

**POWER TRANSMISSION CORPORATION OF UTTARAKHAND LTD.**  
**(A Govt. of Uttarakhand Enterprise)**  
**CHIEF ENGINEER, OPERATION & MAINTENANCE**  
**GARHWAL ZONE, PTCUL**  
**26 - CIVIL LINES, ROORKEE - 247667**

E- Tender for "Supply of 250 kVA, 33/0.4 kV Station Transformer under Operation & Maintenance Divison, Srinagar(G)".

DOWNLOADED BY: -

M/s / Shri \_\_\_\_\_

Sr. No.	DESCRIPTION	
1.	Tender No.	CE/GZR-11/2020-21
2.	Name of Work	"Supply of 250 kVA, 33/0.4 kV Station Transformer under Operation & Maintenance Divison, Srinagar(G)".
3.	Completion Time	<b>03 Months</b>
4.	Route Length in Kms.	--
5.	Tender issuing office	Office of Chief Engineer (O&M) Garhwal Zone, Power Transmission Corporation of Uttarakhand Ltd. " 26-Civil Lines, Roorkee-247667
6.	Tender Fees	<b>Rs. 1,000.00+180.00 (GST@18%) =Rs. 1,180.00 (Non refundable)</b>
7.	EMD/Bid Security	<b>Rs. 42,000.00</b>
8.	Starting date of issue of Bid documents. The tender document is to be downloaded through website- <a href="http://www.uktenders.gov.in">www.uktenders.gov.in</a> against payment of tender fees as above. The non refundable tender fees as specified above should be sent along with the bids as specified in the bid documents.	24.12.2020
9.	Last date of Request of Bid Documents.	As per tender notice / corrigendum if any
10.	Last date of issue of Bid Documents.	As per tender notice / corrigendum if any
11.	Closing Date of receipt of Bid through E-tendering	As per tender notice / corrigendum if any
12.	Address & Place of Submission of Bid supporting documents.	Chief Engineer (O&M), Garhwal Zone, PTCUL, 26-Civil Lines Roorkee-247667.
13.	Date and Time of Opening of Technical Bid	As per tender notice / corrigendum if any
14.	Address & place of Technical bid(Part-1) opening	Chief Engineer (O&M), Garhwal Zone, PTCUL, 26-Civil Lines Roorkee-247667.
15.	Type of Tender	Open Tender
16.	Validity of Bid	180 days after the date of opening of technical bid (Part-I)
17.	Contact & Telephone No. of the Tender issuing office	Phone No.:- 01332-272256 Fax No. : 01332-2722315
18.	E-mail address of the tender issuing office	ce_oandmg@ptcul.org chiefengineergarhwal@gmail.com

**CHIEF ENGINEER (O&M) GARHWAL ZONE, ROORKEE**

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**POWER TRANSMISSION CORPORATION OF UTTARAKHAND LTD.  
OFFICE OF THE CHIEF ENGINEER (OPERATION & MAINTENANCE)  
GARHWAL ZONE, 26-CIVIL LINES, ROORKEE  
E-TENDER NOTICE**

On line, e-tenders against specification No. CE/GZR-11/2020-21 for supply of 250 kVA, 33/0.4 kV Station Transformers under Operation & Maintenance Division, Srinagar(G) are hereby invited. The last date & time of submission of offline/online bid is upto 15.00 Hours on 22.01.2021 which shall be opened on 23.01.2021 at 15.00Hrs. Details of E-tender can be obtained from E-tender website www.uktenders.gov.in (Tender ID: 2020\_PTCUX\_28382\_1) and information of E-tender can be seen from PTCUL website www.ptcul.org. For any assistance on e-tendering, please contact on Mobile No. +91-8899890000.

CHIEF ENGINEER (O&M)

“SAVE ELECTRICITY IN THE INTEREST OF NATION”

## Pre Qualifying Criteria

### (A) Technical Qualifying Requirement

1. The bidder should have successfully completed similar nature of work i.e. "Supply of 250 kVA, 33/0.4 kV or higher capacity and Voltage class Transformer" within last Seven (07) years as on the originally scheduled date of Bid opening.
2. The bidder must comply the Technical Specifications and GTP, an undertaking to this effect must be submitted with the bid.

Remark : - Similar completed works against FQR will be as follows :-

The bidder shall have successfully completed similar nature of work i.e. "Supply of 250 kVA, 33/0.4 kV or higher capacity and voltage class Transformer".

