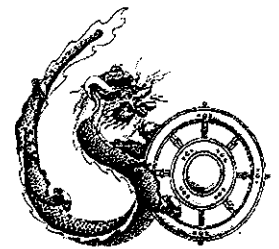




འབྲུག་རྒྱུག་མི་ལས་འཛིན།
Bhutan Power Corporation Limited
Registered Office, Thimphu
Procurement Services Department
Thimphu: Bhutan



BPC/PSD/2018 Materials/2017/16/ 581

August 14, 2017

.....
.....
Subject: Addendum No. 1
Reference: Tender No: BPC/PSD/2018 Materials/2017/16 dated August 02, 2017

Dear Sir(s),

This is with reference to above mentioned tender whereby PSD, BPC would like to issue additional information as given below.

1. Lot 2 (Distribution Transformers)

The quantity for the lots has been changed as additional Transformers have been added. Please find the revised **Technical Specifications, Guaranteed Technical Particulars (GTP) and price schedule** as **Annexure 1, Annexure 2 and Annexure 3** respectively.

However, due to the above inclusion and additional information, no time extension shall be granted and the submission date and time shall remain the same.

Thanking you.

Yours sincerely,


(Drukchu Dorji)
General Manager

Lot 2 (Distribution Transformer)

A. Scope

This Specification covers the design, manufacture, testing and inspection, packing, shipping, delivery, and performance requirements of outdoor 33 kV and 11kV three phase and single phase (two wires) distribution transformers.

Any departure from the provisions of this Specification shall be disclosed in the Schedule of Non-Compliance of this document.

i. Transformer Weights and Special Bracing of Windings

Bidders, please note:

- a) Transformer winding shall be so braced / fitted internally to protect the windings against excessive movement and vibration during transportation and particularly during hand cartage to site.

ii. Standards

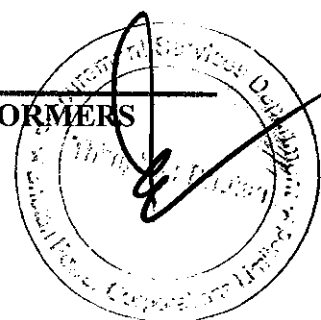
The transformers shall conform to the latest version of the following IEC Standards:

- IEC 60076 Power Transformers.
- IEC 60137 Insulating bushings for alternating voltages above 1000 V.
- IEC 60296 Specification for unused mineral insulating oils for transformers and switchgear.
- IEC 60354 Loading guide for oil-immersed power transformers.
- IEC 60529 Degrees of protection provided by enclosures (IP Code).
- IEC/TR 60616 Terminal and tapping markings for power transformers.

iii. Packing

Transformers shall be crated at the manufacturer's works in a manner entirely suitable for international transport and delivery to the Purchaser's warehouse. Bushings and other parts liable to damage shall be additionally protected. The transformers shall be securely bolted to pallets suitable for handling by forklift. In addition the normal lifting eyes shall be accessible with the crating and pallet in place for handling by slings from a crane.

Each crate shall be clearly marked with the rating and voltage of the transformer, and the total transport weight.



iv.Losses

The fixed (iron) and running (copper) losses shall be as low as possible, consistent with reliability and economical use of materials. The supplier shall provide the guaranteed values of losses in the Schedule of Technical Particulars enclosed with the Bid document.

Maximum losses of the transformer should be as follows:

SL#	DESCRIPTION	Max losses	
		No Load Losses	Load Losses
(A) 11/0.415 kV System			
1	500kVA Transformer	0.850	5.500
2	315kVA Transformer	0.500	3.500
3	250 kVA Transformer	0.450	3.000
4	125 kVA Transformer	0.300	1.700
5	63 kVA Transformer	0.175	1.300
6	25 kVA Transformer	0.070	0.425
(B) 33/0.415 kV System			
1	500 kVA Transformer	0.850	5.500
2	315kVA Transformer	0.560	3.900
3	250 kVA Transformer	0.550	3.500
4	125 kVA Transformer	0.300	1.700
5	63 kVA Transformer	0.175	1.300
6	25 kVA Transformer	0.125	0.425

Bidders are to design the transformer based on the above losses only and no tolerance will be permitted beyond the above values. Those bidders who do not meet the above losses will be rejected.

v. Quality Assurance

The manufacturer must operate a quality assurance system that complies with ISO Series 9000. The Supplier shall provide current certification showing the manufacturers' compliance with ISO Series 9000 or equivalent national standard. The certificate must be issued by an independent, accredited issuing authority.

