TP NORTHERN ODISHA DISTRIBUTION LIMITED, BALASORE

CORRIGENDUM-III

Sub: - Reg. Change in Technical Specification of 25KVA DTR of NIT- TPNODL/OT/2021-22/111 Dt. 03.12.2021

TP Northern Odisha Distribution Limited, Balasore invites tender from eligible bidders for RATE CONTRACT FOR SUPPLY OF SINGLE-PHASE 25KVA DISTRIBUTION TRANSFORMER (AL. WOUND) in TPNODL area published in the newspaper as NIT cited above.

1. **The revised Technical Specification of 25 KVA DTR shall be as per Annexure-TS(1) and ignore Technical Specification attached with NIT-111 dt. 03.12.2021**

All other terms and conditions of the above tender shall remain unaltered.

For detailed tender documents, please visit Tender section on website: - https://www.tpnodl.com (Tender)

-Sd-
H.O.D. (Contracts)

TPNODL TP NORTHERN ODISHA DISTRIBUTION LIMITED (A Tata Power and Odisha Government Joint Venture)	TP NORTHERN ODISHA DISTRIBUTION LIMITED		
	TECHNICAL SPECIFICATIONS		
Doc. Title	SPECIFICATION OF 25KVA AND 50KVA SINGLE PHASE (ALUMINIUM) TRANSFORMER		
Doc. No:	ENG-HV-005		Eff. Date: 05.11.2021
Rev No:	01		Page 1 of 43
Prepared by:	Reviewed by:	Approved by:	Issued by:

CONTENT Annexure-TS(1)

Initiator	Deepak.	HOD (Engineering)	Sandeep Pd.

1. SCOPE

1. This Specification covers the technical requirements of design, manufacture, testing at manufacturer's works, packing forwarding, supply and unloading at site store and performance of Oil immersed, hermetically sealed, naturally cooled, Single Phase 11kV/240V, 50Hz, outdoor type Distribution Transformer of 25KVA and 50KVA Ratings.
2. The transformer shall be complete with all components and accessories, which are necessary or usual for their efficient performance and trouble free operation under the various operating and atmospheric conditions specified in clause no 3.
3. Such of the parts that may have not been specifically included, but otherwise form part of the transformer as per standard trade and/or professional practice and/or are necessary for proper operation of transformer, will be deemed to be also included in this specification. The successful bidder shall not be eligible for any extra charges for such accessories etc. notwithstanding the fact that at the time of an initial offer bidder had segregated such items and quoted for them separately.

2. APPLICABLE STANDARDS

The equipment (and the materials used) covered by this specification shall unless otherwise stated, be designed, manufactured and tested in accordance with the latest editions of the following Indian standards & other relevant standards for components, BEE & CEA guidelines with latest amendment from time to time, thereof, some of which are listed below.

Indian Standards (IS)	Title
IS 1180: 2014	Outdoor Type Of Immersed Distribution Transformers up to and including 2500 KVA, 33 kV-Specification
IS 2026: 2011 (all parts)	Specification for Power Transformers
IS 104: 1979	Specification for ready mixed paint brushing zinc chrome, priming
IS 335: 2018	Specification for new insulating oil
IS 649: 1997	Testing for steel sheets and strips and magnetic circuits
IS 5: 2007	Specification for Colors for ready mixed paints and enamels
IS 1576: 1992	Solid Pressboard for Electrical Purposes Specification
IS 2099: 1986	Specification for bushings for alternating voltages above 1000 Volts
IS 2362: 1993	Determination at water content in oil by Karl in oil Fischer Method-Test Method
IS 3024: 2006	Grain oriented electrical steel, sheets and strips
IS 3347 (Part 1 & Part-3): 1979	Dimensions for Porcelain Transformer Bushings for Use in Normal and Lightly Polluted Atmospheres – Part 1: Up to and including 1 KV
IS 4253 Part-2: 1980	Specification for cork composition sheets – Part 2: Cork and

	Rubber
IS 4257 (Part-1): 1981	Dimensions for Clamping Arrangements for Porcelain transformer Bushings Part 1 For 12 kV to 36 kV Bushings
IS 5082: 1998	Wrought Aluminum and Aluminum Alloy bars, Rods, Tubes, Sections, Plates and Sheet s for Electrical Applications
IS 5561: 1970	Specification for electric Power Connectors
IS 6103: 1071	Specification for Testing of specific resistance of electrical insulating liquids
IS 6600: 1972	Guide for loading of Oil immersed transformer
IS 6792: 1992	Method for Determination of Electric Strength of Insulating oil
IS 7404 (Part 1): 1991	Paper Covered conductors: Round conductors
IS 7421:1988	Specification for porcelain bushings for alternating voltages up to and including 1000kv
IS 8603 (Part-1): 1977	Dimensions for porcelain Transformer Bushings for use in Heavily Polluted Atmospheres - Part 1: 12 kV and 17.5 kV bushings
IS 9335: 1979	Specification for Cellulosic Papers for Electrical Purposes
IS 10028: 1981	Code of Practice for Selection, Installation and maintenance of Transformers
IS 11149: 1984	Specification for rubber gaskets
IS 12444: 1988	Specification for Continuously Cast and Rolled Electrolytic Wire Rods for Electrical Conductors
IS/IEC 60947 (Part-1 & 2)	Specification for LV Switchgear & Control gear
IS 6160	Rectangular electrical conductors for electrical machines
IS 13964: 1994	Methods of measurement of transformer and reactor sound levels
IS 60529	Degree of protection provided by enclosure
IS 816	Welding of mild steel
CEA -2008	Guidelines for specifications of energy efficient outdoor type single and three phase distribution transformers
IS 6262: 1971	Method of test for power factor and dielectric constant of electrical insulating liquids
IS 16659: 2017	Fluids For Electro technical Applications - Unused Natural esters for electrical purposes
IS 16081: 2013	Insulating liquids - Specifications for. Unused synthetic organic esters for Electrical purposes
IEC 60156: 1995	Method of determination of electric strength of insulating oils
IEC 60296: 2003	Specification for unused mineral insulating oils for transformers and switchgear
IEC 60529: 2001	Degrees of protection provided by enclosures (IP Code)
IS 1852	Rolling and cutting tolerances for hot rolled steel products

3. CLIMATIC CONDITIONS

1.	Maximum Ambient Temperature	50°c
2.	Maximum daily average ambient temperature	40°c
3.	Minimum Ambient Temperature	2°c
4.	Maximum humidity	99.7%
5.	Minimum humidity	15%
6.	Average Annual Rainfall	1800mm
7.	Average wind speed prevailing in the area	200kmph
8.	Average Thunderstorms prevailing in the area	70 days per annum
9.	Average Dust storms prevailing in the area	20 days per annum
10.	Average number of rainy days per annum	160
11.	Maximum Altitude above sea level	1200m
12.	Rainy months	June to October

Where the work will take place includes coastal areas, subject to high relative humidity, which can give rise to condensation. Onshore winds will frequently be salt laden. On occasions, the combination of salt and condensation may create pollution conditions for outdoor insulators. Some places are in heavily industrial polluted areas. Therefore, Outdoor material and equipment shall be designed and protected for use in exposed, heavily polluted, salty, corrosive and humid coastal atmosphere. The design of the equipment and accessories shall be suitable to withstand seismic forces corresponding to an acceleration of 0.3g.

4. GENERAL TECHNICAL REQUIREMENTS

Sl.No.	Description	Units	Requirements	
1	Continuous Rated Capacity		25KVA	50KVA
2	Application		Outdoor	Outdoor
3	Rated Voltage	kV	12	12
4	Polarity		Additive	Additive
5	Service Voltage HV	kV	11	11
6	Service Voltage LV	V	240	240
7	Line Current HV	A	2.27	4.55
8	Line Current LV	A	104.16	208.33
9	Number of Phases on HV and LV		HV-Phase to Phase LV-Single phase	HV-Phase to Phase LV-Single phase
10	Frequency	Hz	50±5%	50±5%
11	Type of Cooling		ONAN	ONAN
12	Noise level at Rated voltage and frequency	dB	48	48
13	Permissible Temperature Rise over ambient of:			
13.1	Of top oil measured by thermometer	°C	35	35
13.2	Of winding measured by Resistance	°C	40	40

14	Maximum Losses at 50% loading at 75°C	W	95	190
15	Maximum Losses at 100% loading Wat at 75°C	W	260	520
16	Short Circuit impedance voltage at 75°C (±10 % tolerance allowed)	%	4	4
17	Percentage Regulation	%	4	4
18	Impulse withstand voltage	kVp	75	75
	Insulation Class		A	A
19	Power frequency withstand voltage HV	kV	28	28
20	Power Frequency withstand voltage LV	kV	3	3
21	Permissible Voltage Fluctuation (without affecting the performance)		+12.5% to – 12.5%	+12.5% to – 12.5%
22	Normal Flux Density (at rated voltage and frequency)	Tesla	1.6	1.6
23	Maximum flux density (Increase of +12.5% combined voltage and frequency variation from rated voltage and frequency)	Tesla	1.9	1.9
24	Maximum current density	A/mm	1.6	1.6
25	Minimum clearances in air:			
25.1	HV phase to Earth	mm	140	140
25.2	LV phase to Earth	mm	40	40
26	HV Bushings	kV	12	12
27	LV Terminal Bushings	kV	1	1

5. GENERAL CONSTRUCTION

1. The transformer shall be double wound, Aluminium coil, oil immersed, naturally cooled (ONAN) and hermitically sealed type with round tank.