### (B) Financial Qualifying Requirement

1. Minimum Average Annual Turnover:- The minimum average annual turnover for the preceding best three years (36 months) out of last five financial years should not be less than 20.93 Lakh (Balance sheet/Documentary proof for last five years should be enclosed). The balance sheet and all other financial documents attested/certified by CAs to substantiate fulfilment of FQR should be with UDIN.
2. Experience of having successfully completed similar works during last 7 years lending last day of month previous to the one in which applications are invited should be either of the following;
  - (a) Three similar completed works costing not less than the amount equal to Rs. 5.58 Lakh.  
OR
  - (b) Two similar completed works costing not less than the amount equal to Rs. 6.98 Lakh.  
OR
  - (c) One similar completed work costing not less than the amount equal to Rs. 11.16 Lakh.
3. The bidder has to submit the latest Balance sheet and CA Certificate (along with the UDIN No.) for the Net Worth at the time of bidding.
4. Experience certificate should be issued by an officer not below the rank of Executive Engineer mentioning nature of work, Agreement No., Amount of work, Scheduled time of completion of work and Actual time of completion etc. Completion certificate from officer shall be enclosed by contractor.

### (C) Additional Documents

1. Copy of PAN No. of the firm/Company or PAN No. of all its partner's in case of partnership firm or PAN No. of the individual, in case of proprietorship.
2. The Tenderers should have submitted copy of Goods I& Service Tax (GST) Registration.
3. RTGS/NEFT Details of the bidder is to be submitted.
4. Latest Solvency certificate not more than 3 months old issued by bank (20% of bid value) should be submitted.
5. The balance sheet and all other financial documents attested/certified by CA's to substantiate fulfilment of FQR should be with UDIN, failing which the tender will be summarily rejected without any further reference.
6. GST Registration/Issuing authority.
7. Details of Partners/Directors of the Firm/Company.
8. Experience record and details of other works pending/executed for various utilities.
9. Last year audited Accounts.

# **Technical Specifications for 250 kVA, 3-Phase Distribution Transformers** **33 kV/433V (Outdoor Type)**

## **1. SCOPE:-**

- i) This specification covers design, engineering, manufacture, assembly, inspection and testing before supply and delivery at site of oil immersed, naturally cooled 250 kVA, 3-phase 33 kV/433 V distribution transformers for outdoor use.
- ii) The equipment shall conform in all respects to high standards of engineering, design and workmanship and shall be capable of performing in continuous commercial operation, in a manner acceptable to the purchaser, who will interpret the meanings of drawings and specification and shall have the power to reject any work or material which, in his judgment is not in accordance therewith. The offered equipment shall be complete with all components necessary for their effective and trouble free operation. Such components shall be deemed to be within the scope of bidder's supply irrespective of whether those are specifically brought out in this specification and / or the commercial order or not.
- iii) The transformer and accessories shall be designed to facilitate operation, inspection, maintenance and repairs. The design shall incorporate every precaution and provision for the safety of equipment as well as staff engaged in operation and maintenance of equipment.
- iv) All outdoor apparatus, including bushing insulators with their mountings, shall be designed so as to avoid any accumulation of water.

## **2. STANDARD RATINGS :-**

## **3. STANDARD:-**

- 3.1 The major materials used in the transformer shall conform in all respects to the relevant/specified Indian Standards and international Standards with latest amendments thereof as on bid opening date, unless otherwise specified herein. Some of the applicable Indian Standards are listed as hereunder:

<b>Indian Standard</b>	<b>Title</b>	<b>International</b>
IS – 2026	Specification for Power Transformers	IEC-76
IS 1180 (Part – I) : 2014	Outdoor Type Oil Immersed Distribution Transformers 250kVA, 33kV-Specification	
IS 12444	Specification for Copper wire rod	ASTM B-49
IS-335	Specification for Transformer Oil	IEC Pub 296
IS-5	Specification for colors for ready mixed paints	
IS-104	Ready mixed paint, brushing zinc chromate, priming	
IS-2099	Specification for high voltage porcelain bushing	
IS-649	Testing for steel sheets and strips and magnetic circuits	

IS-3024	Cold rolled grain oriented electrical sheets and strips	
IS-4257	Dimensions for clamping arrangements for bushings	
IS-7421	Specification for Low Voltage bushings	
IS-3347	Specification for Outdoor Bushings	DIN 42531 to 33
IS-5484	Specification for Al Wire rods	ASTM B-233
IS-9335	Specification for Insulating Kraft Paper	IEC 554
IS-1576	Specification for Insulating Press Board	IEC 641
IS-6600	Guide for loading of oil Immersed Transformers	IEC 76
IS-2362	Determination of water content in oil for porcelain bushing of transformer	
IS-6162	Paper covered Aluminium conductor	
IS-6160	Rectangular Electrical conductor for electrical machines	
IS-5561	Electrical power connector	
IS-6103	Testing of specific resistance of electrical insulating Liquids	
IS-6262	Method of test for power factor and dielectric constant of electrical insulating liquids	
IS-6792	Determination of electrical strength of insulating oil	
IS-10028	Installation and maintenance of transformers.	