B. TECHNICAL SPECIFICATIONS

i. General

This specification represents the minimum requirements for the works. The Supplier shall provide equipment, which meets or exceeds these minimum requirements. These items are being sought as additions to existing networks; it is essential to maintain compatibility with existing hardware and line design, as well as with established local work practices and methods.

ii. Tests and Test Certificates

All tests shall be carried out in accordance with IEC 76; routine tests, type tests, if certificates unavailable, as well as any agreed special tests. A satisfactory service history of approximately 5 years is preferred, for all plant items.

iii. Technical Parameters

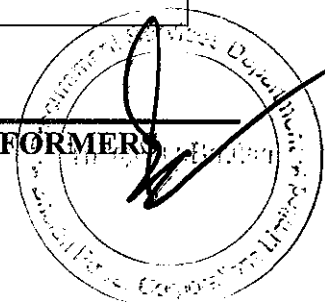
Ratings: The distribution transformers shall have the following ratings:

Three Phase: 11 kV – 25, 63, 125 & 250 kVA.
 33 kV – 25, 63, 125, 250 & 500 kVA

iv. Operating Characteristics

In addition to the common technical requirements specified, the following minimum operating characteristics shall apply to all the distribution transformers covered in this Specification:

Parameter	Requirement
Applicable standard	IS 2026, IEC 60076
Type	Oil filled / two winding
Winding material	Copper
Core Material	CRGO silicon steel
Cooling	Oil natural air natural (ONAN)
Altitude	2400 m
Terminations	
• Primary	Outdoor Bushing or cable box ¹
• Secondary	Outdoor Bushing or Cable box
Rated no load voltage	
• Primary	33 kV or 11 kV
• Secondary	415 V
% Impedance	
25 kVA-630 kVA	4%
Vector group	Dyn11



Section V- Schedule of Supply

Tap changer <ul style="list-style-type: none"> Type Range Step value 	Off load +5% to -5% 2.5%
Insulation Class (IEC-76)	A
Permissible Temperature rise <ul style="list-style-type: none"> Maximum winding temperature Max. Top oil temperature 	55°C 50°C
Insulation levels <ul style="list-style-type: none"> Primary Secondary 	170 kVp-70 kV/75 kVp-28 kV 7500 Vp-3000 V
Min. Clearances between Bushing (Outdoor) <ul style="list-style-type: none"> HV phase to phase/phase to earth LV phase to Phase/phase to earth 	350/320 mm (33 kV), 280/140 mm (11 kV) 25/20 mm
Min. Clearances between Bushing (Indoor) <ul style="list-style-type: none"> HV phase to phase/phase to earth LV phase to Phase/phase to earth 	351/222 mm (33 kV), 130/80 mm (11 kV) 25/20 mm
H.T Bushings <ul style="list-style-type: none"> 12 kV bushings 36 kV bushings 	Conforms to I.S: 3347 Part III(Sec 1&2) Conforms to I.S: 3347 Part V(sec 1&2)
Maximum allowable noise level	As per IEC 551

Note 1: Bushing for pole mount and cable for pad mount as per the specific requirement at site.

v. Construction

The transformers shall be double-wound, oil immersed, naturally cooled (ONAN), oil types either hermetically sealed, or conventional type with tank breathers.

The core shall be constructed from M4 grade cold rolled, non-ageing, grain oriented silicon sheet steel having maximum of 1.11 watt/kg. The primary and secondary windings shall be constructed from super enamelled insulated high conductivity copper. All turns of windings shall be adequately supported top and bottom, to prevent movement. In cases where turns are spaced out, a suitable inter-turn packing shall be provided. The insulation between core and bolts and core and clamps shall withstand 2,000V for one minute.

