

By Regd. Post with Ack. Due.



NORTHERN POWER DISTRIBUTION COMPANY OF TELANGANA LTD
WARANGAL – 506 001.

(PURCHASE ORDER)

Phones: 0870-2461507.

Fax : 0870-2461519.

From

The Chief General Manager / P&MM,
2-5-31/2, 1st Floor, Vidyuth Bhavan,
T.S.N.P.D.C.L, Corporate Office,
Nakkalagutta, Hanamkonda,
Warangal – 506 001.

GSTIN No. 36AABCN2875L321.

Phone: 040-27807640

Fax:- 040-39120023

To

M/s Trinity Transformers
Private Limited, 9-1-83 &84,
Amarchand Sharma Complex
SD Road,
Secunderabad - 500003

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P.O.No.CGM/P&MM/NPDCL/Wgl./GM/DE-2/A3/PM-5484/17, Dt.26-02-18

Dear Sir,

Sub : TSNPDCL – P&MM Wing - Tender Specification No. OT-73/17-18 for procurement of **321 Nos.** 11KV/433–250V, 3-Phase 100 KVA Amorphous/CRGO/Core CSP Type Aluminum Conductor Distribution Transformers with BIS Energy Efficiency Level-3 (Star-2) for **IPDS Scheme** – Purchase Order - Issued–Reg.

Ref : 1. Tender specification No. OT-73/2017-18.
2. Lr.No.CGM/P&MM/NPDCL/Wgl/GM/DE-2/A3/OT-73/17-18/
D. No.5250/17, Dt.21-02-2018.
3. Firm's acceptance letter Dt. 23.02.18, received on Dt.23-02-18.

1. ACCEPTANCE : I acting for and on behalf of and by the order and direction of the TSNPDCL, accept the rates for supply of 11KV/433–250V, 3-Phase 100 KVA Amorphous/CRGO/Core CSP Type Aluminum Conductor Distribution Transformers with BIS Energy Efficiency Level-3 (Star-2) for **IPDS Scheme** with guaranteed losses as per Clause-5.0, Schedule of Material and as per the above cited correspondence subject to the following terms and conditions.

2. PRICES : The prices noted are variable and free at a destination stores inclusive of Freight & Insurance, SGST@9% & CGST@9%.The unloading charges at destination stores shall be to TSNPDCL's account. The prices are variable as per IEEMA price variation formula as given below with base date as **01-11-2017** with ceiling limit of 30% on positive side and there is no limit on negative side.

Cost of CSP component is **Rs. 3865.00/-** which is included in Ex-works and is a firm price.

$$P = \frac{P_0}{100} \left\{ 10 + 19 \frac{AL}{AL_0} + 30 \frac{ES}{ES_0} + 13 \frac{FE}{FE_0} + 4 \frac{IM}{IM_0} + 11 \frac{TO}{TO_0} + 13 \frac{W}{W_0} \right\}$$

Any variation up or down in the existing statutory levies or other new levies introduced after placing of the orders under this specification shall be to the TSNPDCL account provided that the delivery schedules are adhered to by the supplier. If there is increase in the GST other new levies for the material supplied after the agreed delivery schedule the supplier shall bear the impact of those levies and if there is down ward variation revision TSNPDCL shall be given credit to that extent.

The date of delivery for the purpose of price variation, shall be the date of which the Distribution Transformers is notified as being ready for inspection/despatch (in the absence of such notification, the date of manufacturers despatch note shall be considered as the date of delivery) or the contracted delivery date (including any agreed extension thereto) (or) actual date of delivery, whichever is advantageous to purchaser for supplies made beyond schedule delivery date. For material deliveries before the schedule delivery date, the prices shall be as per the IEEMA PVC Clause (on TSNPDCL request for early supplies in writing).

As far as practicable, prices will be revised (upward or downward) abinitio, to take care to any variation in price of raw materials as defined above, but if for any reason it is not found to be practicable, the deliveries shall be effected at the contracted price and price variation claimed subsequently through a supplementary bill which will be paid as per the purchase order terms after approval by this office. If any time, any documentary evidence proof or certificate in regard to the price variation bill is required by this office the supplier shall have to furnish the same.

The price variation bills shall be claimed separately which will be paid after approval of the same by this office and after adjustment of recoveries, if any, intimated by field officers. You shall claim only the prices as indicated in the purchase order in your regular bills.

If there is downward revision in the prices of materials at the time of supply, the suppliers shall invariably claim the invoices at reduced rates on account of such downward revision.

3. SCHEDULE OF MATERIALS :

Sl. No.	Description	Qty. in Nos.	FADS Rate per Unit in		Amount		
			Rs.	Ps.	Rs.	Ps.	
1	11KV/433 - 250V 100 KVA CSP oil immersed naturally cooled three phase, 50 Hz double wound, CRGO Core/ Amorphous Core Aluminum Winding, outdoor type, BIS Energy Efficiency Level-3 Distribution Transformers top cover fixed with nut and bolt and neoprene continuous gasket arrangement generally conforming to IS-1180 (Part-I) : 2014 and IS-2026/1977 latest versions except where specified otherwise with first filling of oil generally as per IS-335/1983 (latest version) and as per specification. <u>Guaranteed Maximum Losses</u> Total loss at 50% loading : 435 watts Total loss at 100% loading at 75 deg centigrade : 1500 watts	321	Ex Works : 1,03,307.00		3,94,38,464.46		
			F&I : 812.72				
			SGST@9% : 9,370.77				
			CGST@9% : 9,370.77				
			Total Cost : 1,22,861.26				
TOTAL		321			3,94,38,464.46		
(Rupees Three Crores Ninety Four Lakhs Thirty Eight Thousand Four Hundred and Sixty Four and Forty Six Paise Only)							

NOTE:-

- The above transformers are guaranteed for a period of five years from the date of receipt of material at destination stores.
- 3 sets of drawings, guaranteed technical particulars, additional details and Source of materials shall be submitted within 15 days of receipt of purchase order and all other particulars mentioned in the list of fittings.
- You are requested to submit the type test reports and BIS certificate before commencement of supplies.

4. DELIVERY :

The delivery of the transformers shall commence and complete as shown below.

Date	Qty. in Nos. (IPDS Works)
15.04.2018	100
15.05.2018	100
15.06.2018	121
Total	321

However, you are requested to advance and improve the quantity to be delivered.

Delay in delivery of materials free at destination stores due to non-availability of transport facility and any such reasons will not be considered. It is the responsibility of the supplier to make alternate arrangements for transporting the material so as to see the materials reaches the destination within the stipulated period.

The TSNPDCL shall have the right to vary the delivery schedule mentioned in this purchase order due to any operational exigencies at any time during the execution of the order by the suppliers, after due notice.

The TSNPDCL shall have the right to increase or decrease the quantity by 50% at any time during the execution of the order.

5. LOSSES :

The total losses (includes no- load & load losses) at 50% and 100% loading equivalent to BIS Energy Efficiency Level-2 shall not exceed the values at rated voltage and rated frequency permitted at 75 Deg.C are indicated below.

KVA Rating	Voltage ratio	Max. Losses @ 50% load, Watts	Max. Losses @ 100% load, Watts
100	11000/433 V	435	1500

The above losses are maximum allowable and there would not be any positive tolerance. Firm has to supply the transformer as per no load losses, load losses and Maximum losses at 50% and 100% as mentioned in GTP.