#### 4. SERVICE CONDITIONS:-

The Distribution Transformers to be supplied against this Specification shall be suitable for satisfactory continuous operation under the following climatic conditions as per IS 2026 (Part - I).

- i) Location : At any location in Uttarakhand
- ii) Maximum ambient air temperature (0C) : 50
- iii) Minimum ambient air temperature (0C) : -05
- iv) Maximum average daily ambient air temperature (0C) : 40
- v) Maximum yearly weighted average ambient temperature(0C) :32

#### 5. PRINCIPAL PARAMETERS :-

The transformers shall be suitable for outdoor installation with three phase, 50 Hz, 33 kV system in which the neutral is effectively earthed and they should be suitable for service with fluctuations in supply voltage upto plus 12.5% to minus 12.5%.

The transformers shall conform to the following specific parameters:-

- I) System Voltage (Max.) : 36 kV

II)	Rated Voltage (HV)	:	33 kV
III)	Rated Voltage (LV)	:	433 V
IV)	Frequency	:	50 Hz +/- 5 %
V)	No. of Phases	:	Three
VI)	Connection HV	:	Delta
VII)	Connection LV	:	Star (Neutral Brought out)
VIII)	Vector Group	:	Dyn-11
IX)	Type of Cooling	:	ONAN

## 6. CORE MATERIAL

- I) The core shall be stack/ wound type of high grade Cold Rolled Grain Oriented or Amorphous Core annealed steel lamination having low loss and good grain properties, coated with hot oil proof insulation, bolted together and to the frames firmly to prevent vibration or noise. The core shall be stress relieved by annealing under inert atmosphere if required. The complete design of core must ensure permanency of the core loss with continuous working of the transformers. The value of the maximum flux density allowed in the design and grade of lamination used shall be clearly stated in the offer.
- II) CRGO steel for core shall be purchased only from the vendors, list of which is available at <http://apps.powergridindia.com/ims/ComponentList/Powerformer%20upto%20420%20kV-CM%20List.pdf>
- III) The transformers core shall be suitable for over fluxing (due to combined effect of voltage and frequency) up to 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.
- IV) No-load current shall not exceed 2% of full load current and will be measured by energising the transformer at rated voltage and frequency. Increase of 12.5% of rated voltage shall not increase the no-load current by 5% of full load current.

## 7. WINDINGS

- i) HV and LV windings shall be wound from Super Enamel covered /Double Paper covered Aluminum/ Electrolytic Copper conductor.
- ii) LV winding shall be such that neutral formation will be at top.
- iii) The winding construction of single HV coil wound over LV coil is preferable.
- iv) Inter layer insulation shall be Nomex /Epoxy dotted Kraft Paper.
- v) Proper bonding of inter layer insulation with the conductor shall be ensured. Test for bonding strength shall be conducted.
- vi) Dimensions of winding coils are very critical. Dimensional tolerances for winding coils shall be within limits as specified in Guaranteed Technical Particulars (GTP Schedule I).
- vii) The core/coil assembly shall be securely held in position to avoid any movement under short circuit conditions.
- viii) Joints in the winding shall be avoided. However, if jointing is necessary the joints shall be properly brazed and the resistance of the joints shall be less than that of parent conductor. In case of foil windings, welding of leads to foil can be done within the winding.

## 8. TAPPING RANGES AND METHODS

- i) The tapping shall be as per provisions of IS: 1180 Part-I (2014).
- ii) Tap changing shall be carried out by means of an externally operated self-position switch and when the transformer is in de-energised condition. Switch position No.1 shall correspond to the maximum plus tapping. Each tap change shall result in variation of 2.5% in voltage. Arrangement for pad locking shall be

provided. Suitable aluminum anodized plate shall be fixed for tap changing switch to know the position number of tap.

## 9. OIL

- i) The insulating oil shall comply with the requirements of IS 335. Use of recycled oil is not acceptable. The specific resistance of the oil shall be as per IS 335.
- ii) Oil shall be filtered and tested for break down voltage (BDV) and moisture content before filling.
- iii) The oil shall be filled under vacuum.
- iv) The design and all materials and processes used in the manufacture of the transformer, shall be such as to reduce to a minimum the risk of the development of acidity in the oil.

## 10. INSULATION LEVELS

- i) Impulse Voltage (kV) : 170
- ii) Power Frequency : 70

## 11. LOSSES

- i) The maximum allowable losses at rated voltage and rated frequency permitted at 75 °C for 33/0.433 kV transformers can be chosen by the utility as per **Table-6 for ratings above 200kVA as per Energy Efficiency Level-2 specified in IS1180 (Part-1):2014** for all kVA ratings of distribution transformers.
- ii) The above losses are maximum allowable and there would not be any positive tolerance. Bids with higher losses than the above specified values would be treated as non-responsive. However, the manufacturer can offer losses less than above stated values.