No material which can be deleteriously affected by the action of oil under the operating conditions of the transformers shall be used in the transformers or leads or bushings.

vi. Transformer Tank and Covers

The transformer tank and covers shall be fabricated from sheet steel and shall be of robust construction. All welds shall be made by the electric arc process. With the exception of radiator elements, all external joints shall be seam welded. Cooling radiators shall be of robust and simple construction.

All matching faces of joints to be made oil tight shall be finished with a smooth surface to ensure that the gasket material will make a satisfactory joint. Bolts shall be spaced at sufficiently close intervals to avoid buckling of either flange or covers and provide reasonably uniform compression of the gasket.

Each transformer shall be provided with a minimum of two closed lifting lugs. The minimum diameter of the hole or width of the slot shall be 25 mm. The two lifting lugs shall be so located that there will be a minimum clearance of 100 mm between the lifting chain and the nearest part of the bushings. Oil conservators are not mandatory, but the bidder must state whether his bid includes or excludes oil conservators. Transformers, other than hermetically sealed types, shall be fitted with oil draining and oil filling gate valves, plus a breather. An oil level sight glass shall be fitted marking the cold oil level.

Transformers 160kVA and below will be mounted on pole platform structures with four 12.5 mm dia bolts spaced 400 mm centre-centre for transformers up to and including 25kVA and spaced 500 mm centre- centre for transformers above 25kVA capacity.

The transformer tank base shall be provided with two steel channels having 14mm dia. holes to allow bolting to pole platforms. The 2 holes on the same channel should be spaced 227 mm centre-centre for transformers up to and including 25kVA and spaced 242 mm centre- centre for transformers above 25kVA capacity.

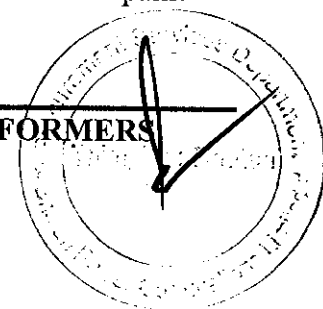
vii. Transformer Sealing

For sealed units, a satisfactory lid sealing gasket shall be provided on each of these transformers to maintain the seal at extremes of operating temperature. A cold oil level mark shall be provided inside each transformer marked C.O.L.

viii. Internal and External Finish

Internal and external tank and radiator surfaces shall be thoroughly cleaned by shot blasting or be given an acid and phosphate dip treatment to remove rust and scale and to provide an adherent, moisture resistant coating. Due care shall be given to avoid over pickling, resulting in pitting or unduly heavy deposit of phosphate. This resultant coating shall provide a surface, which shall offer good paint adhesion and a resistance to corrosion. The interior surfaces of the tank and cover, or conservator; above the lowest oil level shall be given one coat of oil and acid resisting paint, after cleaning.

The exterior surfaces of the complete transformer shall, where appropriate, be protected by a paint system which shall be applied strictly in accordance with the paint



manufacturer's instructions. The system shall consist of not less than two priming coats and two finishing coats of oil and weather resisting paint.

The total thickness of the paint shall be not less than 0.120 mm with a minimum total thickness of priming and finishing paint of 0.06 mm each. Attention shall be paid to the need to achieve adequate coverage at metal edges, where breakdown of the paint film often begins. The paint system and the colour of the final coat shall be dark grey colour.

Attention shall be paid to the need to achieve adequate coverage at metal edges, where breakdown of the paint film often begins.

The paint system and the color of the final coat shall be subject to the approval of the Purchaser and preferably be a dark grey color.

ix. Rating Plate

A stainless steel rating plate, of at least 1 mm thickness, shall be fitted to each transformer and shall carry all the information as specified in the Standards. The rating plate shall be fitted below the LV terminals.

x. Terminal Markings

All transformers shall have the primary and secondary terminal markings plainly and indelibly marked on the transformer adjacent to the relevant terminal.

xi. Tank Marking

Each transformer shall have the kVA rating stencilled on the outside of the tank. The numerals shall be black, 75mm high, and positioned centrally below the HV bushings so as to be readily visible from the ground.

xii. Terminal Leads

Outgoing leads shall be brought out through bushings. The leads shall be such that the core and coils may be removed with the least possible interference with these leads, and they shall be specially supported inside the transformer, to withstand the effects of vibration and handling during transport, hand cartage and short circuits.

xiii. Bushings

All bushings shall be porcelain clad, and shall be sealed to prevent ingress of moisture and to facilitate removal. The neutral bushings and stems shall be identical to those provided for phase terminations. Bushing palms shall be made of brass and have one 14 mm dia. hole.