6. PENALTY FOR EXCESSIVE LOSSES: (During Guarantee period).

During testing at supplier's works if it is found that the actual measured losses are more than the values quoted by the bidder, the purchaser shall reject the transformer and he shall also have the right to reject the complete lot.

Purchaser shall reject the entire lot during the test at supplier's works, if the temperature rise exceeds the specified values.

Purchaser shall reject any transformer during the test at supplier's works, if the impedance values differ from the guaranteed values including tolerance

7 DESIGN & CONSTRUCTION :

7.1 CORE : AMORPHOUS METAL:

a). The core shall be high quality Amorphous ribbons having very low loss formed into wound cores of rectangular shape, bolted together to the frames firmly to prevent vibration or noise. The complete design of core must ensure permanency of the core loss with continuous working of the transformers. The value of the flux density allowed in the design shall be clearly stated in the offer. Curve showing the properties of the metal shall be attached with the offer.

b) Core Clamping – Amorphous Metal and CRGO wound core Transformers.

1. Core clamping shall be with top and bottom U-shaped core clamps made of sheet steel clamped with MS tie rods for efficient clamping.
2. MS core clamps shall be painted with varnish or hot oil resistant paint
3. Suitable provision shall be made in the bottom core clamp / bottom plate of the transformer to Arrest movement of the active part.

c) The transformer core shall be suitable for over fluxing (due to combined effect of voltage and frequency upto 12.5% without injurious heating at full load conditions and shall not get saturated. The Bidder shall furnish necessary design data in support of this situation.

d) Flux density should not be more than 1.38 Tesla for Amorphous core. No load current shall not exceed 3% of full load current and will be measured by energizing the transformer at 433 volts 50 c/s on the secondary. Increase of voltage of 433 volts by 12.5% shall not increase the no load current disproportionately high and shall not exceed i.e., 5%. Test for magnetic balance by connecting the LV phase by phase to rated phase voltage and measurement of an, bn, cn voltage will be carried out.

The bidder should offer the core for inspection and approval by the purchaser during manufacturing stage. Bidder shall give note for inspection with the following documents as applicable as a proof of towards use of prime core material.

1. Invoices of supplier
2. Mill's test certificate
3. Packing list.
4. Bill of landing
5. Bill of entry certificate by custom
6. Description of material, electrical analysis, Physical inspection, certificate for surface defects, thickness and width of the material.

Subjecting to at least 10% of the transformers to routine tests and no load and load loss measurement

It is note that, using seconds /defective CRGO sheets or Load losses found to be more than stipulated limit, heavy penalty will be imposed or the suppliers will be black listed.

7.2. WINDINGS:

Material: Double paper covered insulated electrolytic Aluminum conductor shall be used.

- a) Current density for HV and LV should not be more than 1.6 A/sq.mm
- b) All delta leads from the HT Coils as well as HT line leads should be taken out through DPC covered copper wires of sufficient cross sectional area, to impart the desired strength. The current density in HV lead wires shall not exceed 0.8 A/ Sq.mm.
- c) L.V winding shall be in even layers so that neutral formation will be at top.

- d) Vertical ducts and spacers shall be provided within each coil for HV & LV windings. Dovetail spacers are not applicable in case of wound core construction, since it has a single coil. However, ducts shall be provided as per specification.
- e) Wedges of 3 mm shall be provided at 50% of the HV coil and LV coils in all types of transformers.
- f) The no. of HV coil for HV winding is **one/multi coils** for stacked core and one for wound core /amorphous core transformers.
- g) Proper binding of inter layer insulation with the conductors shall be ensured. Test for binding strength conducted.
- h) Dimensions of winding coils are very critical. Dimension tolerance for winding coils shall be within limits **(+5%** and no negative tolerance).
- i) Inter layer insulation shall be *Epoxy dotted paper. Minimum 2 Nos. of 2 mil Epoxy Dotted papers are to be used for interlayer insulation in HV & LV winding.*
- j) Formation of Delta on HV side shall be with 13 SWG super enameled copper wire with multi layered (not less than 13 layers) paper insulation. Necessary resin bonded paper insulation tubes or bakelite bits may be used through. This shall be done with ferrules and crimping/brazing.
- k) The HT jumpers from winding to the HT bushing (fuse link) inside the transformer should be provided with lugs to bolts and nuts. The jumper wires should pass through resin bonded paper cylinders and fiberglass sleeves.
- l) The star point shall be done with and aluminum ferrules and crimping.
- m) The Un-balanced current i.e., current flowing in neutral during Short Circuit test at full load current shall not be more than 2% of the full load current.
- n) All the sleeves used in construction shall be fibre glass material.
- o) No tapping shall be provided upto 100 KVA.

7.2.1. **Percentage Impedance :**

The percentage impedance at rated frequency is 4.5% (subject to tolerance as per IS:2026)

7.2.2. **Temperature Rise :**

Temperature rise over ambient of 50 deg. C shall not exceed the limits described below.

Top oil temp. rise measured by thermometer	:	35 Deg. C
Winding temp. rise measured by resistance	:	40 Deg. C

Bid not meeting the limits of temperature rise will be treated as non responsive.

7.3 INSULATION MATERIAL & CLEARANCES :

- a. Materials: Electrical grade insulation epoxy dotted Kraft paper of standard make or better material subject to approval of the purchaser. Press Board of standard make or better material and subject to approval of purchaser. Inter layer insulation shall be Epoxy dotted paper.
- b. All spacers, axial wedges/runners used in windings shall be made of pre-compressed Pressboard- solid, conforming to type B 3.1 of IEC 641-3-2. All spacers shall be properly sheared and dovetail punched to ensure proper locking. All axial wedges/ runners shall be properly milled to dovetail shape so that they pass through the designed spacers freely. Insulation shearing, cutting milling and punching operations shall be carried out in such a way, that there should not be any burr and dimensional variations.

7.4 CLEARANCES : The clearances for the core shall be maintained as specified in the tender specification.

7.5. TANK : Circular cross section cooling tubes of not less than 38 mm dia and 1.25 mm thick bent & directly Welded to tank shall be provided. OR The radiators can be Press fin type of 1.2mmthickness to achieve the desired cooling to limit the specified temperature rise. They should be fixed at right angles to the sides and not diagonally. The transformer shall be capable of giving continuous rated output without exceeding the specified temperature rise. The size of the radiator shall be such that it covers at least 50% of the bottom yoke, full core and complete top yoke. Supplier shall submit the calculation sheet. The bidder may offer corrugated tanks for transformers of all ratings

7.5.1. The transformer tank shall be of robust construction rectangular in shape and shall be built up of tested MS sheets with the tolerance applicable as per IS:1852.

- | | | | |
|------|-----------------------------|---|--------------------|
| i) | Side walls (min) | : | 3.15 mm thickness. |
| ii) | Top and bottom plates (min) | : | 5.0 mm thickness. |
| iii) | Bottom plates (Min.) | : | 5 mm thickness. |

7.5.2. The internal clearance of tank shall be such that, it shall facilitate easy lifting of core with coils from the tank without dismantling LV bushings. The four walls of the tank shall be made of TWO "L" shaped sheets (without joints)/**ONE 'U' shaped bend sheet (without joints) and one flat sheet** fully welded at the corners from inside and outside of the tank. Two sides corner shall be welded for withstanding a pressure of 1Kg/Sq.cm for 10 minutes.

