

Annexure-II

PROFORMA FOR STAGE INSPECTION OF DISTRIBUTION TRANSFORMERS (63 KVA Distribution Transformers (level-2) with LT Bushing side Busbar Arrangement, External H.T. Fuse Unit and Oil Immersed LT Internal Breaker for each T/f.

(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) Unique Numbers
5. Details of last stage inspected lot:
 - a) Total quantity inspected
 - b) Unique Numbers
 - c) Date of stage inspection
 - d) Quantity offered for final inspection of
 - (a) above with date

(B) Position of manufacturing stage of the offered quantity:

- a) Complete tanked assembly (Min 25%)
- b) Core and coil assembly ready (Min 30%)
- c) Coils ready for assembly
 - i) HV Coils
 - ii) LV Coils

(C) Unique Number of Transformer whose physical verification is being carried out :

Sl. No.	Particulars	As offered	As observed	Deviation and Remark
(D)	Inspection of Core:			
	(i) Core Material			
	(1) Manufacturer's Characteristic Certificate in respect of grade of lamination used. (Please furnish test certificate)			
	(2) Remarks regarding Rusting and smoothness of core.			
	Whether laminations used for top and bottom yoke are in one piece.			
	(ii) Core Construction :			
	(1) No. of Steps			
	(2) Dimension of Steps			
	Steps No. 1 2 3 4 5 6 7 8 9 10 11 12			
	As offered:			
	W mm			

	T mm										
	As found										
	W mm										
	T mm										
	(3) Core Dia (mm)										
	(4) Total cross Section area of core										
	Effective cross Sectional area of core										
	(6) Clamping arrangement										
	(i) Channel Size										
	(ii) Bolt size and No.										
	(iii) Tie Rods size and No.										
	(iv) Painting										
	(a) Channels										
	(b) Tie Rods										
	(c) Bolts										
	(7) Whether top yoke is cut for LV connection.										
	(8) If yes, at 7 above, whether Reinforcement is done.										
	(9) Size of Support Channels provided for Core base and bottom yoke (single piece of channels are only acceptable).										
	(10) Thickness of insulation provided between ore base and support channel.										
	(11) Core length (leg center to leg center)										
	(12) Window height										
	(13) Core height										
	(14) Core weight only (without channels etc.)										
(E)	INSPECTION OF WINDING										
	(I) Winding material										
	(1) Material used for										
	(a) HV winding										
	(b) LV winding										
	(2) Grade of material for										
	(a) HV winding										
	(b) LV winding										
	(3) Test certificate of manufacturer (enclose copy) for winding material of:										
	(a) HV										
	(b) LV										
	(II) CONSTRUCTIONAL DETAILS										
	(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)			
(F)	INSULATION MATERIALS:			
	(I) MATERIAL			
	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 of manufacturer (enclose copy).			
	3) Material used for top and bottom yoke and insulation			
	(II) Type and thickness of material used : (mm)			
	a) Between core and LV			
	b) Spacers			
	c) Inter layer			
	d) Between HV and LV Winding			
	e) Between phases			
	f) End insulation			
(G)	CLEARANCES : (mm)			
	(I) Related to core and windings			
	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)			
	(II) Between core- coil assembly -and tank : (mm)			
	1) Between winding and body:			
	a) Tank lengthwise			
	b) Tank Breadth wise			
	2) Clearance between top cover and top yoke			
(H)	Tank:			
	(I) Constructional details:			
	1) Rectangular shape			
	2) Thickness of side wall (mm) (min 3.15 mm)			
	3) Thickness of top and bottom plate (mm) (min 5 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 HV side			
	(II) General details :			
	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 o 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 o 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 plug			
	7) Provision of galvanized GI nuts Bolts with 1 no. Plain and 1 no. spring washer.			
(I)	RAIDATORS:			
	1. Fin Radiators of 1.25 mm thick sheet			
	a) Dimension of each fin ($L \times B \times T$)			
	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.			
(J)	CONSERVATOR:(63 KVA & above only)	Not Applicable for 25 KVA		
	1. Dimensions (L× D) (in mm)			
	2. Volume (m ³)			
	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 ⁰ C, 30 ⁰ C and 98 ⁰ C) is provided.			
	7. Whether drain plug and filling hole with cover is provided.			
	8. Inner side of the conservator Tank painted with-			
(K)	BREATHER			
	1. Whether Die cast Aluminium body breather for silica gel provided.			
	2. Make			
	3. Capacity			
(L)	TERMINALS :			
	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 glass sleeves used on the portion of HV winding joining to HV bushing.			
	8. Whether neutral formation is covered with cotton tape			
(M)	BUSHINGS :			
	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			
(N)	TANK BASE CHANNEL/ ROLLERS:			
	1. Size of channel (mm)			
	2. Whether channels welded across the length of the tank			
	3. Size and type of roller (mm)			
(O)	OIL:			
	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)			
(P)	ENGRAVING:			
	1. Engraving of Unique. No. (letter /digit size minimum 10mm & engraving depth approx 0.5 mm)			
	i) On top of clamping channel of core-coil assembly.			
	ii) On inside portion of top cover of transformer.			