In case of outdoor bushings, the HV terminals shall be fitted with moulded heat shrinkable insulating covers suitable for 50 mm ACSR 'Rabbit' conductor to provide protection of the bushing palm. The LV bushings shall be in a cable box with suitable glands for cable sizes from 16-150 mm².

xiv. Arching horns

All the transformers shall be equipped with arching horns on HT outdoor bushings.

xv. Earthing Connections

Two earthing connections shall be provided with connection facilities for 25 x 6 mm GI strip. The bolts shall be located on the lower side of the transformer and be of M12 size. Each connection shall be indicated clearly with an engraved 'earth' symbol.

xvi. Gaskets

Gaskets provided with the transformers shall be suitable for making oil tight joints, and there shall be no deleterious effects on either gaskets or oil when the gaskets are continuously in contact with hot oil. Exterior gaskets shall be weatherproof and shall not be affected by strong sunlight/UV. The material for gaskets shall be cork, neoprene or equivalent.

xvii. Drying Out, Filling, Transformer Oil

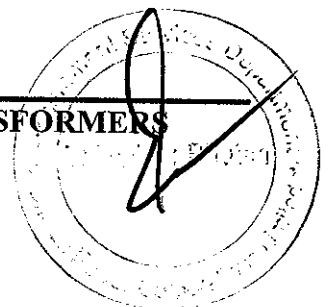
All transformers shall be thoroughly dried out at the manufacturer's works. Oil immersed type transformers shall be delivered filled with oil to normal level, ready for service, except that conservators may be removed for transport.

All transformers shall be filled to the required level with new, unused, clean, standard mineral oil in compliance with BS148/IEC-60296 and shall be free from all traces of polychlorinated biphenyl (PCB) compounds.

xviii. Fittings

The following standard fittings shall be provided:

- Rating and terminal marking plates non-detachable of aluminium material
- Earthing terminals with lugs - 2 Nos.
- Lifting lugs for main tank & top cover
- Pulling lugs - 4 Nos
- HV bushings with arching horns
- LV bushings inside the cable box as per site requirement and neutral bushings (for high rating transformers).



- Metallic conservator tank (mandatory for 50 kVA and above for rated voltage 11 kV and below, and all ratings above 11 kV) with oil gauge
- Terminal connectors on the HV/LV bushings
- Thermometer pocket with cap.
- Air release device (bolted type) for all transformers fitted with conservator tank
- Radiators
- Prismatic oil level gauge
- Drain cum sampling valve
- Oil filling hole having M30 thread with plug and drain valve on the conservator
- Silica gel breather (25 kVA and above for rated voltage 11 kV and below and all ratings above 11 kV). Type of breather (Bolted type is preferred).
- Pressure relief device or explosion vent.
- Metallic off-load tap changer
- Base channel ISMC 75 x 40 mm with M16 bolts and nuts to fix on mounting platform (for pole mounted stations, spacing of the holes to be decided base on pole type (steel tubular / telescopic pole).
- MCCB at LT side inside a cable box for transformers rated 315 kVA and below.
- ACB at LT side inside a cable box for Transformer rated 500kVA.

Transformers 125 kVA and below will be mounted on pole platform structures with four 16 mm dia bolts. The bolts spacing shall be 400 mm centre-centre for transformers up to and including 25 kVA and 500 mm centre- centre for transformers above 25 kVA capacity. The transformer tank base shall be provided with two steel channels to allow bolting to pole platforms. The 2 holes on the same channel should be spaced 227 mm centre-centre for transformers up to and including 25 kVA and spaced 242 mm centre-centre for transformers above 25 kVA capacity.