Tanks with corrugations shall be tested for leakage test at a pressure of 0.15kg/ sq cm measured at the top of the tank.

All the tank plates shall be of such strength that the complete transformer with oil and fittings can be lifted bodily by means of lifting lugs provided.

7.5.3. All joints of tank and fittings shall be oil tight and no bulging should occur during service. The tank design shall be such that the core and windings can be lifted freely. The tank plate shall be of such strength that the complete transformer when filled with oil may be lifted bodily by means of lifting lugs provided. Inside of tank shall be painted with *hot oil proof paint*.

- 7.5.4. Manufacturer should carry out all welding operations as per the relevant ASME standards and submit a copy of the welding procedure qualifications and welder performance qualification certificate to the customer.
- 7.5.5. The tank shall be reinforced by welded angle (40x40x5 mm) on all the outside wall on the edge of the tank. Permanent deflection when the tank without oil is subject to a vacuum of 760 mm of mercury shall not be more than 5 mm up to 750 mm length and 6 mm up to 11000 mm length. The tank shall further be capable of withstanding a pressure of 0.8 kg/sq.cm (g) and a vacuum of 0.3 kg/sq.cm (g) without any deformation.
- 7.5.6 Pressure test will be conducted by the inspecting officer on a transformer vent pipe against each lot offered for inspection. The diaphragm should burst at a pressure between 0.76Kg./Sq.mm to 0.95Kg./Sq.mm. For any operational failure of vent pipe and consequent damaged to the tank in addition to insisting for free replacement of the tank, the TSNPDCL may at its option, recover an estimated loss sustained by it from the manufacturer.
- 7.5.7 The transformer tank top cover shall be fixed with M12/M14 bolts (hot dip galvanized/stainless steel) as per IS 1180 (Part-1) : 2014 spaced not more than 100 mm between each bolt. 4Nos. anti theft stainless fasteners with breakthrough shall be provided at top cover and suitable continuous neoprene gasket (Rectangular) to avoid leakage of Nitrogen/dry air and all the fittings including bushings in position shall be tested for leakage at a pressure of 0.7Kg./Sq.cm inside the tank for 10 minutes. The above test shall be carried out before final sealing of the transformers.
- 7.5.8. The cooling tubes shall not be provided underneath the LV bushing to avoid puncturing of the tubes due to falling down of LV lead on them. Heat Dissipation calculation shall be furnished with respect to the maximum 100% load losses specified to the corresponding BIS Energy Efficiency Level-2.
- 7.5.9. **Lifting Lugs** : 2 Nos. welded heavy duty lifting lugs of MS plate 8 mm thick suitably reinforced by vertical supporting flat welded edgewise below the lug on the side wall.
- 7.5.10 The Sealing** : The supplier shall provide seals to four corners of the distribution transformers. The space on the top of the oil shall be filled with dry air. The dry air plus oil volume inside the tank shall be such that even under extreme operating conditions, the pressure generated inside the tank does not exceed 0.406 Kg/Sq.cm positive or negative. The volume of space above oil level shall normally be not less in volume than 55% of the volume of oil. The nitrogen/dry air shall conform to commercial grade of the relevant standard.
- 'U' shaped pressure relief vent of 2" diameter pipe with 0.025mm copper shim sheet /0.4 mm Bakelite thick sheet as diaphragm shall be provided on the top of the cover of the tank such that the pressure released should be directed to the ground. The vent shall be provided on opposite side of the circuit breaker operating rod. The other end of the vent pipe shall be guarded with wire mesh for preventing the entry of worms and nesting. The diaphragm shall burst at a pressure of 0.76 to 0.95 kg/sq.cm. Conservator shall not be provided for these transformers.

7.5.11 Manufacturer has to emboss his company monogram and the word "IPDS/TSNPDCL" shall be embossed on the side sheet of the Tank above rating & diagram plate. The size of the embossing of the word "TSNPDCL" is of 2 Inches. The following information shall also be embossed on a separate MS sheet of thickness 2mm and firmly welded (No Tack welding) on one side of the transformer. The size of the word is of 1" inch. a) P.O. No. & Date, b) Year of manufacture c) Make and Serial No. d) 5 years Guarantee period.

7.6. **SURFACE, PREPARATION AND PAINTING** : Shall be maintained as specified in the tender specification .

7.6.1 The painted surface shall pass the Cross Hatch Adhesion test, Salt spray test and hardness test as per the relevant ASTM standards.

7.7. FINISHING:

The exterior of the transformer and other ferrous fittings shall be thoroughly cleaned, scraped and given a primary coat and the two finishing coats of durable oil and weather resisting paint of polyurethane. The colour of the finishing coats shall be Air Craft Blue Colour conforming to Paint Shade No. 108 of IS-5 for finishing coats.

7.7.1. Painting procedure: As per specification

7.8. **BUSHINGS:** Shall be maintained as specified in the tender specification. The bushings shall conform to the relevant standards specified and shall be outdoor. The bushing rods and nuts shall be made of brass material 12 mm diameter for both HT & LT. The bushings shall be fixed to the transformers on sides with straight/slant pockets and in the same plane. The tests as per IS:2099/1962 shall be conducted on the transformer bushings as detailed below.

- i) Dry flashover voltage.
- ii) Wet flashover voltage.
- iii) Dry 1 min. withstand voltage.
- iv) Wet 1 min. withstand voltage.
- v) Impulse withstand voltage (1.2/50 micro sec. Positive wave).

7.9 Terminal Connectors:

The L V bushing and HV busing stems shall be provided with suitable terminal connectors so as to connect the jumper without disturbing the bushing stem. Connectors shall be with eye bolts so as to receive 55 sq.mm conductor for HV Terminal connectors must have type tested as per IS:5561.

7.10 Rating Plates:

The rating plates on the transformer containing the information specified in clause 15.2 of IS : 2026-1977 (Part-i). 50% & 100% load losses of the transformer should also be mentioned on the rating plate.

ISI Labeling: ISI label in accordance with colour design, logo etc., shall be provided on each transformer as per the design/recommendations of Bureau of Indian standards (BIS). Expenses incurred to get star rating labeling is in the account of suppliers only. The certificate of registration issued by BIS shall be submitted.

7.11. Arcing Horns : As per IS standards

7.12. FITTINGS : The following standard fittings shall be provided.

- a) Rating and terminal marking plates non detachable -1No.
- b) Earthing terminals with bolt, nuts & washers for connecting earth wire - 2Nos.

- c) Lifting lugs – 2 Nos. for main tank and 2Nos. for top cover
- d) Bimetallic terminal connectors on the HV/LV bushings – 7 Nos.
- e) Thermometer pocket with cap – 1 No.
- f) U shaped Pressure relief vent pipe of 2' dia with 0.0025 mm diaphragm on the tope of the top cover for breaking at a pressure of 0.76 to 0.95 Kg/cm² such that the pressure released should be directed to the ground and other end of the vent pipe shall be guarded with suitable mesh against entering of worm and resting. For corrugated tank, PRD will be provided instead of explosion vent.
- g) HV bushings – 3 Nos.
- h) LV bushings – 4 Nos.
- i) Stiffener angle 40x40x5 mm (and vertical strip of 50x5 mm flat if required).
- j) Cooling tubes – No. & lengths may be mentioned (as per heat dissipation calculations).
- k) Arcing Horns
 - l) Base channels 75 x 40 mm.
- m) LV epoxy bushings – 4 Nos.
- n) HT fuse links.
- o) indicating lamp.
- p) Circuit breaker operating mechanism.
- q) 5 year guarantee embossed plate with details welded below name plate.
- r) Oil level gauge indicating oil level at minimum 30 deg C
- s) Tank and over all dimensions.
- t) Weight content of a) core b) windings c) tank & fittings d) weight/qty. of oil e) over all weight.