## 12. TOLERANCES

No positive tolerance shall be allowed on the maximum losses displayed on the label for both 50% and 100% loading values.

## 13. PERCENTAGE IMPEDANCE

The percentage impedance of transformers at 75 °C shall be as per Table 6 of IS 1180(Part-1):2014.

## 14. TEMPERATURE RISE

The temperature rise over ambient shall not exceed the limits given below:

- i) The permissible temperature rise shall be as per IS: 1180 (Part-I):2014.
- ii) The transformer shall be capable of giving continuous rated output without exceeding the specified temperature rise. Bidder shall submit the calculation sheet in this regard.

## 15. PENALTY FOR NON PERFORMANCE

- i) 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.
- ii) Purchaser shall reject the entire lot during the test at supplier's works, if the temperature rise exceeds the specified values.
- iii) Purchaser shall reject any transformer during the test at supplier's works, if the impedance values differ from the guaranteed values including tolerance.

## 16. INSULATION MATERIAL

- i) Electrical grade insulation epoxy dotted Kraft Paper/Nomex and pressboard of standard make or any other superior material subject to approval of the purchaser shall be used.
- ii) 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. In case of cross-over coil winding of HV 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.

## 17. TANK

- i) Transformer tank construction shall conform in all respect to clause 15 of IS 1180(Part-1):2014.
- ii) 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.
- iii) All joints of tank and fittings shall be oil tight and no bulging should occur during service.
- iv) Inside of tank shall be painted with varnish/hot oil resistant paint.
- v) The top cover of the tank shall be slightly sloping to drain rain water.
- vi) The tank plate and the lifting lugs shall be of such strength that the complete transformer filled with oil may be lifted by means of lifting shackle/Hook Type.
- vii) Manufacturer should carry out all welding operations as per the relevant ASME standards and submit a copy of the welding procedure and welder performance qualification certificates to the customer.

### a) PLAIN TANK:

- i) The transformer tank shall be of robust construction rectangular in shape and shall be built up of electrically tested welded mild steel plates of thickness not less than 6 mm for the bottom and top and not less than 4 mm for the sides. Tolerances as per IS 1852 shall be applicable.
- ii) In case of rectangular tanks the corners shall be fully welded at the corners from inside and outside of the tank to withstand a pressure of 0.8 kg/cm<sup>2</sup> for 30 minutes.
- iii) Under operating conditions the pressure generated inside the tank should not exceed 0.4 kg/sq. cm positive or negative. There must be sufficient space from the core to the top cover to take care of oil expansion and conservator shall be provided.
  - The tank shall be reinforced by welded flats on all the outside walls on the edge of the tank.
  - Permanent deflection: The permanent deflection, when the tank without oil is subjected to a vacuum of 525 mm of mercury for rectangular tank and 760 mm of mercury for round tank, shall not be more than the values as given below:

Horizontal length of flat plate	Permanent deflection
Up to and including 750 mm	5.0 mm
751 mm to 1250 mm	6.5 mm
1251 mm to 1750 mm	8.0 mm
1751 mm to 2000 mm	9.0 mm



- iv) The tank shall be capable of withstanding a pressure of 0.8kg/sq.cm and a vacuum of 0.7 kg/sq.cm (g) without any deformation.
- v) The radiators shall be fin type or pressed steel type to achieve the desired cooling to limit the specified temperature rise.

## **18. CONSERVATOR**

- i) Oil gauge and the plain or dehydrating breathing device shall be fitted to the conservator which shall also be provided with a drain plug and a filling hole [32 mm (1¼")] normal size thread with cover. In addition, the cover of the main tank shall be provided with an air release plug.
- ii) The dehydrating agent shall be silica gel. The moisture absorption shall be indicated by a change in the colour of the silica gel crystals which should be easily visible from a distance. Volume of breather shall be suitable for 1 Kg of silica gel conforming to IS 3401 for transformers.
- iii) The capacity of a conservator tank shall be designed keeping in view the total quantity of oil and its contraction and expansion due to temperature variations. The total volume of conservator shall be such as to contain 10% quantity of the oil. Normally 3% quantity of the oil shall be contained in the conservator.
- iv) The cover of main tank shall be provided with an air release plug to enable air trapped within to be released, unless the conservator is so located as to eliminate the possibility of air being trapped within the main tank.
- v) The inside diameter of the pipe connecting the conservator to the main tank should be within 20 to 50 mm and it should be projected into the conservator so that its end is approximately 20 mm above the bottom of the conservator so as to create a sump for collection of impurities. The minimum oil level (corresponding to -5 °C) should be above the sump level.

## **19. SURFACE PREPARATION AND PAINTING**

### **i) GENERAL**

- a) All paints, when applied in a normal full coat, shall be free from runs, sags, wrinkles, patchiness, brush marks or other defects.
- b) All primers shall be well marked into the surface, particularly in areas where painting is evident and the first priming coat shall be applied as soon as possible after cleaning. The paint shall be applied by airless spray according to manufacturer's recommendations. However, where ever airless spray is not possible, conventional spray be used with prior approval of purchaser.