2. The transformer shall be suitable for service with fluctuations in supply voltage up to plus 12.5% to minus 12.5%.

3. The transformer shall be designed suitable for service life of 25 years.

4. The transformer and accessories shall be designed to facilitate trouble free operation, inspection, maintenance and repairs under the various operating and atmospheric conditions specified in clause no 3.

5. The design shall incorporate every precaution and provision for the safety of the equipment as well as staff engaged in operation and maintenance of the equipment

6. All outdoor apparatus of the transformer, including bushing insulators with their mountings, shall be designed so as to avoid any accumulation of water

7. Transformer shall be designed compatible for both mineral oil and ester oil

5.1 Core

1. Transformer core shall be wound type, constructed from high grade cold rolled, non-ageing, grain oriented, silicon steel lamination which shall be property annealed (under inert atmosphere, it required) to relieve stresses

2. The core shall have low loss and good grain properties

3. The core thickness should be 0.23mm or less and grade should be M3 or better

4. Only one grade and one thickness of core shall be accepted and mixing of different grades shall not set allowed

5. The complete design of the core must ensure maximum permanency of the core losses without continuous working of the transformers

6. All core clamping channel and bolts shall be effectively insulated. It should be coated with hot oil proof insulation, bolted together with frames to prevent vibration and noise.

7. The value of the maximum flux density allowed in the design and grade of lamination used shall be clearly stated. The vendor shall submit the calculations in support of the same.

8. The handling of core lamination and stacking should be smooth and uniform.

9. The transformer shall be suitable for continuous service without damage under “over fluxing” where the ratio of voltage over frequency exceeds the corresponding ratio au rated voltage and rated frequency up to 12.5% and the core shall not get saturated. The BH graph to be submitted by bidder for material.

10. The No Load current shall not exceed 3% of the Full Load current and will be measured by energizing the transformer at rated voltage and frequency. Increase of 12.5% of rated voltage shall not increase the no load current by 6% maximum of full load current.

11. The bidder shall be required to submit the following documents in regard to procurement of core material during stage Inspection:

    Invoice of supplier
    Mill's test certificate
    Packing list
    Bill of landing
    Bill of entry certificate by custom (if required)
    Description of material, electrical analysis, physical inspection certificate for surface defects, thickness and width of material.

12. The bidder shall offer the core for inspection and approval of TPNODL during the manufacturing stage. Heavy penalty or black listing shall be imposed on the bidders using defective CRGO sheets. I.e. in case of non-conformance w.r.t. TPNODL Specifications.
13. Transformer core assembly shall have enclosed hooks for lifting arrangement.
14. Bidder shall provide the below details in below table

Sl.No.	Description	Units	As furnished by bidder
1	Magnetizing (No Load) Current		
	90% Voltage	%	
	100% Voltage	%	
	112.5% Voltage	%	
2	Core grade & Make		
3	Thickness of Core	mm	
4	Core Diameter	mm	
5	Gross core area	Sq.mm	
6	Net core area	Sq.mm	
7	Flux density calculated	Tesla	
8	Over fluxing without saturation(BH Curve to be submitted)	Tesla	
9	Mass of Core	Kg	
10	Loss per kg of core at the above specified flux density	Watt	
11	Core window height	mm	
12	Center to center distance of the core	mm	
13	Mass of core lamination(min.)	kg	
14	Make of core offered		

5.2 Winding Connections

1. Primary and secondary winding shall be constructed from high conductivity (Aluminium conductors), Double Paper Covered (DPC) Aluminium conductor with 60% overlap.

2. The conductor should be drawn uniformly without any deformation and any burr.

3. No metallic or non-metallic dust should be present between the DPC conductors.

4. The current density for HV and LV winding should not be more than 1.6 Ampere per sq.mm.

5. The insulation between core and bolts and core and damps shall withstand 2.5 kV for one minute.

6. Proper bonding of inter layer insulation with the conductor shall be ensured.

7. All turns of windings shall be adequately supported (by which material) to prevent movement. The core/coil assembly shall be securely held in position to avoid any movement under short circuit conditions.
8. The joints in the winding shall be avoided but if it is necessary then, these shall be properly brazed and the resistance of the joints shall be less than that of parent conductor. Crimping is not allowed at any joints.

9. LV winging shall be such that neutral formation is at the top.

10. Bidder shall provide the below details in below table

Sl.No.	Description	Units	As furnished by bidder
1	HV conductor grade		
2	Diameter of HV conductor(Bare)	mm	
3	Diameter of HV conductor(DPC)	mm	
4	Conductivity of HV conductor	%	
5	Purity of HV conductor	%	
6	No. of HV Turns	Nos.	
7	Current density of HV winding (Calculated)		
8	LV conductor grade		
9	Diameter of LV conductor(Bare)	mm	
10	Diameter of LV conductor(DPC)	mm	
11	Conductivity of LV conductor	%	
12	Purity of LV conductor	%	

13	Resistance of windings al 20 degree C		
	HV winding	ohm	
	LV winding	ohm	
14	No. of LV turns	Nos.	
15	Current density of LV winding (Calculated)		
16	No. of parallels		
17	Wt. of the LV winding Aluminium without insulation	kg	
18	Wt. of the HV winding Aluminium without insulation	kg	
19	No. of LV coils		
20	No. of HV coils		
21	Height of LV winding	mm	
22	Height of HV winding	mm	
23	ID of HV winding	mm	
24	OD of HV winding	mm	
25	ID of LV winding	mm	
26	OD of LV winding	mm	
27	Thickness of the duct in LV winding	mm	
28	Thickness of the duct in HV winding	mm	
29	Thickness of the duct between HV & LV	mm	
30	Make of the Aluminium windings		

5.3 Insulating papers and Insulating Pressboards

1. The bidder shall submit characteristics along with make for all the type of insulation papers and Pressboards to be used with the offer.

2. Inter layer insulation both for HV and LV windings shall be Epoxy diamond dotted Kraft paper and compressed pressboard of make (refer Clause no.5. 19) subject to approval of TPNODL.

3. For Winding insulation, only Double Paper Covered insulation is acceptable with laying in opposite direction to each other and each paper must have overlapping more than 60% of its width.

4. Kraft paper and Pressboard should be made of pure Cellulose from soft wood pulp manufactured from sulphate process. No additive, adhesive or coloring matter shall be present

5. Kraft paper and Pressboard should be of minimum class: A (105°C) or better insulation material.

6. All spacers, axial wedges/runners used in windings shall be made of pre-compressed solid pressboard.

7. All axial wedges/runners shall be properly milled to dovetail shape so that they pass through the designed spacers freely.

8. Insulation shearing, milling and punching operations shall be carried out in such a way that there should not be any burr, sharp edges and dimensional variations.

9. Kraft paper self-adhesive tape to be used for bonding of insulating paper layer spanner and paperboards that are immersed in the oil filled transformer.