7.13. FASTENERS:

All bolts, studs, screw threads, pipe threads, bolt heads and nuts shall comply with the appropriate Indian Standards for metric threads, or the technical equivalent. Bolts or studs shall not be less than 6 mm in diameter except when used for small wiring terminals. All nuts and pins shall be adequately locked. Wherever possible bolts shall be fitted in such a manner that in the event of failure of locking resulting in the nuts working loose and falling off, the bolt will remain in position. All ferrous bolts, nuts and washers placed in outdoor positions shall be treated to prevent corrosion, by hot dip galvanizing, except high tensile steel bolts and spring washers which shall be electro-galvanized/plated. Appropriate precautions shall be taken to prevent electrolytic action between dissimilar metals. Each bolt or stud shall project at least one thread but not more than three threads through the nut, except when otherwise approved for terminal board studs or relay stems. If bolts 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. Taper washers shall be provided where necessary.

7.14. MOUNTING ARRANGEMENT : The under base of all transformers shall be provided with two 75 x 40mm channels 460 mm long with holes to make them suitable for fixing on a platform or plinth.

7.15 OVER LOAD CAPACITY: The transformers shall be suitable for loading as per relevant standard (IS 2026(Part-7)). The tendered should state clearly the percentage overload the transformers can take for a continuous period of 1 hour.

8.0. TESTS:

8.1 ACCEPTANCE & ROUTINE TESTS : All transformers shall be subjected to routine tests at the manufacturer's works. The following routine tests shall be carried out in accordance with the details specified in *REC Specification No: 23/1983*, IS: 1180 (Part-II) and IS:2026 or as agreed upon between the TSNPDCL and the manufacturer.

1. *Checking of weights, dimensions fitting and accessories, tank thickness, oil qty., material, finish and workmanship as per purchaser order and contract drawings.*
2. *Physical verification of core coil assembly and measurement of flux density of one unit of each rating, in every inspection with reference to short circuit test report.*
3. Measurement of winding resistance
4. Measurement of voltage ratio, *polarity* and check of voltage vector relationship
5. Measurement of Impedance voltage, \neq short circuit impedance and load loss *at rated current and normal frequency.*
6. Measurement of No Load loss and current at service voltage and normal frequency.
7. *Measurement of No load current and losses at 112.5% of rated voltage.*
8. Measurement of Insulation resistance
9. Induced of over voltage with stand test
10. Separate source voltage withstand test
11. *Checking of name plate and marking on the tank.*
12. *Checking of di-electric strength of transformer oil*
13. Air pressure test : (Routine Test) : **As per IS 1180 (Part-1) : 2014**

All above acceptance and routine tests shall be carried out by the supplier in presence of purchaser's representative on 10% of quantity offered every time.

In addition to the above measurement of losses at 50% load and 100% load losses calculations at 75 Degrees for 100% transformers is to be conducted and report submitted.

Following tests shall be carried out at manufacturer's works on one unit of each rating by the supplier in presence of purchase representative.

- I. Temperature rise test.
- II. Measurement of unbalance current.
- III. Air pressure test on empty tank of transformer opened for physical verification test (Once only).
- IV. Breakdown voltage test of transformer oil.
- V. Functional test on Over-load Protection System to check the function of Over-load Protection System at full load current and at 20% overload current (or as per approved GTP).
- VI. Heat run test shall have to be conducted at suppliers cost on one transformer of each rating, from first offered lot, during the course of supplies.

To facilitate conduction of heat run test on any unit in any lot at any point of time during the supply, the manufacturer will provide a thermometer pocket which gets immersed in oil on the side of the transformer in all the transformers. The depth of the projecting stem of this pocket inside the transformer will be below oil level. It shall not fringe with electrical clearance nor obstruct the untanking of the active part.

- VII. The test certificates for all routine and type tests for the transformers and also for the bushings and transformer oil shall be submitted.

VIII. Tests at site: The purchaser reserves the right to conduct all tests on Transformer after arrival at site and the contractor shall guarantee test certificate figures under actual service conditions.

8.2 TYPE TESTS:

The type test should have been conducted on a transformer as per the tender specification. The following Type tests shall be conducted on one transformer

1. Impulse voltage test: with chopped wave of IS 2026 part-III. BIL for 11 kV shall be of 75 kV
2. Short circuit withstand test: Thermal and dynamic ability.
3. Temperature rise test : For determining the maximum temperature rises after continuous full load run.

8.2.1 The purchase of third party shall witness the type test on randomly selected distribution transformers. The supplier shall make all arrangements for witnessing type test at his own cost.

8.3 **TOLERANCE:** Unless otherwise specified herein the test value of the transformers supplied should be within the tolerance permitted in the relevant standards. No positive tolerance is allowed on guaranteed 50% and 100% load losses.

8.4 **TESTING FACILITIES:** The supplier should have adequate testing facility and also arrange for measurement of losses, resistance etc. All test equipments shall be calibrated at NABL accredited laboratory and reports shall be within one year.

8.5 **INSPECTION AND TESTING OF TRANSFORMER OIL :** Shall be maintained as specified in the tender specification. To ascertain the quality of transformer oil the manufacturer's test report should be submitted at the time of inspection. Arrangements should also be made for testing the transformer oil, after taking out the samples from the manufactured transformer and tested in the presence of TSNPDCL's representative (or) if desired, in an independent laboratory.

8.6. **STAGE INSPECTIONS :** The stage inspection of the transformers during the manufacturing/ assembling stage shall be carried out by the purchaser's representative. The purchaser have absolute right to reject the raw materials/ components not conforming to the requirements of the specifications or of poor quality/workmanship. The purchaser at his option may collect the samples of the following raw material/ components for his independent testing.

- | | | |
|----|-------------------|---|
| a. | CRGO lamination : | One specimen sheet of 300-500 mm length and 500 mm width (for each lot of raw material used by the supplier). |
| b) | HV winding wire : | 11000 mm length specimen for each type. |
| c) | LV winding wire : | 1240 mm length specimen for each type. |
| d) | Transformer oil : | 5 lit. in bottle of 1 Lt. Each. |

9.0 INSPECTION :

The accredited representative of the TSNPDCL /accredited representative of 3rd party identified by TSNPDCL shall have access to suppliers works, at any time during working hours, for the purpose of inspecting the materials and the select samples from the materials to be offered for inspection. You shall offer the equipment to 3rd party for stage wise inspection. The contractor shall provide facilities for testing such samples at any time the supplier shall keep this office informed 15 days in advance about the manufacturing programme so that arrangements can be made for inspection. As soon as the materials are ready, you shall submit the routine test certificates. The dispatches shall be effected only if the test results comply with specification.