Note : 1. All the material is checked/inspected at the works of the firm by the instruments provided by the firms. The firm shall be responsible for any deviation/variation in the material is found later on in respect to approved GTP/Drawing/Technical specification/ISS on account of wrong calibration of firm equipments or any other reason whatsoever.

2. During physical checkup of transformer bearing unique no. was found punched on the top channel of core coil assembly & on inside portion of top cover of transformer.

(Name & Signature)

(Name & Signature)

PVVNL's INSPECTING OFFICER

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) Unique. 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
	Total	
	Multiplying Factors: -	
	CT	
	Watt meter	
	PT	
	Total × MF	
	Loss at ambient temperature (watt)	
	Loss at 75 ⁰ C (with calculation sheet) (watt)	
4.	Winding Resistance:	
	H. V. (In Ohms)	
	(a) At ambient temperature of ⁰ C.	A-B
		B-C
		C-A
	(b) Resistance at 75 ⁰ C.	A-B
		B-C
		C-A
	L. V. (In Ohm)	
	(a) At ambient temperature of ⁰ C.	a-b
		b-c
		c-a
	(b) Per Phase resistance at 75 ⁰ 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:		
	HV	28 kV for 60 secs.	
	LV	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 ⁰ 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.	Deformation of length wise side wall of tank when subjected to:		
	a) Vacuum of (-) 0.7 kg/sq cm for 30 minutes.		
	b) Pressure o 0.8 kg/sq cm for 30 minutes.		
16.	Bushing clearance (mm)	HV	LV
	(a) Phase to Phase		
	(b) Phase to Earth		
17.	Comments on compliance by the firm on the modifications done as per stage inspection clearance letter issued		
18.	Whether fittings of the order have been verified		
19.	Whether aluminum die cast silica gel breather with tin container is fitted on the transformers offered.		
20	NAME PLATE DETAILS:		
	Whether Name Plate on side wall of transformer is fixed as per approved drawing.		
21	Colour of Transformer		
	1.Whether Tank body painted in dark Green colour (for Regular firms)		
	2.Wheter Tank body is painted in Green colour with 100 mm wide Dark Yellow coloured strips on side walls below the top surface of the transformer (for Trial firms)		
	3. Conservator with white colour		
22	Whether engraving of Unique. No. (letter /digit size approx 10mm & engraving depth approx 0.5 mm) on the top channel of core coil assembly & on inside portion of top cover of transformer has been verified.		
23	Whether MS Plate of size 150 × 100 x 2 mm (as per approved drawing) continuously welded on the same side wall on which name plate is fixed.		
24	Whether engraving of name of firm, Unique No, Rating of transformer, PO NO and Date of inspection etc on M.S Plate (as per above column no. 23) as per approved Drawing has been verified.		
25	<u>LT Bushing Side Bus Bar Arrangement</u>		
	a. L.T Strip Size 160x40x5 mm – 4 nos.		
	b. Bakelite strip size 500x40x6 mm – 1 no		
	c. Al. Lugs 70 mm ² – 4 nos.		
	d. External phase to phase clearance between Al. Strip (min 100 mm)		
	e Whether bushing rod connected to Al. Strip by Nut-Bolt of 12 mm size of brass material		
	f. Whether Al. Strip connected to Al. Lugs by M.S. galvanized Nut-Bolt of 12 mm size		
	g. Whether Bakelite strip is properly fixed with tank wall by suitable nut-bolts.		
26	External HT Fuse Unit Arrangement		
	(a) Size of Glass Fiber stripe (3nos)		