10. Below required values could be verified if required at any stage of the inspection and I should fulfill the requirement as per below table:

Characteristics	Kraft Paper	Pressboard (all sizes)
Dimension	As specified by bidder with ±5% tolerance	As specified by bidder with tolerance as per IS1576
Apparent Density	>0.80 g/cm^3	As per IS 1576 w.r.t Thickness
pH of Aqueous extract	6-8%	6-8%
Electrical strength 1) In air 2) In oil	 7kV/mm ----------	 12kV/mm 35kV/mm
Ash content	1% max	0.7 max
Moisture content	8% max	8% max
Oil absorption	----------	9% min
Heat stability	As per IS 9335-part 3	As per IS 1576
Tear index	As per IS 9335-part 3	As per IS 1576

11. Bidder has to submit the test certificates as per IS-9335, IS-1576 for all type of insulating materials covering above stated parameters along with below parameters during stage inspection:

    1. Substance (Grammage) (g/m3)
    2. Compressibility
    3. Tensile strength
    4. Conductivity of water extract
    5. Shrinkage in air
    6. Flexibility
    7. Cohesion between plies
    8. Elongation
    9. Air permeability

12. Bidder shall provide the below details in below table

Sl. No.	Description	Unit	As furnished by bidder
1.	DPC Paper for HV and LV conductors		
	Type of DPC Paper		
	Make of DPC Paper		
	Thickness DPC Paper	mm	
	Percentage Overlapping (not less than 60%)		
2.	Type of Paper for Interlayer Insulation		
	Make of Paper for Interlayer Insulation		
	Thickness of Paper for Interlayer Insulation	mm	
3.	Type of Paper for Insulation Between HV and LV winding		
	Make of Paper for Insulation Between HV and LV winding		

	Thickness of Paper for Insulation Between HV and LV winding (for all sizes)	mm	
4.	Type of Pressboards used for Insulation Between HV and LV winding		
	Make of Pressboards used for Insulation Between HV and LV winding		
	Thickness of Pressboards for Insulation Between HV and LV winding (all size)	mm	
5.	Type of Paper used for insulation between core and LV		
	Make of Paper used for insulation between core and LV		
	Thickness of Paper used for insulation between core and LV (All sizes)		
6.	Type of Pressboard used for insulation between core and LV		
	Make of Pressboard used for insulation between core and LV		
	Thickness of Pressboard used for insulation between core and LV (All sizes)		
7.	Material used for top and bottom yoke insulation		
	Make of material used for top and bottom yoke insulation		
	Thickness of material used for top and bottom yoke insulation	mm	
8.	Type of material used for Spanner, wedge and Axial for insulation		
	Type of material used for Spanner, wedge and Axial for insulation		
	Thickness of material used for Spanner, wedge and Axial for insulation (all sizes)		

5.4 Losses

1. The bidder shall guarantee No load loss (Iron loss at rated voltage and frequency) and full load Loss (at 75°C) without any positive tolerance.

2. The bidder shall also guarantee the total loss at 50% and 100% load condition (at rated voltage and frequency and these should be within the limits of max mum total loss declared by TPNODL for both 50% and 100% loading values (as per table below.

Description	Units	Rating	
		25 kVA	50 kVA
Maximum Losses at 50% loading at 75°C	Watt	95	190
Maximum Losses at 100% loading at 75°C	Watt	260	520

No positive tolerance shall be allowed on the losses as mentioned above. However, bidder can offer losses less than specified but no consideration in cost will be given for the same.

3. The successful bidder shall guarantee the quoted losses for at least five years. If at any point of time during operation if it is found that the total losses at 50% and 100% load are more than the values given in specifications, then bidder shall be liable to pay a fine of Rs. 250 per watt to the amount by which losses at 50% loading and 100% loading increase with respect to the values given in specifications.

4. During testing at Bidder's/Third party works if it is found that the actual measured losses are more than the values quoted by the Bidder TPNODL shall have the right to reject the complete lot

5. During testing at Bidder's/ third party works, if the temperature rise exceeds the specified values, the entire lot shall be rejected by TPNODL.

6. During testing, if the impedance values differ from the guaranteed values including tolerance, the entire lot shall be rejected by TPNODL.

7. Transformer losses shall be checked on any one of DT from supplied lot at TPNODL workshop. If it is found that the actual measured losses are more than the values quoted by the Bidder, TPNODL shall have the right to reject the complete lot.

8. Transformer shall be designed for the efficiency Level of minimum 99.05% for loading range from 20% to 60% at unity power factor.

9. Percentage regulation shall be less than 4% at 0.8 power factor

10. Bidder shall provide the below details in below table:

Sl. No.	Description	Unit	As furnished by bidder
1	No Load losses	Watt	
2	Load losses at 50%loading at 75° C	Watt	
3	Load losses at 100% loading at 75° C	Watt	
4	Total losses at 50%load at 75° C	Watt	
5	Total losses at 100% load at 75° C	Watt	
6	**Efficiency at 75 deg. C**		
7	**Efficiency at Unity P.F.**		
7.1	100% load	%	
7.2	80% load	%	
7.3	60% load	%	
7.4	40% load	%	
7.5	20% load	%	
8	**Efficiency at 0.8 P.F.**		
8.1	100% load	%	
8.2	80% load	%	
8.3	60% load	%	
8.4	40% load	%	
8.5	20% load	%	
9	**Regulation at :**		
9.1	Unity P.F. at 75 deg. C	%	
9.2	0.8 P.F. at 75 deg. C	%	
9.3	% Impedance at 75 deg. C	%	

5.5 Transformer tank & Tank construction

1. The transformer tank shall be of robust construction, round in shape and shall be built up of electrically tested welded mild steel plates.

2. The tank shall be fabricated by welding at corners. No horizontal or vertical joints in tank side walls and its bottom or top cover shall be allowed.

3. All welding operations should be carried by qualified welders (performance qualification certificates to the customer) as per the relevant ASME standards and a copy of the welding procedure has to be submitted to TPNODL at the time of drawing approval.

4. The thickness of tank should be as below:

For top and bottom plate: 3.15 mm (min.)
For Sides: 2.5 mm (min.)

5. The circular bottom plate edges of the tank should be folded upward, for at least 25 mm, to have sufficient overlap with vertical side wall of transformer so that oil shall not reach the bottom surface to avoid oil leakage.

6. The tank cover shall have plasticized surface at the top to guard against birds faults. Alternately, suitable UV resistant polymeric insulating shrouds (Height minimum-300mm) shall be provided on the bushing terminals.

7. The tank cover shall be conical shape (slope of at least 15 degree taking horizontal plane as reference).

8. The tank cover should be fixed to the tank through Anti-theft / shear bolt arrangement to prevent theft.

9. There must be sufficient space from the core to the top cover to take care of oil expansion. The oil volume inside the tank shall be such that even under the extreme operating conditions, the pressure generated inside the tank does not exceed 0.4 kg/sq. cm positive or negative and the tank shall be of adequate mechanical strength to withstand it.

10. The transformer should be capable of withstanding pressure of 0.8kg/sq.cm and a vacuum of 0.7kg/sq.cm of mercury for 30 minutes and there should be no deformation in tank.

11. The tank design shall be such that the core and the windings can be lifted freely without dismantling the bushings.

12. All joints of tank and fittings shall be oil tight and free from bulging.

13. Minimum oil level mark shall be embossed inside the tank (at 25° C).

14. The tightening torque chart to be provided for all bolts used in specific rating. This shall be submitted along with each rating drawings.

Lifting lugs

15. The transformer shall be provided with two permanent lifting lugs (Enclosed type) of MS plate for lifting the transformer bodily.

16. The location of lifting lugs shall be such that the clearance between lifting chain and nearest part of bushing shall be at least 100 mm.

17. There shall be facilities for lifting the core coil assembly separately.

18. The lifting lugs shall be capable of withstanding two times of the total weight of the transformer.

19. Calculation sheet for Lifting lug design to be submitted by Bidder.

20. Thickness of MS plate for lifting lugs shall be minimum 5mm or more as per calculations.

Mounting Lugs

21. The transformer shall be provided with two mounting lugs (made of Steel of 5mm thickness) suitable for fixing the transformer to a single pole by means of 2 bolts of 20 mm dimeter as per the calculation.

22. The mounting lugs faces should be in one plane.

23. Calculation sheet for mounting lug design to be submitted by Bidder.

24. Bidder shall provide the transformer size and clearances in below table:

Sl. No.	Description	Unit	As furnished by bidder
1	**Transformer overall Dia x Height**	mm x mm	
2	Only Tank **overall Dia x Height**	mm x mm	
3	Cable box overall LxWxH	mm x mm x mm	
4	**Clearances**		
4.1	Core and LV	mm	
4.2	LV and HV	mm	
4.3	HV Phase to Body	mm	
4.4	Between HV winding and Yoke	mm	
4.5	Between LV winding and Yoke	mm	
4.6	Between yoke and inside of tank to cover	mm	
4.7	Between yoke and bottom	mm	
4.8	Any point of winding to tank	mm	
5	**Calculated Impedance**	%	
5.1	HV to Earth Creepage distance in oil		
5.2	LV to Earth Creepage distance in oil		
6	Make of Tank sheet		

5.6 Gasket

1. Cork rubber gaskets: conforming to Type C, grade RC70 as per IS 4253 (Part-2) shall be provided for all oil bearing & water ingress resistant requirements for components like HT LV bushings, LV terminal box, terminal box cover etc.

2. Nitrile/Neoprene rubber gaskets: conforming to Type V as per IS 11149 shall be provided for bushing oil gaskets and tank cover.

3. Joint free Gasket to be used only.

4. Cork sheet, Nitrile/Neoprene rubber gaskets shall be free from cracks, pinholes and shall be capable of being cut or punched without crack or tearing.