In the case of transformers, instrument transformers and meters, inspection will be conducted every year, for the first 2 years on a 2% sample of the quantities supplied. Samples will be collected at random to establish that the guaranteed technical parameters are as per the submitted bid by the supplier. In the case of non-adherence, the purchaser may take suitable action on the supplier including cancellation of vendor registration and banning further dealings, depending on the gravity of the deviation. These random inspections may be entrusted to a third party.

In case of materials are not of acceptance quantity or not confirming to specification, the materials will be rejected. You have to re-offer the material for inspection. In such cases the 2nd inspection charges are to your account only. In case the materials are rejected in the 2nd inspection also, the TSNPDCL reserves the right to cancel the order.

The dispatches shall be made only after inspection to the TSNPDCL's satisfaction or such inspection is waived by this office.

TSNPDCL reserves the right to insist for witnessing the acceptance/ routine tests of the bought out items.

9.1 SEALING OF TRANSFORMERS AFTER TESTING AND INDIVIDUAL TEST REPORTS:

After witnessing testing on sample quantity and physical inspection of all offered Transformers, the purchaser's representative will provide numbered lead/ plastic seal bits to two opposite corners of tank and inspection cover of all offered Transformers, for delivery of correct inspected materials only. The seal bit numbers against each transformer shall also be mentioned in the test reports signed by purchaser's representative submitted for delivery instructions. The transformer serial numbers and the seal bit numbers will be verified at the stores before accepting the material.

Manufacturer should submit the list of equipment for testing along with latest calibration certificates to the purchaser.

The TSNPDCL may, at its option open a Transformer supplied to stores in your presence at TSNPDCL's laboratory. If any of the guaranteed technical particulars are found to be at variance during this test the TSNPDCL reserves the right to reject the whole lot supplied.

In addition to the above, the TSNPDCL may pick up any Transformer and decide to get it type-tested at CPRI at TSNPDCL cost. The tenderer will have to organize packing etc. at TSNPDCL stores for which charges will be paid by TSNPDCL. If the Transformer fails to meet the requirements of type tests, the quantity of Transformers ordered on them will be rejected and TSNPDCL may go in for risk purchase.

10. TERMS OF PAYMENT:

100% payment along with F&I, taxes and duties will be made on or after 30 days reckoned from the date of receipt of material/equipment at destination/stores duly transferring the said amount to the bank account of the supplier by the purchaser bank. The supplier will have to predefine the Bank details while entering into contract for electronic transfer of payments. The 10% Bank Guarantee on the value of P.O. should be furnished from a Nationalized /Scheduled Bank.

NOTE:-

- i) The date of delivery would be the date on which the stores officer certifies the receipt of materials at stores in good condition i.e. Form 13, date of last consignment.

- (ii) The supplier should invariably submit test certificates as soon as despatch is made so that the test certificates can be checked up and approved well before it becomes due for payment. Routine Test Certificates of the entire lot shall be submitted to the Consignee.
- (iii) The performance Bank guarantee to be executed in accordance with this specification shall be furnished on a stamp value of Rs.100/-. The performance guarantee has to be extended suitably by you in accordance with the guarantee clause, so that the last consignment against the order is covered by the guarantee.
- (iv) The payment for materials supplied will be made by cheque on any scheduled bank at Headquarters of the Paying Officer.
- (v) If you have received any over payments by mistake or if any amounts are due to the TSNPDCL due to any other reason, when it is not possible to recover such amounts under the contract resulting out of the subject specification, the TSNPDCL reserves the right to collect the same from any other amounts and/or bank guarantee given by you due to or with the TSNPDCL.
- vi) When you do not at any time, fulfill your obligations in replacing / rectifying etc., of the damaged/ defective materials in part or whole promptly to the satisfaction of the TSNPDCL officers, the TSNPDCL reserves the right not to accept the bills against subsequent dispatches made by the supplier and only the supplier will be responsible for any demurrages, wharf ages or damages occurring to the consignment so dispatched.

11. DESPATCH :

Please arrange to supply the article specified herein and dispatch them by lorry freight prepaid to the persons and stations noted separately.

12. ACKNOWLEDGEMENT:

The Transport receipt should be sent to the persons noted against each item and should be accompanied by two copies of the invoice/challan, one of which will be returned to you direct in token of acknowledge of receipt of the goods. A copy of the invoice shall be sent to this office as soon as despatch is made.

13. LOSS OR DAMAGE :

- a. You are responsible for the safe delivery of the goods in condition at destination stores. You should acquaint yourself of the conditions obtaining for handling and transport of the goods to destination and shall include and provide for security and protective packing of the goods so as to avoid damage in transit.
- b. External damages or shortages that are prima facie the result of rough handling in transit or due to defective packing will be intimated within a fortnight of receipt of materials. Internal defects damages or shortages or any internal parts which cannot ordinarily be detected on superficial examination though due to bad handling in transit or defective packing would be intimated within 2 months from the date of receipt of the materials. In either case the damaged or defective materials should be replaced by you free of cost to TSNPDCL.

- c. If no steps are taken within 15 days of receipt of intimation of defects or such other reasonable time as the TSNPDCL may deem proper to afford, the TSNPDCL may without prejudice to its other rights and remedies causes to be repaired or rectified the defective materials or replace the same and recover the expenditure incurred therefore from the deposits such as PERFORMANCE or other monies available with the A P Transco or by resorting to legal action and also decline to accept further delivery of materials/equipment.
- d. Where any plant/machinery or other materials supplied by you is found to be defective in whole or in part WITHIN THE GUARANTEE PERIOD, you will be intimated of the same. You should take immediate steps to rectify the defect or to replace the defective materials free of cost within 60 days from the date of the receipt of the intimation.
- e. The defective portions or whole of the materials so replaced should give satisfactory performance till the expiry of six months from the date of such replacement or until the end of guarantee period whichever may be later.
- f. For the purpose of any legal construction, the materials should be deemed to pass into TSNPDCL's ownership only at the destination stores where they are delivered and accepted.
- g. The TSNPDCL reserves the right apart from the above said provisions, not to accept further dispatches of materials and the connected bills etc. under conditions of your continued negligence to replace any materials supplied earlier and received in damaged condition or failed within the guarantee period, or not conforming to the purchase order /specification conditions.

14. GUARANTEE :

- i) The above Distribution Transformers have been guaranteed by you for satisfactory operation for a period of **5 years** from the date of supply. The 5 years guarantee shall be embossed on a separate metal sheet, painted prominently and welded to the transformer tank just below the nameplate.
- ii) For strict implementation of this clause you may note:
 - a) On failure of a transformer, a telegraphic intimation/letter will be given to you and the transformer will be shifted to SPM Centre. You should either rectify the transformer or replace it with a good transformer within 30 days of intimation.
 - b) Please note that you shall rectify/replace the defective transformer within 30-days of receipt of intimation of defects failing which payment to the extent of failed units will be deducted from the subsequent bills/banks guarantee.
 - c) In case the transformer is repaired or replaced by you after 180 days of date of telegraphic intimation you should note that 5 years guarantee will be counted from the date from which the transformer is replaced and commissioned successfully by us.
 - d) If the transformer is repaired or replaced beyond 3 months of date of telegraphic intimation to you, you should note that the 5 years guarantee period will be extended by the number of days by which 90 days or exceeded from the date of telegraphic intimation of failure to you.

e) TSNPDCL reserves the right to claim the financial loss incurred suffered due to failure of Distribution Transformers during the guarantee period.

