank (to be tested by Inspecting Officer).			
	3. Supplier's test certificate (enclose copy)			
<b>(P)</b>	<b>ENGRAVING:</b>			

	1. Engraving of Sl. No. and name of firm.			
	i) On bottom of clamping channel of core-coil assembly.			
	ii) On side wall and top cover of tank along with date of dispatch.			
<b>(Q)</b>	i) MS plate o size 125×125 mm welded on width side of stiffner			
	ii) Following details engraved (as per approved GTP) :			
	(a) Serial Number			
	(b) Name of firm			
	(c) Order No. and Date			
	(d) Rating			
	(e) Name of Inspecting Officer			
	(f) Designation			
	(g) Date of dispatch			
<b>(R)</b>	<b>NAME PLATE DETAILS:</b>			
	Whether Name Plate is as per approved drawing			
<b>(S)</b>	<b>Colour of Transformer</b>			
	1. Tank body with dark Green colour			
	2. Conservator with white colour			
<b>(T)</b>	<b>CHECKING OF TESTING FACILITIES:</b>			
	(Calibration certificate also to be checked for its validity)			
	<b>TESTS:</b>			
	1. No Load Current			
	2. No Load Loss			
	3. % Impedance			
	4. Load Losses			
	5. Insulation Resistance Test			
	6. Vector Group Test (phase relationship)			
	7. Ratio and Polarity test relationship			

	8. Transformer Oil Test (Break Down Voltage)			
	9. Magnetic Balance			
	10. Measurement of winding resistance (HV and LV both)			
	11. Induced over voltage withstand test (Double voltage and Double frequency)			
	12. Separate source power frequency withstand test at 28 kV for HV and 3 kV LV (one minute).			
	13. Air pressure/ Oil leakage Test			
	14. Vacuum test			
	15. Unbalanced current test			
	16. Temperature rise (Heat Run) test.			
(U)	We have specifically checked the following and found the same as per G. T. P. / deviations observed as mentioned against each:			
	i) Rustlessness of CRGO laminations used			
	ii) Core steps			
	iii) Core area			
	iv) Core weight			
	v) Winding cross sectional area			
	a) LV			
	b) HV			
	vi) Weight o windings			
	vii) Clearance between winding and wall of tank (mm)			
	a) Length-wise			
	b) Breadth-wise			
	viii) Clearance between top of yoke/top most live part of tap changer over to tank cover.			
	ix) Details of Neutral formation			
	x) Connections to bushings :			

	a) LV			
	b) HV			
	xi) Slope of tank top			
	xii) Position of mounting of bushings			

(Name & Signature)  
PVVNL's INSPECTING OFFICER

(Name & Signature)  
FIRM'S REPRESENTATIVE

DATE OF INSPECTION:

**Annexure-III****PROFORMA FOR PRE-DELIVERY INSPECTION OF DISTRIBUTION TRANSFORMERS**

1.	Name of the firm	:	
2.	Details of offer made	:	
	(i) Order No. and Date	:	
	(ii) Rating	:	
	(iii) Quantity	:	
	(iv) Sl. No. of transformers	:	
3.	Date of stage inspection of lot	:	
4.	Reference of stage inspection clearance	:	
5.	Quantity offered and inspected against the order prior to this lot	:	

**(A) ACCEPTANCE TESTS TO BE CARRIED OUT**

SL. No.	PARTICULARS	OBSERVATIONS
1.	(a) Ratio Test	AB/an
		BC/bn
		CA/Cn
	(b) Polarity Test	
2.	No load loss measurement	
		W1
		W2
		W3
		TOTAL
		Multiplying Factor
		CT
		Watt Meter
		Total × MF
		NET LOSS
3.	Load loss measurement	
		W1
		W2
		W3
		<b>Total</b>
		<b>Multiplying Factors: -</b>
		<b>CT</b>
		<b>Watt meter</b>
		<b>PT</b>
		Total × MF
		Loss at ambient temperature (watt)
		Loss at 75 <sup>0</sup> C (with calculation sheet) (watt)
	4.	Winding Resistance:
<b>H. V. (In Ohms)</b>		
(a) At ambient temperature of ..... <sup>0</sup> C.		A-B
		B-C
		C-A
(b) Resistance at 75 <sup>0</sup> C.		A-B
		B-C
		C-A
<b>L. V. (In Ohm)</b>		
(a) At ambient temperature of ..... <sup>0</sup> C.		a-b