### **ii) CLEANING AND SURFACE PREPARATION**

- a) After all machining, forming and welding has been completed, all steel work surfaces shall be thoroughly cleaned of rust, scale, welding slag or spatter and other contamination prior to any painting.
- b) Steel surfaces shall be prepared by shot blast cleaning (IS 9954) to grade Sq.2.5 of ISO 8501-1 or chemical cleaning including phosphating of the appropriate quality (IS 3618).
- c) Chipping, scraping and steel wire brushing using manual or power driven tools cannot remove firmly adherent mill-scale. These methods shall only be used where blast cleaning is impractical. Manufacturer to clearly explain such areas in his technical offer.

### **iii) PROTECTIVE COATING**

As soon as all items have been cleaned and within four hours of the subsequent drying, they shall be given suitable anti-corrosion protection.

**iv) PAINT MATERIAL**

- a) Following are the types of paint which may be suitably used for the items to be painted at shop and supply of matching paint to site: Heat resistant paint (Hot oil proof) for inside surface.
- b) For external surfaces one coat of thermo setting powder paint or one coat of epoxy primer followed by two coats of synthetic enamel/polyurethane base paint. These paints can be either air drying or stoving.
- c) For highly polluted areas, chemical atmosphere or for places very near to the sea coast, paint as above with one coat of high build Micaceous iron oxide (MIO) as an intermediate coat may be used.

**v) PAINTING PROCEDURE**

- a) All prepared steel surfaces should be primed before visible re-rusting occurs or within 4hours, whichever is sooner. Chemical treated steel surfaces shall be primed as soon as the surface is dry and while the surface is still warm.
- b) Where the quality of film is impaired by excess film thickness (wrinkling, mud cracking or general softness) the supplier shall remove the unsatisfactory paint coating and apply another coating. As a general rule, dry film thickness should not exceed the specified minimum dry film thickness by more than 25%.

Sl. No.	Paint Type	Area to be painted	No. of Coats	Total dry film thickness (min.) (microns)
1.	Thermo setting powder paint	Inside Outside	01 01	30 60
2.	<b>Liquid Paint</b> a) Epoxy (Primer) b) P.U. Paint (Finish Coat) c) Hot oil paint/ Varnish	Outside Outside Inside	01 02 01	30 25 each 35/10

**20. BUSHINGS**

- i) 33 kV-36 kV class and 0.433 kV- 1 kV class bushings shall be used for transformers.
- ii) Bushing can be of porcelain/epoxy material. Polymer insulator bushings conforming with relevant IEC can also be used.
- iii) Dimensions of the bushings of the voltage class shall conform to the Standards specified and dimension of clamping arrangement shall be as per IS 4257
- iv) Minimum phase to phase and phase to earth clearances of bushing terminals (HV) and cable box(LV) shall be as follows:

Voltage	Clearance	
	Phase to Phase	Phase to Earth
33 kV	350 mm	320 mm
LV	25 mm	20 mm

- v) Arcing horns shall be provided on HV bushings.
- vi) Brazing of all inter connections, jumpers from winding to bushing shall have cross section larger than the winding conductor. All the Brazes shall be qualified as per ASME, section – IX.

- vii) The bushings shall be of reputed make supplied by those manufacturers who are having manufacturing and testing facilities for insulators.
- viii) The terminal arrangement shall not require a separate oil chamber not connected to oil in the main tank.

## 21. TERMINAL CONNECTORS

The LV and HV bushing stems shall be provided with suitable terminal connectors as per IS5082 so as to connect the jumper without disturbing the bushing stem. Connectors shall be with eye bolts so as to receive conductor for HV. Terminal connectors shall be type tested as per IS 5561.

## 22. CABLE BOXES

The transformer shall be fitted with suitable LV cable box having non-magnetic material gland plate with appropriate sized single compression brass glands on LV side to terminate 1.1 kV/single core XLPE armoured cable (Size as per requirement).

## 23. TERMINAL MARKINGS

High voltage phase windings shall be marked both in the terminal boards inside the tank and on the outside with capital letter 1U, 1V, 1W and low voltage winding for the same phase marked by corresponding small letter 2U, 2V, 2W. The neutral point terminal shall be indicated by the letter 2N. Neutral terminal is to be brought out and connected to local grounding terminal by an earthing strip.