- 15. CHALLENGE TESTING :** “The other manufacture can also request challenge testing for any test based on specification and losses. The challenger would request for testing with testing fee. The challenge test fees are proposed at least three times the cost of testing. This is likely to deter unnecessary challenges. The challenger would have the opportunity to select the sample from the store and any such challenge should be made within the guarantee period. The party challenged, and the utility could witness the challenged testing.

The challenged testing would cover the

1. Measurement of magnetizing current
2. No Load losses test.
3. Load Losses test (At 50% loading or as per acceptance test)
4. Temperature rise test.
5. Total losses at 50% and 100% loading
6. Physical verification.

The challenge test could be conducted at NABL accredited laboratory, like ERDA and CPRI. If the values are within limit the product gets confirmed else not confirmed. No positive tolerance in losses is permitted. If the product is not confirmed the manufacture would pay the challenge fee and challenger would get the fee refunded. However as redressal system the challenger would allowed to ask for fresh testing of two more samples from the store and the same be tested in NABL laboratory in presence of party challenged, challenger and the utility.

If any one or both sample does not confirm the test then the product said to have failed the test. In such cases the manufacture will be declared as unsuccessful manufacturer for the said product with wide publicity and would not be allowed to compete in tenders of the Boards for the period of three years and heavy penalty would be imposed”.

- 16. DEFECTIVE SUPPLIES :** If, during the guaranteed period, any of the goods are found to be defective in materials or workmanship they shall be replaced by you free of cost.

17. PENALTY :

GENERAL:- The delivery of materials as per the agreed schedule of delivery is the essence of the contract and no extension of the time for delivery would be allowed except under recognized force majeure conditions.

For supplies made beyond the agreed delivery schedule, penalty shall be levied for an amount of equivalent to ½ % of the contract value of the material not delivered within the prescribed time limit for every week of delay or part thereof subject to a maximum of 5% of cost of the undelivered portion within scheduled time.

The date of certified receipt of material at destination stores in good condition will be taken as the date of delivery. For calculation of penalty the date of receipt of material at destination stores is the “Date of Delivery” subject to the condition that, the materials is received in good condition. For penalty, the number of days would be rounded off to the nearest week and penalty calculated accordingly.

In case you do not adhere to the delivery schedule the TSNPDCL reserves the right to purchase the balance quantity from the open market and recover expenditure incurred from you. This is in addition to the right of the TSNPDCL mentioned in first para of this clause and under law.

- 18. FORCE MAJEURE:** You shall not be liable for any liquidated damages for delay or for failure to perform the contract for reasons of Force Majeure such as acts of God, acts of Public enemy, acts of Govt., fires, floods, epidemics, quarantine restrictions, strikes, lock-outs, riots freight embargoes and provided that you shall within 10 days from the beginning of such delay notify the TSNPDCL in writing of the cause of delay, the TSNPDCL shall verify the facts and grant such extension as facts justify.
- 19. EXTENTION OF TIME:** If the completion of supplies is delayed due to reason beyond the control of the supplier, the supplier shall without delay give notice to the purchaser in writing of his claim for an extension of time. The purchaser on receipt of such notice may agree to extend the contracted delivery to such date as may be reasonable but without prejudice to other terms and conditions of the contract.
- 20. DRAWINGS AND MANUALS:** the following drawings of 3 sets shall be furnished for arranging approval.
- a) Rating plate & ISI labeling
 - b) Outline diagram i.e., complete dimensional drawing showing the general arrangement, fitting details and clearances.
 - c) Core coil assembly drawing and weights of main component parts (internal construction with bill of materials).
 - d) Embossing Sheet : Supplier has to emboss his company monogram and The word "IPDS/TSNPDCL & DDUJGY/TSNPDCL" shall be embossed on the side sheet of the Tank above rating & diagram plate. The size of the embossing of the word "TSNPDCL" is of 2" Inches. The following information shall also be embossed on a separate MS sheet of thickness 2mm and firmly welded (No Tack welding) on one side of the transformer. The size of the word is of 1" inch. a) P.O. No. & Date, b) Year of manufacture c) Make and Serial No. d) Guarantee period.

The detailed thermal ability to withstand short circuit and temperature rise and heat dissipation calculations shall be furnished along with the drawings.

21. TEST CERTIFICATES:

The latest certificates containing the results of the tests as per IS-2026/1977 (of latest issue) must be submitted to Chief General Manager/P&MM, Corporate Office, 1ST Floor, Vidyut Bhavan, TSNPDCL, Hanumakonda, Warangal – 506 001 and got approved by him before sending bills for payment, which will not be paid unless these are approved (vide clause 8)

- a) Heat run test shall be carried out on one unit of each capacity at free of cost.
- b) TSNPDCL shall have all rights to conduct type tests at its own cost by an independent agency on a transformer either in service or from stores at its discretion. In the event of failure of transformer in such tests, the expenses incurred in testing shall be to the suppliers account. The failed unit will not be accepted for supply of TSNPDCL even after repairs.

- c) If similar transformer is tested for impulse & short circuit tests previously, copy of the same may be furnished. Otherwise impulse & short circuit tests shall be carried out on one unit free of cost and submit before drawing approval.
- d) Proof of purchase or CRGO Core, transformer oil and E grade Copper/ Aluminum must be furnished along with each inspection offer.

22. GUARANTEED TECHNICAL PARTICULARS: The technical particulars as per annexure-I have been guaranteed by you for the supplies against this order.

23. DISPATCH INSTRUCTIONS : All the materials detailed in clause -3 must be consigned and dispatched as per dispatch instructions to be issued after inspection and the bills sent to as follows.

Sl. No.	To be sent to the TSNPDCL's stores at	Materials to be consigned and despatched to ADE/Stores/TSNPDCCL	Paying officer to whom bills & RR to be sent to accounts officer/Expr. O/o. SE/Opn.
1.	Warangal	Warangal	Warangal
2.	Karimnagar	Karimnagar	Karimnagar
3.	Nizamabad	Nizamabad	Nizamabad
4.	Khammam	Khammam	Khammam
5.	Nirmal	Adilabad	Adilabad

24. PACKING :

i) The packing may be in accordance with the manufacturer's standard practice unless otherwise specified. You should however reach the departmental stores within damages after transport by Road. The packing should stand unloading and inter stores transfer with reasonable care.

ii) Whenever you dispatch materials to consignee, you should prepare the following information in the form of packing slip in quadruplicate and send the name to the consignee and obtain his acknowledge on the same. The consignee will return to you one copy of the packing slip with his remarks. The proforma of the packing slip shall be as follows.

PACKING

1. Purchase order no. and date
2. Quantity allotted to the stores and rate applicable
3. Quantity so far supplied to the stores and the rate applied
4. Quantity now supplied and the rate applied
5. Total quantity supplied under the purchase order with rates applied

iii) You shall invariably send to the purchasing office a copy of the delivery challan whenever materials are dispatched.