		b-c
		c-a
	(b) Per Phase resistance at 75 <sup>0</sup> C.	a-n
		b-n
		c-n
5.	Insulation Resistance (M ohm) :	HV-LV
		HV-E
		LV-E
6.	Separate Source Voltage withstand test voltage:	
	<b>HV</b>	28 kV for 60 secs.
	<b>LV</b>	3 kV for 60 secs.
7.	Induced over-voltage withstand test at double voltage and double frequency	100 Hz, 866 volts for 60 seconds.
8.	No load current at	
	90% volts	
	110% volts	
9.	Unbalance current	
10.	Vector group test	Diagram and readings be shown in separate sheets.
11.	Percentage Impedance at 75 <sup>0</sup> C (Please furnish calculation sheet)	
12.	Transformer oil test (Break down voltage)	
13.	Oil leakage test	
14.	Heat run test	To be carried out once against the order
15.	Bushing clearance (mm)	<b>HV</b> <b>LV</b>
	(a) Phase to Phase	
	(b) Phase to Earth	
16.	Comments on compliance by the firm on the modifications done as per stage inspection clearance letter issued	
17.	Whether fittings of the order have been verified	
18.	Whether aluminium die cast silica gel breather with tin container is fitted on the transformers offered.	
19.	Whether engraving of Sl. No. and Name of firm on core clamping channel, side wall and top cover of tank has been verified.	
20.	Whether MS Plate of size 125 × 125 mm welded on with side of stiffener.	
21.	Whether engraving of name of firm, Sl. No. and Rating of transformer, Order No. and date and Date of Dispatch on MS Plate.	
22.	Copy of calibration certificates of metering equipments be enclosed.	

**(B) POINTS TO BE SEEN / DIMENSIONS TO BE NOTED AT THE TIME OF DISMANTLING OF TRANSFORMERS:**

Sl. No.	PARTICULARS	OBSERVATIONS
1.	Details of the transformer dismantled for physical verification	
	(a) Rating (kVA)	
	(b) Sl. No.	
2.	Whether GI Nut Bolts with one spring one plain washer	

	provided for tightening the tank cover.	
3.	Details of gasket used between top cover and tank Material :	
	(i) Thickness (mm)	
	(ii) Type of joints	
4.	Whether core is earthed properly with copper strip ( one end should be tightened in between the core laminations and other bolted on core clamping channel).	
5.	Connections from winding to bushings (describe the manner in which it has been done)	
	(a) HV	
	(b) LV	
	(c) Formation of Star connection on LV side.	
6.	Winding wire dia and cross sectional area :	
	(a) <b>HV</b>	
	(i) Dia (mm)	
	(ii) Area (sq mm)	
	(b) <b>LV</b>	
	(i) L×W× Nos. of layer	
	(ii) Area (sq mm)	
7.	Thickness of press board (s) provided between HV coils to cover the tie rods	
8.	Whether painted with oil and corrosion resistant paint / varnish	
	(a) Inside of the tank	
	(b) Inside of the conservator tank	
	(c) Core clamping and core base channels	
	(d) Tie rods	
	(e) Core bolts	
9.	Whether tie rods and core bolts insulated, if yes, material of insulation.	
10.	Whether flap on inner side of top cover provided to prevent direct falling of oil on core-coil assembly.	
11.	Method of joints	
	(a) Between HV Coils	
	(b) Between tap Coils	
	(c) For tap changer	
12.	Whether engraving Sl. No. and name of firm done on bottom channel of core coil assembly.	
13.	Diameter of copper wire, used for formation of delta (should not be less than 1.5 times the dia of conductor). (mm)	
14.	Whether empire sleeves provided upto the end portion of HV winding joining to bushing	
15.	<b>HV Coils :</b>	
	(a) Inner dia (mm)	
	(b) Outer dia (mm)	
16.	<b>LV Coils :</b>	
	(a) Inner dia (mm)	
	(b) Outer dia (mm)	
17.	Core dia	
18.	Core height including base channel and insulation in between (mm)	

19.	Leg Center of core	
20.	Clearances between	
	(a) Core and LV (mm)	
	(b) HV and LV (mm)	
	(c) Phase to phase of HV coils (mm)	
	(d) Core coil assembly and tank body (mm)	
	(i) Length-wise	
	(ii) Width-wise	
	(e) Top of yoke and tank cover (mm)	
	(f) Top most live part of tap changer and top cover.	
21.	Weight of core only (kg)	
22.	Weight of windings (kg)	
	(a) LV	
	(b) HV	
23.	Whether core laminations are in one piece, used for	
	(a) Bottom yoke	
	(b) Top yoke	
24.	Specific remarks regarding smoothness and rusting of core used.	
25.	Volume of oil filled (to be done once against the order)	
	(a) In conservator tank	
	(b) In tank of the transformer	
26.	Weight of transformer (inclusive of all fittings, accessories, oil etc. complete)	
27.	Inner dimensions of the tank	
	(a) Length	
	(b) Width	
	(c) Height	
	(i) LV side	
	(ii) HV side	
28.	Remarks, if any :	

**Note:** Please ensure that complete details have been filled in the proforma and no column has been left blank.

SIGNATURE OF INSPECTING OFFICER

(With name and designation)

SIGNATURE OF FIRM'S REPRESENTATIVE

(With name and designation)

DATE OF INSPECTION : .....

## Annexure-III

**SOURCE OF MATERIALS/PLACE OF MANUFACTURE, TESTING AND INSPECTION**

<b>Sl. No.</b>	<b>Item</b>	<b>Source of Material</b>	<b>Place of Manufacture</b>	<b>Place of testing and inspection</b>
<b>1</b>	Laminations			
<b>2</b>	Copper Conductor			
<b>3</b>	Insulated winding wires			
<b>4</b>	Oil			
<b>5</b>	Press boards			
<b>6</b>	Kraft paper			
<b>7</b>	MS Plates/Angles/Channels			
<b>8</b>	Gaskets			
<b>9</b>	Bushing HV/LV			
<b>10</b>	Paints			