Pad mounted transformers below 500 kVA shall have skid type under base channels having towing holes for pulling & mounting holes for foundation of transformer. For heavy transformers of 500kVA and above, the under base shall be equipped with rollers allowing the unit to be manoeuvred into final position and then anchored.

xix. Radio Interference

When operated at voltages up to 10% 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 communications.

xx. Packing

Wooden pallets shall be provided for each transformers suitable for international transport and delivery to the Purchaser's warehouse. Bushings and other parts liable to

damage shall be additionally protected. The transformers shall be securely bolted to pallets suitable for handling by forklift. In addition, the normal lifting eyes shall be accessible with handling by slings from a crane.

Providing of crate shall be at the discretion of the supplier. In case, if the crate is provided for protection, then each crate shall be clearly marked with the rating and voltage of the transformer, and the total transport weight.

C. TEST STANDARDS

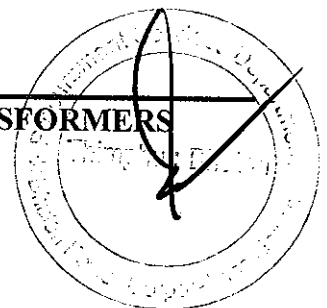
i. Inspection and Testing

The supplier shall carry out a comprehensive inspection and testing program during manufacture of the equipment. An indication of inspection envisaged by the purchaser is given under Clause 3.1.1. This is however not intended to form a comprehensive program as it is supplier's responsibility to draw up and carry out such a program in the form of detailed quality plan duly approved by purchaser for necessary implementation.

ii. Inspection

Tank and Conservator

- a) Certification of chemical analysis and material tests of plates.
- b) Check for flatness.
- c) Electrical interconnection of top and bottom by braided tinned copper flexible.
- d) Welder's qualification and weld procedure.
- e) Testing of electrodes for quality of base materials and coatings.
- f) Inspection of major weld preparation.
- g) Crack detection of major strength weld seams by dye penetration test.
- h) Measurement of film thickness of:
 - Oil insoluble varnish.
 - Zinc chromate paint.
 - Finished coat.
- i) Check correct dimensions between wheels, demonstrate turning of wheels through 90° C and further dimensional check.



- j) Check for physical properties of materials for lifting lugs, jacking pads, etc. All load bearing welds including lifting lug welds shall be subjected to NDT.
- k) Leakage test of the conservator.
- l) Certification of all test results.

iii. Core

- a) Sample testing of core materials for checking specific loss, bend properties, magnetisation characteristics and thickness.
- b) Check on the quality of varnish if used on the stampings :
 - Measurement of thickness and hardness of varnish on stampings.
 - Solvent resistance test to check that varnish does not react in hot oil.
 - Check overall quality of varnish by sampling to ensure uniform shining colour, no bare spots, no over burnt varnish layer and no bubbles on varnished surface.
- c) Check on the amount of burrs.
- d) Bow check on stampings.
- e) Check for the overlapping of stampings. Corners of the sheet are to be part.
- f) Visual and dimensional check during assembly stage.
- g) Check for interlaminar insulation between core sectors before and after pressing.
- h) Check on completed core for measurement of iron loss and check for any hot spot by exciting the core so as to induce the designed value of flux density in the core.
- i) Visual and dimensional checks for straightness and roundness of core, thickness of limbs and suitability of clamps.
- j) High voltage test (2 kV for one minute) between core and clamps.
- k) Certification of all test results.

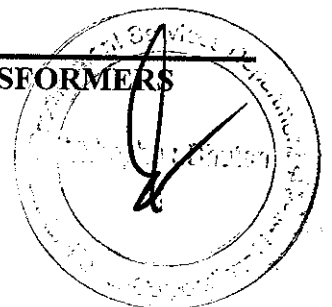
iv. Insulation Material

- a) Sample check for physical properties of materials.
- b) Check for dielectric strength.