## 24. STANDARD FITTINGS

The following standard fittings shall be provided :

- i) Rating and terminal marking plates, non-detachable.
- ii) Earthing terminals with lugs - 2 Nos.
- iii) Lifting lugs for main tank and top cover
- iv) Terminal connectors on the HV/LV bushings (For bare terminations only).
- v) Thermometer pocket with cap - 1 No.
- vi) Air release device (for non-sealed transformer)
- vii) HV bushings - 3 Nos.
- viii) LV bushings - 4 Nos.
- ix) Pulling lugs
- x) Stiffener
- xi) Radiators - No. and length may be mentioned (as per heat dissipation calculations)/ corrugations.
- xii) Arcing horns on HT side - 3 No . Only clamps for lightning arrestor shall be provided.
- xiii) Prismatic oil level gauge.
- xiv) Drain cum sampling valve.
- xv) One filter valve on upper side of the transformer.
- xvi) Oil filling hole having p. 1- ¼ " thread with plug and drain plug on the conservator.
- xvii) Silica gel breather (for non-sealed type transformer)
- xviii) Base channel 100 mmx50 mm, 460 mm long with holes to make them suitable for fixing on a platform or plinth.
- xix) 4 No. rollers for transformers.
- xx) Pressure relief device or explosion vent.
- xxi) Oil level gauge
  - 5 °C and 90°C marking for non-sealed type Transformers
  - - 30°C marking for sealed type transformers

- xxii) Nitrogen / air filling device/ pipe with welded cover Capable of reuse (for sealed type transformers)
- xxiii) Inspection hole for transformers.
- xxiv) Pressure gauge for sealed type transformers.

## 25. FASTENERS

- i) 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.
- ii) Bolts or studs shall not be less than 6 mm in diameter except when used for small wiring terminals.
- iii) All nuts and pins shall be adequately locked.
- iv) 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.
- v) All bolts/nuts/washers exposed to atmosphere should be as follows.
  - Size 12 mm or below – Stainless steel
  - Above 12 mm- steel with suitable finish like electro galvanized with passivation or hot dip galvanized.
- vi) 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 and nuts are placed so that they are inaccessible by means of ordinary spanners, special spanners shall be provided.
- vii) 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.
- viii) Taper washers shall be provided where necessary.
- ix) Protective washers of suitable material shall be provided front and back of the securing screws.

## 26. OVERLOAD CAPACITY

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

## 27. TESTS

- i) All the equipment offered shall be fully type tested by the bidder or his collaborator as per the relevant standards including the additional type tests. The type test must have been conducted on a transformer of same design **during the last five years** at the time of bidding. The bidder shall furnish four sets of type test reports along with the offer. **In case, the offered transformer is not type tested, the bidder will conduct the type test as per the relevant standards including the additional type tests at his own cost in CPRI/ NABL accredited laboratory in the presence of employers representative(s) without any financial liability to employer in the event of order placed on him.**
- ii) Special tests other than type and routine tests, as agreed between purchaser and bidder shall also be carried out as per the relevant standards.
- iii) The requirements of site tests are also given in this clause.
- iv) The test certificates for all routine and type tests for the transformers and also for the bushings and transformer oil shall be submitted with the bid.
- v) The procedure for testing shall be in accordance with IS 1180 (Part-1) :2014 /2026 as the case may be except for temperature rise test.
- vi) Before dispatch each of the completely assembled transformers shall be subjected to the routine tests at the manufacturer's works.

## 28. ROUTINE TESTS

- i) Ratio, polarity, phase sequence and vector group.

- ii) No Load current and losses at service voltage and normal frequency.
- iii) Load losses at rated current and normal frequency.
- iv) The test certificates for all routine and type tests for the transformers and also for the bushings and transformer oil shall be submitted after the receipt of order.
- v) Impedance voltage test.
- vi) Resistance of windings at each tap, cold (at or near the test bed temperature).
- vii) Insulation resistance.
- viii) Induced over voltage withstand test.
- ix) Separate source voltage withstand test.
- x) Neutral current measurement-The value of zero sequence current in the neutral of the star winding shall not be more than 2% of the full load current.
- xi) Oil samples (one sample per lot) to comply with IS 1866.
- xii) Measurement of no load losses and magnetizing current at rated frequency and 90%, 100% and 110% rated voltage.
- xiii) Pressure and vacuum test for checking the deflection on one transformer of each type in every inspection.