25. NOTE : It may be noted that :-

- a) The price cited are variable, FADS.
- b) ED & VAT as applicable will be paid.
- c) The owner ship of the materials would rest with you till they are all received at destination in good condition.
- d) Freight charges shall be prepaid.
- e) The materials may be duly insured at your cost as per specification
- f) **Interchangeability :** All similar materials and removable parts of similar equipment shall be interchangeable with each other .
- g) **Name Plate :** The equipment shall be marked with your trade mark SI. No. and the year of manufacture.
Tank shall be embossed with IPDS Scheme/TSNPDCCL for 321 Nos. Distribution Transformers. The size of the embossing of the word shall be 2 inches.
- h) ISI labeling

26. TRAINING OF TSNPDCL PERSONNEL: TSNPDCL reserves the right to depute TSNPDCL's personnel for training at your works relating to design manufacture, assembly, testing and operation and maintenance in batches. You shall provide necessary facilities during training period specified by TSNPDCL.

27. INSURANCE: The Materials/equipment supplied under the Contract will be fully insured against loss or damage incidental to manufacture or acquisition, transportation and delivery and also storage for **45 days** at destination stores **before taking into stock.**

The bidder shall a) Initiate and pursue insurance claim till settlement, and b) Promptly arrange for repair and/or replacement of any damaged items in full irrespective of settlement of insurance claim by the under Writers. c) All costs because of insurance liabilities covered under the contract will be to supplier's account. The supplier shall provide the Purchaser with a copy of all insurance policies and documents taken out by him in pursuance of the 'Contract'. Such copies of documents shall be submitted to the purchaser immediately after such insurance coverage. The supplier shall also inform the Purchaser in writing at least sixty (60) days in advance, regarding the expiry, cancellation and/or change in any of such documents and ensure revalidation/renewal etc., as may be necessary well in time.

The risks that are to be covered under the insurance shall be comprehensive and shall include but not limited to, the loss or damage in transit, storage, due to theft, pilferage, riot, civil commotion, weather conditions, accident of all kinds, fire, flood, war risk(during ocean transportation) bad or rough handling etc. The scope of such insurance shall cover the entire contract value.

The insurance will be in an amount equal to 100% FADS value of Materials/ equipment on all risks basis. The policy will have a provision for extension to cover further storage if necessary at destination stores/ site at TSNPDCL cost. **"The Insurance beneficiary shall be TSNPDCL".**

28. GENERAL :

1. Your bills in duplicate along with a copy of invoice and substantiating vouchers for all extra claims to be made separately should be forwarded to the paying officers mentioned in the dispatch instructions.
2. All General and technical correspondence should be addressed to the Chief General Manager/P&MM, Corporate Office, 1ST Floor, Vidyuth Bhavan, TSNPDCL, Hanamkonda, Warangal – 506 001.
3. All Correspondence regarding bills, payment etc. should be addressed to the Paying Officers cited in the dispatch instructions with a copy to the Pay Officer, TSNPDCL , Warangal– 506 001.
4. All and any disputes or differences arising out of or touching this order shall be decided by counts or tribunals situated in Warangal. No suit or other legal proceedings shall be instituted elsewhere.
5. Unless otherwise specified, you shall abide by all the terms and conditions specified in specification.
6. Please return within a period of 15 days one copy of the purchase order duly signed in token of acceptance of all the terms and conditions of this purchase order along with the contract form executed on a Rs. 100/- Non-Judicial stamp paper.

7. This is in regularization of preliminary acceptance Lr. No. CGM/P&MM/NPDCL/WGL/GM/DE-2/A3/OT-73/17-18/D.No.5250/17, Dt. 21.02.18.

**Yours faithfully,
Sd/-
(B. ASHOK KUMAR)
CHIEF GENERAL MANAGER,
P&MM/NPDCL/WARANGAL.**

We accept all the terms and Conditions of this order.

SIGNATURE OF THE CONTRACTOR

Copy Communicated to :-

The Chief General Manager/ Finance./NPDCL/Warangal.
The Chief General Manager/Projects/NPDCL/Warangal.
The Chief General Manager/O&M/NPDCL/Warangal.
The Chief General Manager/P&MM/CPDCL/4th Floor, Corporate Office,
Mint Compound, Hyderabad – 500 004.

Copy to:-

The Superintending Engineer/Operation/WGL, KNR, KMM, NZB & ADB.
The Divisional Engineer/Transformers/ WGL, KNR, KMM, NZB & ADB.
The Accounts Officer/Expr. O/o. SE/Opn./ WGL, KNR, KMM, NZB & ADB.
The Asst. Divisional Engineer/Stores/ WGL, KNR, KMM, NZB & NML.
The Divisional Engineer/IT/TSNPDCL/Warangal.

(Place the Scanned Purchase Order copy in the TSNPDCL Website).

// FORWARDED BY ORDER//

***Divisional Engineer/P&MM-2
TSNPDCL/Warangal.***

CONTRACT FORM

THIS AGREEMENT made the. day of. 200 Between.(Name of Purchaser) of the one part and.(Name of Supplier) of the other part:

WHEREAS the Purchaser invited bids for certain Materials/equipment and ancillary services viz., (Brief description of Materials/equipment and Services) and has accepted a bid by the Supplier for the supply of those Materials/equipment and services in the sum of(Contract Price in Words and Figures) (hereinafter called "the Contract Price").

NOW THIS AGREEMENT WITNESSETH AS FOLLOWS:

1. In this Agreement words and expressions will have the same meanings as are respectively assigned to them in the Conditions of Contract referred to.

2. The following documents will be deemed to form and be read and construed as part of this Agreement, viz.:

- (a) the Bid Form and the Price Schedule submitted by the Bidder;
- (b) the Schedule of Requirements;
- (c) the Technical Specifications;
- (d) the General Conditions of Contract;
- (e) the Purchaser's Notification of Award.

3. In consideration of the payments to be made by the Purchaser to the Supplier as hereinafter mentioned, the Supplier hereby covenants with the Purchaser to provide the Materials / equipment and services and to remedy defects therein in conformity in all respects with the provisions of the Contract.

4. The Purchaser hereby covenants to pay the Supplier in consideration of the provision of the Materials / equipment and services and the remedying of defects therein, the Contract Price or such other sum as may become payable under the provisions of the Contract at the times and in the manner prescribed by the Contract.

Brief particulars of the Materials/equipment and services which will be supplied/ provided by the Supplier are as under:

	Brief Description of Materials/Equipment & services	Quantity to be supplied	Unit Price Rs.	Total Price Rs.	Delivery Terms

TOTAL VALUE: (Rupees _____ only)

DELIVERY SCHEDULE:

IN WITNESS whereof the parties hereto have caused this Agreement to be executed on the day and year first above written.

Signed, Sealed and Delivered by the
said.(for the Purchaser)

in the presence of.

Signed, Sealed and Delivered by the
said.(for the Supplier)

in the presence of.

NOTE: To be executed on a Rs.100/- Non-judicial stamp paper.