- c) Visual and dimensional checks.
- d) Check for the reaction of hot oil on insulating materials.
- e) Dimension stability test at high temperature for insulating material.
- f) Tracking resistance test on insulating material.
- g) Certification of all test results.

v. Winding

- a) Sample check on winding conductor for mechanical properties and electrical conductivity.
 - b) Visual and dimensional checks on conductor for scratches, dent marks etc.
 - c) Sample check on insulating paper for pH value, bursting strength and electric strength.
 - d) Check for the reaction of hot oil on insulating paper.
 - e) Check for the bonding of the insulating paper with conductor.
 - f) Check and ensure that physical condition of all materials taken for windings is satisfactory and free of dust.
 - g) Check for absence of short circuit between parallel strands.
 - h) Check for brazed joints wherever applicable.
 - i) Measurement of voltage ratio to be carried out when core/yoke is completely restacked and all connections are ready.
 - j) Conductor enamel test for checking of cracks, leakage and pin holes.
 - k) Conductor flexibility test.
 - l) Heat shrink test for enamelled wire.
 - m) Certification of all test results.
- vi. Checks before Drying Process**
- a) Check condition of insulation on the conductor and between the windings.



- b) Check insulation distance between high voltage connections, cables and earth and other live parts.
- c) Check insulating distances between low voltage connections and earth and other parts.
- d) Insulation of core shall be tested at 2 kV/minute between core to bolts and core to clamp plates.
- e) Check for proper cleanliness and absence of dust etc.
- f) Certification of all test results.

vii. Checks during Drying Process

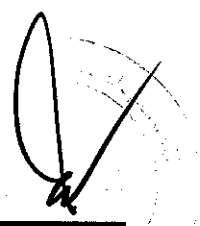
- a) Measurement and recording of temperature, vacuum and drying time during vacuum treatment.
- b) Check for completeness of drying by periodic monitoring of IR and Tan delta.
- c) Certification of all test results.

viii. Assembled Transformer

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

ix. Bought Out Items

- a) The makes of all major bought out items shall be subject to Purchaser's approval.
- b) The Contractor shall also prepare a comprehensive inspection and testing programme for all bought out/sub-contracted items and shall submit the same to the Employer for approval. Such programme shall include the following components:
 - Buchholz Relay.
 - Axles and wheels.
 - Winding temperature indicators for local and remote mounting.



- Oil temperature indicators.
- Bushings.
- Bushing current transformers.
- Cooler control cabinet.
- Cooling equipment.
- Oil pumps.
- Fans/Air Blowers
- Tap change gear.
- Terminal connectors.

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

x. Factory Tests

Routine Tests

All standard routine tests in accordance with IS:2026 with dielectric tests corresponding to Method 2 shall be carried out on each transformer. Operation and dielectric testing of OLTC shall all be carried out as per IS:2026.

Following additional routine tests shall also be carried out on each transformer:

a) Magnetic Circuit Test

After assembly each core shall be tested for 1 minute at 2000 Volts between all bolts, side plates and structural steel work.

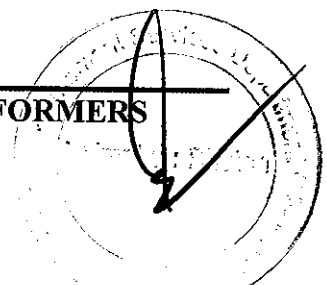
b) Oil leakage test on transformer tank as per Clause 3.2.7 below.

c) Magnetic balance test

d) Measurement of no-load current with 415V, 50 Hz AC supply on LV side.

e) Frequency response analysis (FRA)

f) Noise level test



g) Heat run test

g) Pressure test

xi. Type Tests

Following type tests shall be conducted on one Transformer of each rating:

a) Temp. Rise Test as per IS:2026 (Part-II)

Gas chromatographic analysis on oil shall also be conducted before and after this test and the values shall be recorded in the test report. The sampling shall be in accordance with IEC 567. For the evaluation of the gas analysis in temperature rise test the procedure shall be as per IS:9434 (based on IEC:567) and results will be interpreted as per IS:10593 (based on IEC -599).

The temperature rise test shall be conducted at a tap for the worst combination of loading on the three windings of the transformer. The supplier before carrying out such test shall submit detailed calculations showing alternatives possible, on various taps and for the three types of ratings of the transformer and shall recommend the combination that results in highest temperature rise for the test.

b) Tank vacuum Test as per Clause No. 3.2.7 (i) below.

c) Tank pressure Test as per Clause No. 3.2.7 (ii) below.

d) Pressure Relief Device Test.

The pressure relief device of each size shall be subjected to increase in oil pressure. It shall operate before reaching the test pressure specified in transformer tank pressure test at Clause No. 3.2.7 (ii) below. The operating pressure shall be recorded. The device shall seal off after excess pressure has been released.