## 29. TYPE TESTS TO BE CONDUCTED ON ONE UNIT

In addition to the tests mentioned in clause 30 and 31 following tests shall be conducted :

- i) Temperature rise test for determining the maximum temperature rise after continuous full load run. The ambient temperature and time of test should be stated in the test certificate.
- ii) Short circuit withstand test: Thermal and dynamic ability.
- iii) Air Pressure Test: As per IS – 1180 (Part-1):2014.
- iv) Magnetic Balance Test.
- v) Un-balanced current test: The value of unbalanced current indicated by the ammeter shall not be more than 2% of the full load current.
- vi) Noise-level measurement.
- vii) Measurement of zero-phase sequence impedance.
- viii) Measurement of Harmonics of no-load current.
- ix) Transformer tank shall be subjected to specified vacuum. The tank designed for vacuum shall be tested at an internal pressure of 0.35 kg per sq cm absolute (250 mm of Hg) for one hour. The permanent deflection of flat plates after the vacuum has been released shall not exceed the values specified below:

Horizontal length of flat plate (in mm)	Permanent deflection (in mm)
Upto and including 750	5.0
751 to 1250	6.5
1251 to 1750	8.0
1751 to 2000	9.0

- x) Transformer tank together with its radiator and other fittings shall be subjected to pressure corresponding to twice the normal pressure or 0.35 kg / sq.cm whichever is lower, measured at the base of the tank and maintained for an hour. The permanent deflection of the flat plates after the excess pressure has been released, shall not exceed the figures for vacuum test.
- xi) Pressure relief device test: The pressure relief device shall be subject to increasing fluid pressure. It shall operate before reaching the test pressure as specified in the above class. The operating pressure shall be recorded. The device shall seal-off after the excess pressure has been released.
- xii) **Short Circuit Test and Impulse Voltage Withstand Tests:** The purchaser intends to procure transformers designed and successfully tested for short circuit and impulse test. In case the transformers proposed for supply against the order are not exactly as per the tested design, the supplier shall be required

to carry out the short circuit test and impulse voltage withstand test at their own cost in the presence of the representative of the purchaser.

- The supply shall be accepted only after such test is done successfully, as it confirms unsuccessful withstand of short circuit and healthiness of the active parts thereafter on untanking after a short circuit test.
- Apart from dynamic ability test, the transformers shall also be required to withstand thermal ability test or thermal withstand ability will have to be established by way of calculations.
- It may also be noted that the purchaser reserves the right to conduct short circuit test and impulse voltage withstand test in accordance with the IS, afresh on each ordered rating at purchaser cost, even if the transformers of the same rating and similar design are already tested. This test shall be carried out on a transformer to be selected by the purchaser either at the manufacturer's works when they are offered in a lot for supply or randomly from the supplies already made to purchaser's stores. The findings and conclusions of these tests shall be binding on the supplier.

### **30. ACCEPTANCE TESTS**

- i) **At least 1 no. transformers** shall be subjected to the following routine/ acceptance test in presence of purchaser's representative at the place of manufacture before dispatch without any extra charges. The testing shall be carried out in accordance with IS:1180 (Part-1): 2014 and IS:2026.
- ii) Checking of weights, dimensions, fitting and accessories, tank sheet thickness, oil quality, material, finish and workmanship as per GTP and contract drawings on one transformer.
- iii) Physical verification of core coil assembly and measurement of flux density of one unit with reference to short circuit test report.
- iv) Temperature rise test on one unit of the total ordered quantity.

### **31. TESTS AT SITE**

The purchaser will conduct the following test on receipt of transformers in their store. The utility shall arrange all equipment, tools & tackle and manpower for the testing. The bidder will deputee his representative to witness the same. All such test shall be conducted by utility not later than 10 days from receipt of transformers.

- i) Megger Test
- ii) Ratio test

### **32. INSPECTION**

In respect of raw material such as core stampings, winding conductors, insulating paper and oil, supplier shall use materials manufactured/supplied by standard manufacturers and furnish the manufacturers' test certificate as well as the proof of purchase from these manufacturers (excise gate pass) for information of the purchaser. The bidder shall furnish following documents along with their offer in respect of the raw materials:

- i) Invoice of supplier.
- ii) Mill's certificate.
- iii) Packing list.
- iv) Bill of landing.
- v) Bill of entry certificate by custom.

Please refer to —**Check-list for Inspection of Prime quality CRGO for Transformers**” attached at Annexure-A. It is mandatory to follow the procedure given in this Annexure.