Sd./-
(B. ASHOK KUMAR)

**CHIEF GENERAL MANAGER,
P&MM/NPDCL/WARANGAL.**

ANNEXURE – I

**GUARANTEED TECHNICAL & OTHER PARTICULARS FOR DISTRIBUTION
TRANSFORMERS**

Sl. No.	Description	100KVA
1	Make & Manufacturer	Trinity Transformers Pvt.Ltd.
2	Place of Manufacture	Jadcherla, Mahbubnagar, T.S
3	Voltage Ratio	11000/433 V
4	Rating in KVA	100
5.Core Details:		
1	Core Grade	Amorphous core
2	Thickness of core plates	0.025 (+/-0.005)mm
3	Flux density (Max)	1.38 TESLA
4	Over fluxing without saturation	112.5%
5	Core Details. 1) No. of Core steps. 2) Max. width of first step lamination. 3) Stacking factor 4) Core building factor.	1) 1 2) 170.18 3) 86% 4) 30%
6	Core diameter	17.018x11.7 cm
7	Gross Core area	199.11 sq.cm
8	Net Core area	171.24 sq.cm
9	Wt. Core	267 Kg.
10	Loss per Kg. of core at the specified Flux Density	0.1982 Watts/kg
11	No load loss in watts	75 watts
11	Core loss in watts a) Normal Voltage b) Maximum Voltage	a)75 W b)150 W
12	Power factor magnetizing current (lag max)	0.2
13	Magnetizing (No load) current at a) Normal Voltage b) Maximum Voltage	a)3% of FL current b)5% of FL current
14	Core window height	325 mm
15	Center to center distance of the core	162/85 mm
16	Maximum temperature rise of Core by Thermometer	Shall no way reach the value that will damage the core
6.Winding Details		
1	Maximum temperature rise of Windings by resistance method	40°C
2	Winding material : LV : HV	LV – Aluminium HV - Aluminium
3	Resistance of windings at 20 Deg. C (with 5% tolerance) a) HV Winding (ohms) b) LV winding (ohms)	a)HV =22.96 Ω b)LV=0.0086Ω (Without Breaker)
4	No. of LV Turns	48
5	No. of HV Turns	2112
6	Size of LV conductor bare/covered	10.5x3.6/10.9x4mm
7	Rounding Factor for LV	0.86
8	No. of parallels	3
9	Area of LV cross section (sq.mm)	110.82sq.mm
10	Size of HV conductor bare/covered	1.78/2.03mm
11	Area of HV cross section (sq.mm)	2.49 sq.mm

12	Current density of LV winding	1.2Amp/sq.mm
13	Current density of HV winding	1.22Amp/sq.mm
14	Wt. Of the HV winding for transformers	43Kg.
15	Wt. Of the LV winding for transformers	30Kg.
16	No. of LV Coils/Phase	1
17	No. of HV Coils/Phase	1
18	ID/OD of LV winding	125x181/174x238mm
19	ID/OD of HV winding	196x260/269x350mm
20	Height of LV winding	288mm (physical ht.)
21	Height of HV winding	275mm(physical ht.)
22	Axial height of HV coil	305mm(with packing)
23	Axial height of LV coil	305mm(with packing)
24	Radial depth of LV coil	24.5x28.5mm
25	Radial depth of HV coil	36.5x45mm
26	Full load current HV	5.25Amps
27	Full load current LV	133.34Amps
28	Full load losses (watts) at 75 Deg. C	1345Watts
29	Estimated stray losses	40Watts
30	Estimated Breaker Losses	40Watts
31	Total Losses(Full load losses+ stray losses+ Breaker Losses)	1425Watts
32	Maximum losses at 50% loading	435watts
33	Maximum losses at 100% loading	1500watts
34	Calculated Impedance	4.5% (+/-IS tolerance)
35	Edge strip size on LV coil (top & Bottom)	8.5 mm
7.Clearances		
1	Size of the duct in HV winding	3mm
2	Size of the duct in LV winding	3mm
3	Size of the duct between HV & LV	8mm
4	HV winding to LV clearance	11mm
5	HV winding to tank clearance	30/40mm
6	HV to earth creepage distance	140mm (in air)
7	LV to earth creepage distance	40mm(in air)
8	Clearances (minimum) a) Core & LV b) LV & HV c) HV Phase to phase d) End insulation clearance to Earth e)Any point of winding to tank	Mm a)4 mm b)11 mm c)10 mm d)25 mm e)30/40 mm
8.Heat Dissipation Calculations		
1	Maximum temperature rise of Oil by Thermometer	35°C
2	Transformer (minimum) 1) Overall length x breadth x height 2) Tank length x breath x height (internal) 3) Height of Oil level in tank 4) Thickness of plates a) Side walls (min.) b) Top & bottom plate (min.)	1)1220x1000x1100 mm 2)985x430x905 mm 3)635 mm 4) a)3.15 mm b)5 mm
3	Radiation: 1) Heat dissipation by tank walls exclusive top & bottom 2) Heat dissipation by cooling tube 3) Dia& thickness of cooling tube 4) Whether calculation sheet for selecting cooling area to ensure to ensure that the transformer is capable of giving continuous rated output without	1)500 W/sq.m in oil and 250w/sq.m above oil level 2)Radiators are provided 3)Radiators are provided 4)Yes calculation sheet enclosed 5)Minimum 55% of oil volume (270mm)

	exceeding temperature rise & also transformer tank size is sufficient is enclosed. 5) Minimum free space available above oil level.	
4	Weight content of a) Core lamination (min.) b) Windings (min.) c) Tank & Fittings d) Oil e) Oil Qty in liters(min.) f) Core channels, rods, bolts, etc g) Insulation material inside tank. h) Total Weight	a)267 kg b)73 kg c)180 kg d)165 kg e)195 lit f)27 kg g)18 kg h)730 kg
5	Oil Data 1) Qty. for first filling (min.) 2) Grade of oil used 3) Maker's name 4) BDV at the time of filling	1)195 lit 2)EHV grade confirming to IS 335 3)Apar/Savita/Raj petro/Equiv. 4)60KV at the time of filling
9.Efficiency,Regulation, and other particulars		
1	Efficiency at 75 Deg. C a) Unity P.F. & b) 0.8 P.F. 125% load 100% load 75% load 50% load 25% load	UPF- 98.19,98.52,98.84,99.14,99.35 0.8PF- 97.75,98.16,98.56,98.93,99.19
2	Regulation at a) Unity P.F. b) 0.8 P.F at 75 Deg. C	a)1.52 b)3.73
3	Percentage Impedance at 75 Deg. C	4.5% (+/- IS tolerance)
4	Flash Test HV 28 KV/50Hz for 1 minute LV 3 KV/50 Hz for 1 minute	As per IS 2026/1180 As per IS 2026/1180
5	Over potential Test Double Voltage & Double frequency for 1 minute	As per IS 2026/1180
6	Impulse test	75 kVp
7	Inter layer insulation provided in design for 1) Top & Bottom layer 2) In between all layer 3) Details of end insulation 4) Whether wedges are provided at 50% turn of the HV coil.	1)E.D.Paper 2)E.D.Paper 3)Press board/Kraft paper 4)Yes
8	Insulation materials provided a) For Conductors (1) HV (2) LV b) For Core	a)1)HV-DPC 2)LV-DPC b)Core – N/A
9	Is the name plate gives all particulars are required in tender	Yes
10	Particulars of Bushing HV/LV 1) Maker's name 2) Type IS-3347/IS-1180 3) Rating as per I.S. 4) Dry power frequency voltage withstand test 5) Wet power frequency voltage withstand test	1)Bikaneer/Gensis/Equi. Make 2)As per IS 3347 3)for 11KV-17.5KV class and for 0.433KV-1KV class bushing shall be used 4)As per IS 2099 5)As per IS 2099
11	Medium of free space above oil level Transformer	Dry air/Nitrogen
12	Details of type tests conducted (indicating rating, year of testing, details of tests)	Enclosed Separately

Sd./-
(B. ASHOK KUMAR)
CHIEF GENERAL MANAGER,
P&MM/NPDCL/WARANGAL.