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

f) Lightning Impulse withstand test in all phases as per IS: 2026 (As type test, only for 220 kV class & below)

xii. Additional type tests

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

a) Measurement of zero Seq. reactance (As per IS:2026, for 3-phase transformer only.)



- b) Measurement of acoustic noise level.
- c) Measurement of power taken by fans and oil pumps.
- d) Measurement of harmonic level in no load current.
- e) One cooler control cabinet of each type shall be tested for IP:55 protection in accordance with IS:13947.
- f) Measurement of transferred surge on LV (tertiary) winding due to HV lightning impulse and IV lightning impulse.
- g) High voltage withstand test shall be performed on auxiliary equipment and wiring after complete assembly.

xiii. Routine tests on bushings

The following tests shall be conducted on bushings

- a) Test for leakage on internal fillings.
- b) Measurement of creepage distance, dielectric dissipation factor and capacitance.
- c) Dry power frequency test on terminal and tapping.
- d) Partial discharge test followed by dielectric dissipation factor and capacitance measurement.

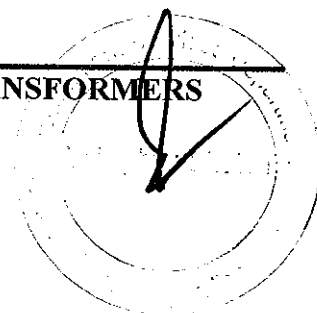
xiv. Tank Tests

- a) Routine Tests

Oil Leakage Test

All tanks and oil filled compartments shall be tested for oil tightness by being completely filled with air or oil of a viscosity not greater than that of insulating oil conforming to IS:335 at the ambient temperature and applying a pressure equal to the normal pressure plus 35 KN/Sq.m (5 psi) measured at the base of the tank. The pressure shall be maintained for a period of not less than 12 hours for oil and one hour for air during which time no leak shall occur.

- b) Type Tests
 - i. Vacuum Test



Section V- Schedule of Supply

Where required by the purchaser one transformer tank of each size shall be subjected to the specified vacuum. The tank designed for full vacuum shall be tested at an internal pressure of 3.33 KN/Sq.m absolute (25 torr) for one hour. The permanent deflection of flat plate after the vacuum has been released shall not exceed the values specified below:

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

ii. Pressure Test

One transformer tank of each size, its radiator, conservator vessel and other fittings together or separately shall be subjected to a pressure corresponding to twice the normal head of oil or to the normal pressure plus 35 KN/m² whichever is lower measured at the base of the tank and maintained for one hour. The permanent deflection of flat plates after the excess pressure has been released shall not exceed the figure specified above for vacuum test.

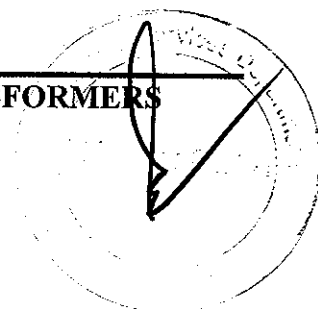
xv. Pre-shipment Checks at Manufacturer's Works

- a) Check for interchangeability of components of similar transformers for mounting dimensions.
- b) Check for proper packing and preservation of accessories like radiators, bushings, dehydrating breather, rollers, buchholz relay, fans, control cubicle, connecting pipes, conservator etc.
- e) Check for proper provision for bracing to arrest the movement of core and winding assembly inside the tank.

- f) Gas tightness test to confirm tightness.
- e) Derivation of leakage rate and ensure the adequate reserve gas capacity.

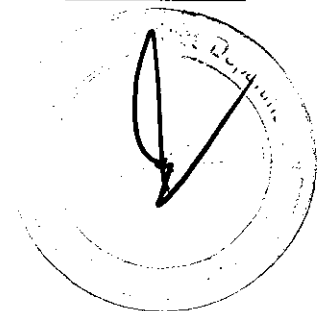
xvi. Note

- a) Accuracy class PS as per IS:20705
- b) Class (for the relevant protection and duties) as per IEC 185.