	(b) No of adjustable HT Connectors size 12 mm (3 nos.)	
	(c) Break Down Voltage Test of Glass Fiber strip to withstand 28 KV for 1 min.	
27	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) Unique. 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 Bushing are minimum 40 mm above the upper yoke level	
5.	H.T. Internal fuse links Note: No HT fuse link is to be provided within H.T. Bushing inside the transformer	
6.	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).	
7.	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.	
8.	Winding wire dia and cross sectional area :	
	(a) HV	
	(i) Dia (mm)	
	(ii) Area (sq mm)	
	(b) LV	
	(i) L×W× Nos. of layer	
	(ii) Area (sq mm)	
9.	Thickness of press board (s) provided between HV coils to cover the tie rods	
10.	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	
11.	Whether tie rods and core bolts insulated, if yes, material of insulation.	
12.	Whether flap on inner side of top cover provided to prevent direct falling of oil on core-coil assembly.	
13.	Method of joints	
	(a) Between HV Coils	
	(b) Between tap Coils	
	(c) For tap changer	
14.	Whether engraving of Unique. No. done on top of clamping channel of core coil assembly & on inside portion of top cover of transformer	
15.	Diameter of copper wire, used for formation of delta (should not be less than 1.5 times the dia of conductor). (mm)	
16.	Whether glass sleeves provided upto the end portion of HV winding joining to bushing	
17.	HV Coils :	
	(a) Inner dia (mm)	
	(b) Outer dia (mm)	
18.	LV Coils :	
	(a) Inner dia (mm)	
	(b) Outer dia (mm)	

19.	Core dia	
20.	Core height including base channel and insulation in between (mm)	
21.	Leg Center of core	
22.	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.	
23.	Weight of core only (kg)	
24.	Weight of windings (kg)	
	(a) LV	
	(b) HV	
25.	Whether core laminations are in one piece, used for	
	(a) Bottom yoke	
	(b) Top yoke	
26.	Specific remarks regarding smoothness and rusting of core used.	
27.	Volume of oil filled (to be done once against the order)	
	(a) In conservator tank	
	(b) In tank of the transformer	
28.	Weight of transformer (inclusive of all fittings, accessories, oil etc. complete)	
29.	Inner dimensions of the tank	
	(a) Length	
	(b) Width	
	(c) Height	
	(i) LV side	
	(ii) HV side	
30.	Internal breaker :	
	(a) make	
	(b) position of internal breaker (To be provided LT Phases side)	
	(c) Signal Light & Trip operation Test	
	(i) Apply 11 KV on HT Side of transformer	
	(ii) Move the handle to “off” Position and verify if the light is “ON”	
	(iii) Move the handle to “ON” position and verify if the Light if “Off”	
	(iv) Disconnect Input supply i.e HT	
	(v) Short all Three phases on LT Side	
	(vi) Apply 5 times rated current on LT side by applying 2200-2880 V on HT side	
	(vii) The Breaker must trip within 1 minute	
	(viii) Verify if the Light is “ON” after tripping	
	(ix) Move the handle to “Reset/Off” position and back to “ON” position and verify that light is “OFF”	
	(x) Disconnect input supply on HT side	
	(d) Whether Breaker “ON” & “OFF/Reset” position is labeled in Red colour on the T/F Body	
31.	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 :

SOURCE OF MATERIALS/PLACE OF MANUFACTURE, TESTING AND INSPECTION

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