5.7 Bushings and terminal connectors

1. HT Bushings (12 kV/250 A):

i. The bushings shall be two part and outdoor type external part shall be made of porcelain material and rods and nuts (Tightening Nut along with Check Nut) shall be made of tinned brass material.
ii. The HV bushings shall be fixed to the top cover
iii. The HV bushings shall have arcing horns.
iv. IS to be followed: IS 8603(Part-I) and IS 2099.
v. The HV bushing shall be fitted with Polymeric molded heat shrinkable insulating covers suitable for protection of the HT bushing connector.
vi. Tinned Brass/ bimetallic connectors shall be provided connected on HV bushing rods suitable for bare dog conductor connections in horizontal & vertical direction.

2. LT Bushings (1kV/250A):

i. The bushings shall be of outdoor type made of porcelain material and rods and nuts (Tightening Nut along with Check Nut) shall be made of tinned brass material.
ii. IS to be followed: IS 3347(Part-I) and IS 7421(latest amendment of IS).
iii. LV bushings shall be provided within cable box.

3. Bidder to give the details of Maker.

5.8 LV box with MCCB

1. LV box should made of Mild Steel of 2.2mm thickness with suitable handle and front cover shall have antitheft hinge arrangement with side opening angle of 150degree (min.).

2. The Box cover shall be with bend edges such that it shall protect the gasket on three sides.

3. Door in Door system to be provided. Small Door shall be designed for MCCB operation only. Both Doors shall have rain shed and Magnetic latch arrangement with key-locking arrangement

4. The Single phase MCCB box shall be provided with suitable size of Al bus bar w.r.t minimum current density (Calculated) of 1 A / sq.mm. Inside for further distribution of supply.

5. LV box shall be IP 55 and proper slope shall be provided so that water does not accumulate on cable box and ensure drainage of water.

6. LV box shall be fixed on the tank with minimum 06 nuts and bolts with rubberized cork sheet placed in between them, in such a way that they can be completely removed whenever required.

7 The MCCB make must be of as per clause 5.19 mounted in vertical position.

8. Arrangement in the box shall be N-Ph from left to right when viewed from front

9. Neutral bus bar should be extended and taken out (at least 40 mm) of box on a bolt of M10 size and it should be insulated from body. Nuts with bimetallic washers shall be provided on it for earthing.

10. The rating of MCCB box of distribution box shall be as per below:

Rating of Transformer	Rating of MCCB (Ics=Icu)	No. of Half Punched/Knock out type holes to be provided in Gland plate for 2C X 25 sq.mm armored cable
25kVA	125A, 10kA	8nos. (Dia 20.5mm)
50kVA	250A, 10kA	15nos. (Dia 20.5mm)

11. The outgoing bus bars should be provided with AL lugs (Size for 2CX25 sq.mm cable), electroplated spring washer, nuts and bolts.
12. Gland plates shall be mounted separately with nut & bolt arrangement and gasket in between them.
13. Epoxy Insulators shall be provided in LV box to support LV bus bar.
14. Painting of the Box to be done as per clause 5.14.
15. Insulated Flexible Cu Wire with Cu Lugs to be used to connect MCCB with both the terminals i.e. phase and neutral. Nominal Size of Cable is as below:
    35sq.mm multi strand Cu Cable for 25KVA DT
    95sq.mm multi strand Cu Cable for 50KVA DT
16. Bus bar shall have 8nos. holes (for 25KVA) and 15nos. (for 50KVA) of hole size 10mm at min 30mm gap (hole center to hole center). Nut-bolts of size M10 with washers shall be provided on each holes.

5.9 EQUILISING/EQUIPOTENTIAL STRIP

1. The Transformer top cover shall be connected at two places (diagonally opposite with each other) with the tank by tinned copper strip (30mm wide, 0.7mm thick).

2. The strip should touch bare surface of tank in order to ensure proper electrical connection of tank body with top cover with the strip.

5.10 Earthing Connections

NEUTRAL EARTHING:

1. The LV side neutral bushing shall be used for neutral earthing.

BODY EARTHING:

Two body earthing terminals, located on the lower side of the transformer, diagonally opposite to each other of M12 size (taken 50mm out of tank) shall be provided on Transformer tank with Bolt.

5.11 Oil

Note: Default Oil shall be Mineral Oil only if not specified/asked for other oil.

Selection of Oil i.e. Mineral Oil, Natural Ester oil or Synthetic Ester Oil will vary as per tender requirements and as per approval of TPNODL Requirements is given as below:

Mineral Oil: In case of Mineral Oil below are the requirements to be fulfilled:

1. All transformers shall be filled with new, unused, clean, standard mineral oil in compliance with IS 335 and type 2/IEC 296 and shall be free from all traces of polychlorinated biphenyl (PCB) compounds.

2. The use of recycled oil is not acceptable.

3. Oil shall be filled under vacuum before filling it shall be filtered and tested (as per IS 6103).

4. The test parameters should be as per the table below:

Test parameters	Values
Break Down Voltage (min)	60 kV
Water content ppm, (max.)	20 ppm
Specific resistance (min.) (at 27 ^{o}C)	2.5x10^{12} ohm-cm

Ester Oil: In case of Natural Ester oil or Synthetic Ester Oil below are the requirements to be fulfilled:

All transformers shall be filled to the required level with new, unused, Natural or Synthetic Ester as per TPNODL approval in compliance with Specification. The use of recycled ester oil is not acceptable. Ester shall be filtered and tested for break down Voltage (BDV) and

moisture content before filling. Ester shall be filled under vacuum. The Dielectric strength and water content shall meet the requirement. Ester oil shall be procured from approved vendor of TPNODL only.

Bidder has to provide the oil data in below table:

Sl. No.	Description	Unit	As furnished by bidder
1	Type of oil		
2	Oil Qty. for first filling	Ltr.	
3	Grade of Oil		
4	Maker's name		
5	BDV at the time of first filling	kV	

5.12 Pressure Release Device

1. The transformer shall be equipped with a self-sealing pressure release device designed to operate at a minimum pressure of 8PSI (0.564 kg/sq.cm).
2. The pressure release device shall be provided in the low voltage terminating portion of the tank above top oil level.

5.13 Fasteners

1. All the bolts or studs shall be at least 6 mm in diameter except when used for small wiring terminals.

2. All nuts/bolts/washers exposed to atmosphere shall be as follows:
   Size 12mm (or below): Stainless Steel
   Above 12mm: Steel with antirust coating , Hot dip galvanized

3. All ferrous bolts, nuts and washers placed in outdoor positions shall be hot dip galvanized to prevent corrosion (except high tensile steel bolts and spring washers which shall have electrolytic action between dissimilar metals).

4. In case the galvanization is removed due to welding or manufacturing, the parts should be properly cleaned and painted to avoid exposure to atmosphere.

5. Taper washers shall be provided where necessary. Protective washers of suitable material shall be provided on front and back of the securing screws.

6. Each bolt shall project at least one thread but more than three threads through the nut. If bolts and nuts are placed so that they are inaccessible by means of ordinary spanners, special spanners shall be provided. The length of the screwed portion of the bolts shall be such that no screw thread may form part of a shear plane between members.

5.14 Surface preparation and Painting

1. The paint shall be applied by airless spray.

2. Steel surfaces shall be prepared by shot blast cleaning (IS-9954) to grade Sq.2.5 of ISO 8501-1 or chemical cleaning including phosphating of the appropriate quality (IS 3618).

3. Heat resistant (Hot oil proof) paint shall be used for the inside surface and whereas for external surface one coat of thermos setting powder.

Paint or one coat of epoxy primer (zinc chromate) followed by two coats of polyurethane (P.U.) base paint. as per table given below:

S.No.	Paint type (should be UV restraint, non-fading)	Area to be painted	No of coats	Total dry film thickness (min); micron
1.	Thermosetting **powder paint**	Inside Outside	01 01	30 60
2.	**Liquid Paint**			
a.	Epoxy (primer)	Outside	01	30
b.	P.U. Paint (finish paint)	Outside	02	25 (each)
c.	Hot oil resistant paint	Inside	01	35

The two coats shall be of oil and weather-resistant nature with final coat as flossy and non-fading paint of shade 631 as per IS 5 or RAL 7032.

The dry film thickness shall not exceed the specified minimum dry film thickens by more than 25%. Any damaged part shall be cleaned to bare metal with an area extending 25 mm around its boundary. A priming coat shall be immediately applied followed by full paint finish equal to that originally applied and extending 50 mm around the perimeter of the original damage. The repainted surface shall present a smooth surface which shall be obtained by carefully chamfering the paint edges before and after priming.

Painting shall not affect by weather changes & performance against pilling out or fading etc. to be guaranteed for 5 Years.