Annex-2
Guaranteed Technical Particulars for Distribution Transformers
Restricted Brands: Marson, Kanohar, Nucon, Kotsons, NEEK, Uttam Bharat, Universal Power Transformer, Kirloskar, PT
Trafoindo, Schnedier Electric Infrastructure Limited.

Sl.No.	Particulars	Unit	11/0.415 kV, 500 kVA	11/0.415 kV, 315 kVA	11/0.415 kV, 250 kVA	11/0.415 kV, 125 kVA	11/0.415 kV, 63 kVA	11/0.415 kV, 25 kVA	
1	Country of Manufacture								
2	Manufacturer's Type No.								
3	Applicable Standards								
4	Rated Power Output	kVA							
5	Number of Phases								
6	Rated frequency	Hz							
7	Rated Primary Voltage	kV							
8	Rated Secondary Voltage	kV							
9	Vector Group								
10	Off-Load Tapings, Primary	%							
11	Ambient temperature	°C							
12	Temperature Rise in	°C							
	- Winding								
	- Top oil								
	- Core								
13	Applied Test Voltage 1 min, 50Hz	kV							
	- Primary winding								
	- Secondary winding								
14	Impulse Test Voltage Full wave, primary winding	kV							
15	No Load Losses	kW							
16	Load Losses	kW							
17	Impedance Voltage								
18	No Load Current								
19	Terminal Bolts								
	- material								
	-diameter, primary side	mm							
	- diameter, secondary side	mm							
20	Material of Windings								
	High voltage								
	Low voltage								
21	Mass of transformer	kg							
	Total mass								
	Mass of oil								
	Un-tanked mass								



Sl. No.	Particulars	33/0.415 kV, 500 kVA	33/0.415 kV, 315 kVA	33/0.415 kV, 250 kVA	33/0.415 kV, 125 kVA	33/0.415 kV, 63 kVA	33/0.415 kV, 25 kVA
1	Country of Manufacture						
2	Manufacturer's Type No.						
3	Applicable Standards						
4	Rated Power Output						
5	Number of Phases						
6	Rated frequency						
7	Rated Primary Voltage						
8	Rated Secondary Voltage						
9	Vector Group						
10	Off-Load Tapings, Primary						
11	Ambient temperature						
12	Temperature Rise in						
	- Winding						
	- Top oil						
	- Core						
13	Applied Test Voltage 1 min, 50Hz						
	- Primary winding						
	- Secondary winding						
14	Impulse Test Voltage Full wave, primary winding						
15	No Load Losses						
16	Load Losses						
17	Impedance Voltage						
18	No Load Current						
19	Terminal Bolts						
	- material						
	- diameter, primary side						
	- diameter, secondary side						
20	Material of Windings						
	High voltage						
	Low voltage						
21	Mass of transformer						
	Total mass						
	Mass of oil						
	Un-tanked mass						

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**Price Schedule
Lot 2 (Distribution Transformers)**

Restricted Brands: Marson, Kanohar, Nucon, Kotsons, NEEK, Uttam Bharat, Universal Power Transformer, Kirloskar, PT Trafoindo, Schneider Electric Infrastructure Limited.

Sl. No.	Description of goods	UoM	Qty	Brand & Country of Origin	Unit Price DDP (Nu.)	Total Price DDP (Nu.)
1	Distribution Transformer 25kVA, 11/0.415kV	SET	1			
2	Distribution Transformer 63kVA, 11/0.415kV	SET	6			
3	Distribution Transformer 125kVA, 11/0.415kV	SET	7			
4	Distribution Transformer 250kVA, 11/0.415kV	SET	4			
5	Distribution Transformer 315kVA, 11/0.415kV	SET	2			
6	Distribution Transformer 500kVA, 11/0.415kV	SET	2			
7	Distribution Transformer 25kVA, 33/0.415kV	SET	1			
8	Distribution Transformer 63kVA, 33/0.415kV	SET	10			
9	Distribution Transformer 125kVA, 33/0.415kV	SET	11			
10	Distribution Transformer 250kVA, 33/0.415kV	SET	5			
11	Distribution Transformer 315kVA, 33/0.415kV	SET	2			
12	Distribution Transformer 500kVA, 33/0.415kV	SET	3			
Total Amount (Nu.)						