### **33. INSPECTION AND TESTING OF TRANSFORMER OIL**

- i) To ascertain the quality of the transformer oil, the original manufacturer's tests report should be submitted at the time of inspection. Arrangements should also be made for testing of transformer oil as per IS: 335, after taking out the sample from the manufactured transformers and tested in the presence of purchaser's representative.
- ii) To ensure about the quality of transformers, the inspection shall be carried out by the purchaser's representative at following two stages:-
  - Anytime during receipt of raw material and manufacture/ assembly whenever the purchaser desires.
  - At finished stage i.e. transformers are fully assembled and are ready for dispatch.
- iii) The stage inspection may be carried out.
- iv) After the main raw-material i.e. core and coil material and tanks are arranged and transformers are taken for production on shop floor and a few assemblies have been completed, the firm shall intimate the purchaser in this regard, so that an officer for carrying out such inspection could be deputed, as far as possible within seven days from the date of intimation. During the stage inspection a few assembled cores shall be dismantled to ensure that the laminations used are of good quality. Further, as and when the transformers are ready for despatch, an offer intimating about the readiness of transformers, for final inspection for carrying out tests as per relevant IS shall be sent by the firm along with Routine Test Certificates. The inspection shall normally be arranged by the purchaser at the earliest after receipt of offer for pre-delivery inspection.
- v) In case of any defect/defective workmanship observed at any stage by the purchaser's Inspecting Officer, the same shall be pointed out to the firm in writing for taking remedial measures. Further processing should only be done after clearance from the Inspecting Officer/ purchaser.
- vi) All tests and inspection shall be carried out at the place of manufacture unless otherwise specifically agreed upon by the manufacturer and purchaser at the time of purchase. The manufacturer shall offer the Inspector representing the Purchaser all reasonable facilities, without charges, to satisfy him that the material is being supplied in accordance with this specification. This will include Stage Inspection during manufacturing stage as well as Active Part Inspection during Acceptance Tests.
- vii) The manufacturer shall provide all services to establish and maintain quality of workmanship in his works and that of his sub-contractors to ensure the mechanical /electrical performance of components, compliance with drawings, identification and acceptability of all materials, parts and equipment as per latest quality standards of ISO 9000.
- viii) Purchaser shall have every right to appoint a third party inspection to carry out the inspection process.
- ix) The purchaser has the right to have the test carried out at his own cost by an independent agency wherever there is a dispute regarding the quality supplied. Purchaser has right to test 1% of the supply selected either from the stores or field to check the quality of the product. In case of any deviation purchaser has every right to reject the entire lot or penalize the manufacturer, which may lead to blacklisting, among other things.

### **34. QUALITY ASSURANCE PLAN**

- i) The bidder shall invariably furnish following information along with his bid, failing which his bid shall be liable for rejection. Information shall be separately given for individual type of equipment offered.

- ii) Statement giving list of important raw materials, names of sub-suppliers for the raw materials, list of standards according to which the raw materials are tested, list of tests normally carried out on raw materials in the presence of bidder's representative, copies of test certificates.
- iii) Information and copies of test certificates as above in respect of bought out accessories.
- iv) List of manufacturing facilities available.
- v) Level of automation achieved and list of areas where manual processing exists.
- vi) List of areas in manufacturing process, where stage inspections are normally carried out for quality control and details of such tests and inspection.
- vii) List of testing equipment available with the bidder for final testing of equipment along with valid calibration reports. These shall be furnished with the bid. Manufacturer shall possess 0.1 accuracy class instruments for measurement of losses.
- viii) Quality Assurance Plan (QAP) with hold points for purchaser's inspection.
- ix) The successful bidder shall within 30 days of placement of order, submit following information to the purchaser :
  - List of raw materials as well as bought out accessories and the names of sub suppliers selected from those furnished along with offer.
  - Type test certificates of the raw materials and bought out accessories.
  - The successful bidder shall submit the routine test certificates of bought out accessories and central excise passes for raw material at the time of routine testing.
  - ISI marking on the transformer is mandatory. As per Quality Control Order for Electrical Transformers- 2015, issued by Department of Heavy Industries, Government of India, the Standard / ISI marking on Distribution Transformers is mandatory and the product should be manufactured in compliance with IS 1180 Part-1: (2014).

### **35. DOCUMENTATION**

- i) The bidder shall furnish along with the bid the dimensional drawings of the items offered indicating all the fittings.
- ii) Dimensional tolerances.
- iii) Weight of individual components and total weight.
- iv) An outline drawing front (both primary and secondary sides) and end-elevation and plan of the tank and terminal gear, wherein the principal dimensions shall be given.
- v) Typical general arrangement drawings of the windings with the details of the insulation at each point and core construction of transformer.
- vi) Typical general arrangement drawing showing both primary and secondary sides and end- elevation and plan of the transformer.

### **36. PACKING AND FORWARDING**

- i) The packing shall be done as per the manufacturer's standard practice. However, it should be ensured that the packing is such that, the material would not get damaged during transit by Rail / Road / Sea.
- ii) The marking on each package shall be as per the relevant IS.

### **37. GUARANTEE**

- i) The manufacturers of the transformer shall provide a guarantee of 60 months from the date of receipt of transformer at the stores of the Utility. In case the transformer fails within the guarantee period, the supplier will depute his representative within 15 days from date of intimation by utility for joint inspection. In case, the failure is due to the reasons attributed to supplier, the



transformer will be replaced/repared by the supplier within 2months from date of joint inspection.

- ii) The outage period i.e. period from the date of failure till unit is repaired/ replaced shall notbe counted for arriving at the guarantee period.
- iii) In the event of the supplier's inability to adhere to the aforesaid provisions, suitablepenal action will be taken against the supplier which may inter alia include blacklisting ofthe firm for future business with the purchaser for a certain period.