5.15 Radio Interference

When operated at voltages up to 12.5% in excess of the normal system rating, transformers shall be substantially free from partial discharges (i.e. corona discharges in either internal or external insulation) which are likely to cause interference with radio or telephone communication.

5.16 Overload Capacity

The transformer shall be suitable for loading as per IS 6600.

5.17 Load Management Signal Light

A signal light shall be provided to give information about the loading condition of the transformer. It shall forewarn any overloading (not momentary overloading) problem at the installation.

The signal light mechanism shall not reset itself when the load drops from the overloaded condition.

The signal light shall remain lighted once the signal light contacts close due to overload and can be turned off only by manual operation.

5.18 Fittings

The following standard fittings shall be provided

1. Two earthing terminals with earthing symbol
2. Lifting lugs (2 Nos.) for complete transformer
3. Markings and Marking Plates (as specified in clause No.6) (Non detachable)
4. Pressure relief device
5. Top cover fixing clamps
6. Mounting lugs (2 Nos) and mounting provision for transformer
7. Bird guard
8. LV earthing arrangement
9. HV bushings with arcing horns — 2 number (12kV/250 A)
10. LV bushings — 2 number (1kV/250A)
11. MCCB with distribution Box.
12. Terminal connector for HT and palm connector for LT side.

5.19 MAKE OF MAJOR COMPONENTS & RAW MATERIALS

The BA shall procure the following constituent items from the preferable vendors as follows:

S.no	RAW MATERIAL/EQUIPMENT	MAKE

a)	Aluminium	
b)	Core	M/S AK Steels, POSCO, Kawasaki/ JFE, Nippon Steel
c)	Insulation paper	Raman Boards- Mysore Senapathy Whiteley — Bangalore
d)	Transformer Oil	Savita, Apar, Gandhar
e)	Gaskets & Corks	Nu Cork,Anchor Corks
f)	Steel For Tank	M/S TISCO, M/S SAIL, M/S Bhushan steel,M/S ISSCO. M/S RINL, M/S Jindal Steel
g)	MCCB	ABB, C&S, Schneider, Eaton, Havells, Siemens, L & T.

Also, Bidder has to provide all test certificates from original manufacturers & relevant sourcing documents. BA shall also have shot blasting facility.

6. NAME PLATE AND MARKING

1. MARKING PLATES

Name Plate (Rating) Plate:
The name plate of size 125 mm x 125 mm shall be provided having following details shall be strictly as per IS 1180:2014. Additionally, following points shall be displayed.

I. Actual no load losses of transformer.
II. Actual total losses of transformer at 50% load and 100% load.
III. "PROPERTY OF TPNODL" shall be written in bold letters
IV. PO number with date has to be mentioned.
V. Name of the firm.
VI. Serial No.
VII. Rating of transformer.
VIII. Order no. and date.
IX. Date of dispatch

Terminal Marking Plate:
The terminal marking plate shall be provided which shall be strictly in accordance with figure 5 of IS 1180-Part 1: 2014. This plate may be combined with the rating plate or can be provided separately. Value of percentage circuit impedance and indication of winding to which impedance is related has to be displayed additionally.

Guarantee Plate:
A separate warranty plate made of Stainless Steel with following clause written on it.
"THE EQUIPMENT GUARANTEED UPTO A PERIOD OF 48 MONTHS FROM THE DATE OF COMMISSIONING OR 60 MONTHS FROM THE DA TE OF LAST SUPPLY"

All the plates described above should be as followings:

Material	Stainless Steel
Thickness	1 mm
Engraving	The letters on the rating plate shall be engraved black on the white/silver back ground.
Fixing	Fixing screws shall be of stainless steel.

Danger Plate:
Danger notice shall have red lettering on a white background on a plate as specified in IS: 2551 — 1982.

2. MARKING

1. Alf transformers shall have the primary and secondary terminal markings (engraved on steel strips with black colour i.e. 1U & 2u) adjacent to the relevant terminal.

2. The neutral point terminal shall be indicated by the letter 2n.

3. Colour marking of the HV & LV bushings top cap shall be done.

4. On the body of tank Manufacturer's name, rating, serial no. and year of manufacturing shall be written with black paint on yellow base. It should be written in suitable place in approved format that it is readable from ground after installation on pole.

7. TESTS

1. All routine, acceptance & type tests shall be carried out in accordance with the IS 2026 and IS 1 180: Part-I (2014) and shall be witnessed by the TPNODL's authorized representative.

2. Offered material and its components shall also be type tested not older than 5years as per the relevant standards.

3. Following tests shall be necessarily conducted on the Distribution Transformers in addition to others specified in IS/IEC standards

7.1 Type Test

1. Lightning Impulse Test [As per IS 2026 (Part 3) Cause no. 12]

2. Temperature Rise Test [As per IS 2026 (Part 2) Clause no.4]
   NOTE: Maximum measured total loss (No load at Rated excitation, load loss at maximum current tap converted to 75^0C reference temperature) at 100 percent loading shall be supplied during temperature rise test.
3. Short Circuit impedance Withstand test below 200kVA rating [As per IS 2026 (Part 1) clause no. 16, 11 & 2026 part 5].
   NOTE: Routine tests before and after short circuit test shall be conducted as per IS 2026(Part 1).

4. Pressure Test [As per IS 1180: Part 1 (2014) clause no. 21.5.1.1).
5. Test to verify IP 55 for cable box. (As per IS 60529 clause 11 to 15)

Note: - Out of the above mention type test, the tests under sl. No- 1, 2 and 3 shall be conducted at CPRI/ERDA labs and the balance tests to be conducted at NABL accredited labs, accreditation certificates to be submitted, in- house tests accepted if in-house lab is NABL accredited for these tests.

7.2 Routine Test

Sr. No.	Test to be done	Reference BIS	Clause no.
1	Measurement of Winding Resistance	IS 2026 (Part 1)	16.2.1 & 16.2.3
2	Measurement of voltage ratio and polarity check	IS 2026 (Part 1)	16.3
3	Measurement of percentage impedance and load loss at 50% and 100% load	IS 2026 (Part 1)	16.4
4	Measurement of no load losses and magnetizing current at rated frequency and 90%, 100% and 112.5% of rated voltage	IS 2026 (Part 1)	16.5
5	Measurement of insulation resistance	IS 2026 (Part 1)	16.6
6	Induced over voltage withstand test	IS 2026 (Part 3)	11
7	Separate Source voltage withstand test	IS 2026 (Part 3)	10
8	Oil leakage test	IS 1180 (Part 1)	21.5.1.3
9	BDV and moisture content of oil in transformer (Type-2 oil)	For mineral oil : IS 335 (2018) For Ester oil : IEC 60247 & IEC61099	For mineral oil : IS 335Table 2

7.3 Acceptance Test

1. Temperature Rise Test (on one unit of first lot against first release order / PO for each rating, for further lots/RO, TPNODL also reserves the right to perform Temperature rise if required) [As per IS 2026 (Part 2) Clause no.4]

2. Oil leakage test for acceptance shall be conducted at pressure of 0.35kg/sq.cm for one hour. IS 1180 (Part 1) clause 21 .5.1 .3)

3. The painted surface shall pass the Cross Adhesion Test (IS 1180 part 1 clause no. 21.4.d).
4. At stage inspection -Checking of weight, dimensions, fitting and accessories, tank sheet thickness, oil quantity, material finish and workmanship, physical verification of core coil assembly and measurement of flux density on one unit of each rating of the offered lot with reference to the GTP and contract drawings. Oil BDV of all offered lot.
5. At least 10% transformer of the offered lot (minimum of one) shall be subjected to all the tests mentioned under the section ROUTINE Test" in presence of TPNODL's representative at the place of manufacture before dispatch without any extra charges. The testing shall be carried out in accordance with IS: 1180 and IS: 2026.
6. The format of final inspection as per annexure-ll.
7. At Stage and Final inspection, the incoming raw material and its movement/consumption record in the related jobs of TPNODL will be verified by inspecting officer. In case of any deviation or non- availability of such records, the offered lot ma get rejected.

8. TYPE TEST CERTIFICATES

a. The Bidder shall furnish the type test certificates of the offered rating and design of transformer for the tests as mentioned above as per the corresponding standards.
b. All the tests shall be conducted at CPRI / ERDA or as defined in 7.1 as per the relevant standards.
c. Type tests should have been conducted in certified Test laboratories during the period not exceeding 5 years from the date of opening the bid.
d. In the event of any discrepancy in the test reports i.e. any test report not acceptable or any/all type tests (including additional type tests, if any) not carried out, same shall be carried out without any cost implication to TPNODL.

9. PRE-DESPATCH INSPECTION

1. Equipment shall be subject to inspection by a duly authorized representative of the TPNODL.
2. Inspection may be made at any stage of manufacture at the option of the purchaser and the equipment if found unsatisfactory as to workmanship or material, the same is liable to rejection.
3. Bidder shall grant free access to the places of manufacture to TPNODL representatives at all times when the work is in progress.
4. Inspection by the TPNODL or its authorized representatives shall not relieve the supplier of his obligation of furnishing equipment in accordance with the specifications.
5. The BA shall ensure that 100% of the lot must be ready for inspection and at least 10% must be ready with all mounting and accessories during inspection.

6. Material shall be dispatched after specific MDCC (Material Dispatch Clearance Certificate) is issued by TPNODL.
7. Following documents shall be sent along with material:

   - Test reports
   - MDCC issued by TPNODL
   - Invoice in duplicate
   - Packing list
   - Drawings & catalogue
   - Guarantee / Warrantee card
   - Delivery Challan
   - Other Documents (as applicable)

8. To ascertain the quality of the transformer oil, the original manufacturer's tests report shall be submitted at the time of inspection.

9. Arrangements shall also be made for testing of transformer oil, after taking out the sample from the manufactured transformers and tested in the presence of TPNODL's representative.

10. In respect of raw material such as core stampings, winding conductors, insulating paper and oil, bidder shall use materials manufactured/supplied by standard manufacturers and furnish the manufacturers' test certificate as well as the proof of purchase from these manufacturers (excise gate pass) for information of the TPNODL.

11. The bidder shall furnish following documents along with their offer in respect of the raw materials:
    1. Invoice of supplier.
    2. Mill's certificate
    3. Packing List
    4. Bill of Landing
    5. Bill of entry certificate by custom.

12. To ensure about the quality of transformers, the inspection shall be carried out by the TPNODL ' s representative at following two stages:
    i. Online anytime during receipt of raw material and during manufacturing/assembly Stage.
    ii. At finished stage i.e. transformers are fully assembled and are ready for dispatch.

13. Advance intimation of 7 Days (Within Balasore)/ 12 Day (Outside Balasore) is required for both Stage and final inspections.

14. All tests and inspection shall be carried out at the place of manufacture unless otherwise specifically agreed upon by the manufacturer and TPNODL at the time of purchase.

15. The manufacturer shall offer the inspector representing the TPNODL all reasonable facilities, without charges, to satisfy him that the material is being supplied in accordance with this specification. This will include Stage Inspection during manufacturing stage as well as Active Inspection during Acceptance Tests.

16. The stage inspection shall be done as per the format given in Annexure -1.

17. During the stage inspection a few assembled core coil and assembled Tanked transformer shall be dismantled (only in case of CRGO material) to ensure that the CRGO laminations, Windings and workmanship are of good quality. TPNODL also reserves the right to review any document or certificates related to material, manufacturing process, quality checks at any point of stage inspection.

18. TPNODL also reserves the right to inspect the tank of transformer before surface preparation and painting. The same shall be informed to TPNODL accordingly.

19. Final inspection Call for carrying out acceptance tests as per relevant IS/IECs shall be sent by the Bidder along with routine test certificates.

20. The bidder shall provide all services to establish and maintain quality of workmanship in his works and that of his sub-contractors to ensure the mechanical / electrical performance of components, compliance with drawings, identification and acceptability of all materials, parts and equipment as per latest quality standards of ISO 9000.

21. The TPNODL has the right to have the test carried out at his own by an independent agency wherever there is a dispute regarding the quality supplied. Also TPNODL has right to test 1% of the supply selected either from the stores or field to check the quality of the product. In case of any deviation TPNODL have every right to reject the entire lot or penalize the bidder, which may lead to blacklisting, among other things.

22. At the time of inspection the material should be ready as specified In case of material non-readiness or material failure in acceptance, Cost of re-inspection shall be borne by bidder.

10. INSPECTION AFTER RECEIPT AT STORE

1. The material received at the TPNODL store shall be inspected for acceptance and shall be liable for rejection, if found different from the reports of the pre-dispatch inspection.
2. In case the transformers proposed for supply against the order are not exactly as per the tested design, the Bidder shall be required to carry out the short circuit test and impulse voltage withstand test at its own cost in the presence of the representative of TPNODL.
3. TPNODL reserves the right to conduct all tests on Transformer after arrival at site stores and the manufacturer shall guarantee test certificate figures under actual service conditions.

4. TPNODL reserves the right to conduct short circuit test and impulse voltage withstand test in accordance to IS, a fresh on each ordered rating at purchaser cost, even if the transformer of the same rating and similar design are already tested. This test shall be carried out on a transformer to be selected by TPNODL either at the manufacturer's works when they are offered in a lot for supply or randomly from the supplies already made to TPNODL stores. The findings and conclusions of these tests shall be binding on the bidder

11. GUARANTEE:

1. Bidder shall stand guarantee towards design, materials, workmanship & quality of process/manufacturing of items under the contract for due and intended performance of the same, as an integrated product delivered under this contract. In the event any defect is found by the Purchaser up to a period of 48 months from the date of commissioning or 60 months from the date of last supplies made under the contract, whichever is earlier.

2. Bidder shall be liable to undertake to replace/rectify such defects at his own costs within mutually agreed timeframe and to the entire satisfaction of the TPNODL, failing which the TPNODL will be at liberty to get it replaced/rectified at Bidder's risks and costs and recover all such expenses plus the TPNODL's own charges (@ 20% of expenses incurred), from the Bidder or from the "Security cum Performance Deposit" as the case may be.
3. In case of Distribution transformer fails within the guarantee period TPNODL will immediately inform the Bidder who shall take back the failed Distribution Transformer within 15 days from the date of intimation at his own cost and replace / repair the transformer within 45 days of date of intimation with a roll over guarantee. The outage period i.e. period from the date of failure till unit is repaired/replaced shall not be counted for arriving at the guarantee period.
4. Bidder shall further be responsible for 'free replacement' for another period of 3 years from the end of the guarantee period for any 'Latent Defects' if noticed and reported by the Purchaser.

12. PACKING

1. Bidder shall ensure that all the equipment covered under this specification shall be prepared for rail/road transport in a manner so as to protect the equipment from damage in transit.
2. Transformers shall be delivered filled with oil and supplied with all accessories mounted. Screws and bolts shall be thoroughly tightened to ensure no leakage of oil.
3. Bidder shall ensure that all the equipment covered under this specification shall be prepared for rail/road transport in a manner so as to protect the equipment from damage in transit.

Note: Single use plastic not to be used for packing of the material

13. TENDER SAMPLE — All offered transformer detailed documents to be submitted as per clause no. 19. The sample shall be not applicable.

14.TRAINING — The bidder shall arrange to provide training of our staff if required for installation & commissioning or maintenance etc.

13. QUALITY CONTROL — The bidder shall submit with the offer Quality assurance plan indicating the various stages of inspection, the tests and checks which will be carried out on the material of construction, components during manufacture and bought out items and fully assembled component and equipment after finishing. As part of the plan, a schedule for stage and final inspection within the parameters of the delivery schedule shall be furnished. TPNODL's engineer or its nominated representative shall have free access to the manufacturer's/sub-supplier's works to carry out inspections.

The following information shall necessarily be submitted with the bid:

1. List of important raw materials, names of sub-suppliers for raw materials, standards to which raw material is tested and the copies of test reports of the tests carried out on raw materials in presence of Bidder's re representatives.
2. List of manufacturing facilities available, level of automation achieved and the areas where manual process exists.
3. List of areas in manufacturing process where stage inspections are normally carried out for quality control and details of these tests and inspections.
4. List of testing equipment for final testing with valid calibration reports. Manufacturer shall possess 0.1 class instruments for measurement of losses.
5. QAP withhold points for TPNODL inspection.

14. MINIMUM TESTING FACILITIES

1. Bidder shall have adequate in house testing facilities tor carrying out all routine tests, acceptance tests and pre-dispatch inspection as per relevant International/Indian standards.
2. Bidder to submit the testing equipment details in tender.

15. MANUFACTURING ACTIVITIES

Successful bidder have to submit the bar chart for various manufacturing activities clearly elaborating the stages with quantity. This bar chart should be in line with the Quality assurance plan submitted with offer. This bar chart to be submitted within 15 days from the release of the order.

16. SPARES, ACCESSORIES AND TOOLS

1. Bidder shall provide a list of recommended spares with quantity and unit prices for 5 years of operation after commissioning. The Purchaser may order all or any of the spare part listed at the time of award of contract and these parts shall be supplied as a part of definite works. The Purchaser may order additional spares at any time during the contract period at the rates stated in the Contract document.

2. Bidder shall give an assurance that the reparability of transformer, spare parts and consumable items will continue to be available through the life of the equipment which shall be 25 years minimum. However, the Purchaser shall be given a minimum of 12 months' notice in the event that the Bidder or any sub-vendor plans to discontinue manufacture of any component used in this equipment.

3. Any spare apparatus, parts or tools shall be subject to the same specification, tests and conditions as similar material supplied under the Contract. They shall be strictly interchangeable and suitable for use in place of the corresponding parts supplied with the plant and must be suitably marked and numbered for identification.

17. DRAWINGS AND DOCUMENTS

Following drawings and documents shall be prepared based on TPNODL specifications and statutory requirements and shall be submitted with the bid

a. Completely filled in Technical Particulars and compliance to each clause of the specification.
b. Description of the transformer and all components
c. General arrangement for Transformer
d. LV box drawing along with MCCB and bus bar arrangement and gland plate drawing
e. Bill of material
f. Experience Certificate and list
g. Type test certificates
h. List of makes of major components as listed above

Drawings/documents to be submitted after award of contract are as under:
List of Drawings/Parameters to be submitted:

1. Technical Parameters as asked in Specification (General Technical Particulars, General Technical Requirements, Additional Details, Fittings, Type test Reports and Routine test certificates of bought out accessories

2. General Arrangement Drawing of the Transformer (Front view, Top view and both sides view. Complete list of fittings to be displayed and quantities to be mentioned with the drawing).

3. Internal Core arrangement drawing

4. Internal Core-coil assembly drawing

5. Marking plates and Markings (as mentioned in clause 6)

6. HV and LV bushings drawing with internal view and metal parts)

7. HT connector, LT connector (palm connector), Aluminum bus bar

8. LV Box with Gland Plate drawing.

9. BH curve & Loss/kg graph of core material offered.

10. LV Terminal Box drawing with internal wiring arrangement of MCCB and bus bar etc.

11. MCCB with Distribution box GTP and drawing (as per TPNODL's specification of MCCB with Distribution Box)

12. The tightening torque chart to be provided for all bolts used in specific rating

13. Type Test Certificates.

14. Installation/ Mounting Instructions/Drawing.

15. Quality Assurance plan.

16. Efficiency vs Load curve of the offered design

List of Calculations to be submitted:

All the calculations shall be step by step showing the use of formulas and other practical considerations. Concise calculations in table or excel sheet shall not be accepted. Also, the reference (only standard sources as IS, IEC or any such standard is acceptable) of the formulas shall be mentioned

17. Resistance Calculation (75 deg. C)
18. Load Losses Calculation (at 75 deg. C)
19. No load Losses.
20. Stray Losses
21. Weight of Aluminium (Bare and with Insulation also).
22. Weight of Core.
23. Flux Density calculations,
24. Current Density Calculations
25. Short Circuit withstand
26. Temperature Rise Calculations.
27. Cooling Calculations.
28. Calculation sheet for Lifting lug design and mounting lug design to be submitted by Bidder.

Additional Documents to be submitted:

a. List of raw materials as well as bought out accessories and the names of sub-suppliers selected from those furnished along with offer.
b. Type test certificates of the raw materials and bought out accessories.
c. The successful Bidder shall submit the routine test certificates of bought out accessories and central excise passes for raw material at the time of routine testing.

All the documents & drawings shall be in English language. After the receipt of the order, the successful bidder will be required to furnish all relevant drawings/parameters/calculation to TPNODL for approval.

Instruction Manuals:

Bidder shall furnish softcopies of nicely bound manuals (In English language) covering erection and maintenance instructions and all relevant information and drawings pertaining to the main equipment as well as auxiliary devices.

18. GUARANTEED TECHNICAL PARTICULARS

All clauses and points in the Specification to be complied for along with GTR.

21.0 SCHEDULE OF DEVIATIONS

(TO BE ENCLOSED WITH THE BID)

All deviations from this specification shall be set out by the Bidders, clause by Clause in this schedule. Unless specifically mentioned in this Schedule, the tender shall be deemed to confirm the purchaser's specifications:

S.No.	Clause No.	Details of deviation with justifications

We confirm that there are no deviations apart from those detailed above.
Seal of the Company:
Signature

Designation

ANNEXURE – I
INSPECTION TEST PLAN FOR STAGE INSPECTION OF DISTRIBUTION TRANSFORMER

S No.	Particulars	Details
(A)	**GENERAL INFORMATION:**	
1	Name of firm	
2	Order No. and Date	
3	Details of offer	
a)	Rating	
b)	Quantity	
c)	Serial Numbers	
4	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)	**Position of manufacturing for the offered quantity:**	
a)	Complete tanked assembly	
b)	Core and coil assembly ready	
c)	Core assembled	
d)	Coils ready for assembly	
	i) HV coils ii) LV coils	

I. The stage inspection shall be carried out in case:

a) 50% quantity is ready with core coil assembly (CCA).
b) 30% quantity of core and coil shall be ready for inspection.
c) 20% Quantity shall be available in form of core stacking and coil winding for taking measurements.
d) Minimum 50% tanks must be ready for testing and inspection & balance quantity must be in process.

II. 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 cleared shall be liable for cancellation

S No.	Particulars	As offered	As observed	Deviation and Remarks
(C)	**Inspection of Core :** (I) Core Material 1) Manufacturer's characteristic certificate in respect of grade of lamination used. (Please furnish test certificate)			
	2) Thickness of core lamination			
	3) Remarks regarding Rusting and smoothness of core.			
	(II) Core Construction :			
	(1) Core Diameter (mm)			
	(2) Total cross sectional area of core			

	(3) Effective cross sectional area of core			
	(4) Whether top yoke is cut for LV connection.			
	(5) If yes, at 4 above, whether Reinforcement is done.			
	(6) Core length(leg center to leg center)			
	(7)Window height.			
	(8)Core height			
	(9)Core weight only			
D	**INSPECTION 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 (enclosed copy) for winding material of:			
	a) HV			
	b) LV			
	II. Construction Details 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 coils in.			
	a) LV winding			
	i)Internal diameter (mm)			
	ii)Outer diameter (mm)			
	b) HV winding			
	i)Internal diameter (mm)			
	ii)Outer diameter (mm)			
	4) Current density of winding material used for:			
	a) HV			
	b) LV			
	5) Total No. of turns			
	a) HV coils			
	b)LV coils			
	6) Total weight of coils of			
	a)LV winding (Kg)			
	b) HV winding (Kg)			
	7) Inspection of DPC Aluminium for metallic and non-metallic Dust for HV and LV winding			
	8) Inspection of DPC Aluminium for deformation in			

Initiator	Deepak.	HOD (Engineering)	Sandhya Pd.

	HV and LV winding			
(E)	**INSULATION MATERIALS**			
	(I) DPC Paper Insulation			
	a) Type of Paper (Dotted Kraft or Diamond Dotted Kraft)			
	b) Make			
	c) Thickness (mm)			
	d) DPC laying direction			
	e) Percentage of Overlapping of each paper			
	II) Interlayer Insulation			
	a) Type of Paper			
	b) Make			
	c) Thickness (mm)			
	III) Between HV and LV winding			
	a) Type of Paper			
	i. Make			
	ii. Thickness (mm) (all size)			
	b) Type of Pressboards			
	i. Make			
	ii. Thickness (mm) (all size)			
	IV) Between core and LV			
	Type of Paper			
	ii. Make			
	iii. Thickness (mm) (all size)			
	Type of Pressboards			
	i. Make			
	ii. Thickness (mm) (all size)			
	V) Material used for top and bottom yoke and insulation			
	a) Type of Material			
	i. Make			
	ii.Thickness (mm) (all size)			
	VI) Material used for Spanner, wedge and Axial for insulation			
	a) Type of Material			
	i. Make			
	ii. Thickness (mm) (all size)			
	iii. Visual condition(i.e free from dust, burr, damage and sharp edges)			
	VII) Test certificate of manufacturer (enclose copy for all type of papers and pressboard used)			
(F)	**CLEARANCES: (mm)**			
	(I) Related to core and winding			
	1) LV to core (radial)			
	2) Between HV and LV (Radial)			
	3) Thickness of duct between HV and LV coil mm			
	(II) Between core – coil assembly and tank:			
	1) Between winding and body			
	a) Tank height wise			

	b) Tank side wise			
(G)	**TANK :**			
	(I) Construction Details:			
	1) Circular shape			
	2) Thickness of side wall (mm)			
	3) Thickness of top and bottom plate (mm)			
	4) Provision of sloping top cover			
	5) Tank internal dimensions (mm)			
	a) Diameter			
	b) Height			
	(II) General Details :			
	1) Inside painted by oil corrosion resistant paint (please specify which type of coating done)			
	2) Provision of lifting lugs.			
	a) Numbers			
	b) Weither reinforcement done by welding all side of Lug			
	3) Provision of air release plug			
	4) Provision of hot dip galvanized GI Nuts Bolts with 1no. plain and 1no. spring washer.			
	5) Deformation of side wall of tank when subject to:			
	a) Vacuum of (-) 0.7 Kg/sq.cm for 30 minutes.			
	b) Pressure of 0.8 Kg/sq.cm. for 30 minutes.			
(K)	**TERMINALS:**			
	1) Material whether of Brass Rods			
	a) HV			
	b) LV			
	2) Size (dia. In mm)			
	a) HV			
	b) LV			
(L)	**BUSHINGS – Two part**			
	1) Whether HV & LV bushings mounted as per drawing.			
	a) HV- Top Inclined			
	b) LV – Side			
	2) Bushing Clearance: (mm)			
	a) LV to Earth			
	b) HV to Earth			
	3) Bushing are two part and inner part shall be sealed and external part is replaceable without affecting sealing and need of opening of top cover.			
(M)	**TANK BASE:**			
	1) Whether tank base is welded folded upwards, as Specified in specification.			
(N)	**OIL:**			
	1) Name of supplier			
	2) Breakdown voltage of oil: (kV)			
	a) Filled in tanked transformer			

	b) In storage tank (to be tested by Inspecting officer).			
	3) Supplier's test certificate (enclose copy)			
(O)	**ENGRAVING:**			
	1) Engraving of Sl. No. and name of firm and YoM.			
	a) On bottom of clamping channel of core-coil assembly.			
	b) On Body of tank (on Yellow base with Black paint)			
(P)	**MS Plate of size 125× 125 mm welded on width side of stiffener.**			
	i) Following details engraved (as per approved GTP):			
	a) Serial Number			
	b) Name of firm			
	c) Order No. and date			
	d) Rating			
	e) Date of dispatch			
(Q)	**NAME PLATE DETAILS:**			
	Whether Name Plate is as per approved drawing			
(R)	**COLOUR OF TRANSFORMER**			
	1) Tank body (Inner side)			
	2) Tank body (Outer side)			

PURCHASER'S OFFICER

BIDDER'S REPRESENTATIVE

DATE OF INSPECTION

ANNEXURE-II

INSPECTION TEST PLAN FOR PRE-DELIVERY OF DISTRIBUTION TRANSFORMERS

1	Name of the firm / BA	
2	Date of inspection	
3	Details of offer made	
	(i) Order No. and date	
	(ii) Rating	
	(iii) Quantity	
	(iv) Sl. No. of transformers	
4	Date of stage inspection of the lot	
5	Reference of stage inspection clearance	
6	Sample Quantity (10% of the offered lot, min. one)	Sr. No.----------

ACCEPTANCE TESTS TO BE CARRIED OUT

S No.	PARTICULARS	Specified Value	Reference documents	Test Results	Pass/Fail
1.	Visual and Physical verification	GTP/Drawing/ ENG-HV-2005 reference value	GTP/Drawing/ENG-HV-2005		
2.	Ratio Test	26	ENG-HV-2005 cl. 4.0 , IS 2026 (Part 1) cl. 16.3		
3	Polarity check	Additive	ENG-HV-2005 cl. 4.0 , IS 2026 (Part 1) cl.16.3		
4.	No load loss measurement	GTP value	IS 2026 (Part 1) cl.16.5		
5.	Max. Load loss measurement (watt) at 60% loading at 75°C	110 for 25KVA 210 for 50KVA	IS 2026 (Part 1) cl.16.4		
	Max. Load loss measurement (watt) at 100% loading at 75°C Note – Calculation sheet to be attached along with	300 for 25KVA 590 for 50KVA			
6.	Winding Resistance :	GTP Value	IS 2026 (Part 1) 16.2.1 & 16.2.3		
	H.V. (in Ohms) Resistance at 75 deg.C (Calculated)				
	L.V. (in Ohms) Resistance at 75 deg.C (Calculated)				
7.	Insulation resistance (M ohm)		IS 2026 (Part 1) cl.16.6		

8.	a) Separate source Voltage withstand test voltage:		IS 2026 (Part 3) cl.10		
	HV	28 kV for 60secs.			
	LV	3 kV for 60 secs.			
9.	Induced over-voltage withstand test at double voltage and double frequency	100 Hz, 866 volts for 60 seconds.	IS 2026 (Part 3) cl.11		
10.	No load current at	GTP values	IS 2026 (Part 1) cl.16.5		
	90% volts				
	100% volts				
	112.5% volts				
11.	Neutral current measurement (A)	within 2% of the Full load current			
12.	Percentage Impedance at 75 deg.C (Please furnish calculation sheet)	4	IS 2026 (Part 1) cl.16.4		
13.	Transformer oil test (Break down voltage)	>60KV per 2.5mm			
14.	Oil leakage test (0.35Kg/sq.cm)	Should Withstand for one hour	IS 1180 (Part 1) clause 21.5.1.3		
15.	Pressure test		IS 1180 (Part 1) cl. 21.5.1.2		
16.	Temperature Rise test (Over ambient temperature)	top oil – 35° top oil – 40°	IS 2026 (Part 2) Clause no.4		
17.	Paint Thickness test /Cross Adhesion Test	ENG-HV-2005 cl. 5.14	IS1180 part 1 clause no. 21.4.d		
18.	Engraving on Name plate, Guarantee plate and Tank body	GTP	GTP/ ENG-HV-2005		
19.	Copy of calibration certificates of testing equipment be enclosed.	100% testing equipment			
20.	Verification of tightening torque w.r.t torque chart.	GTP	Approved torque chart		
21.	Verification of Efficiency level at unity power factor	GTP	As per clause 5.4.8 of specification		
22.	Raw Material consumption documents verification in offered lot	Usage of Desired grade material in the product	As per acceptance clause in the specification/GTP		

Purchaser's Officer Bidder's Representative

Date of Inspection

POINTS TO BE SEEN / DIMENSIONS TO BE NOTED AT THE TIME OF DISMANTLING OF TRANSFORMERS:

S No.	PARTICULARS	As required in approved documents / Drawings	As observed	Remark/Deviations
1.	Details of the transformer dismantled for physical verification			
	a) Rating (kVA)			
	b) Sl. No.			
2.	Whether Hot dip galvanized Nuts and Bolts with one spring one plain washer provided for tightening the tank cover.			
3.	Details of Gasket used between top cover and tank Material			
	a) Thickness (mm)			
	b) Type of joints			
4.	Whether core is earthed properly with Cu strip (one end should be tightened in between the core laminations and other end bolted on core clamping channel).			
5.	Connections from winding to bushings (describe the manner in which it has been done)			
	a) HV			
	b) LV			
6.	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)			
7.	Thickness of pressboard (s) provided between HV coils to cover the tie rods			
8.	Whether painted with oil and corrosion resistant paint			
	a) Inside the tank			
	b) Core clamping and core base channels			
	c) Tie rods			
	d) Core bolts			
9.	Whether engraving of Sl. No. and name of firm done on the bottom channel of core coil assembly.			
10.	Whether empire sleeves provided up to the end portion of HV winding jointing to bushing			
11.	HV coils :			

	a) Inner dia. (mm)			
	b) Outer dia. (mm)			
12.	LV coils :			
	c) Inner dia. (mm)			
	d) Outer dia. (mm)			
13.	Core dia.			
14.	Core height including base channel and insulation in between (mm)			
15.	Clearances between			
	a) Core and LV (mm)			
	b) HV and LV (mm)			
	c) Core coil assembly and tank body (mm)			
	I) Length wise			
	II) Width wise			
	d) Top of yoke and top cover (mm)			
16.	Weight of core only (Kg.)			
17.	Weight of windings (Kg.)			
	a) LV			
	b) HV			
18.	Whether core laminations are in one piece, used for			
	a) Bottom yoke			
	b) Top yoke			
19.	Specific remarks regarding smoothness and rusting of core used.			
20.	Volume of oil filled (to be done once against the order)			
	In tank of the transformer			
21.	Weight of transformer (inclusive of all fittings, accessories, oil etc. complete)			
22.	Inner dimensions of the tank			
	a) Height			
	b) Diameter			

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

SIGNATURE OF PURCHASER'S
INSPECTING OFFICER
(Name and designation)

SIGNATURE OF BIDDER'S
REPRESENTATIVE
(Name and designation)

DATE OF INSPECTION: _____

Annexure-III

Source of material/places of manufacture, testing & inspection

S No.	Item	Source of Material	Place of Manufacture	Place of testing and Inspection
1.	Core Laminations			
2.	Aluminium Conductor			
3.	Insulating winding wires			
4.	Transformer Oil			
5.	Press Boards			
6.	Kraft paper			
7.	Tank material			
8.	Gaskets			
9.	Bushing HV/LV			
10.	Paint			
11.	MCCB			