Annexure ‘B’

**STANDARD TECHNICAL SPECIFICATION**

**FOR**

**OUTDOOR TYPE THREE PHASE OIL IMMERSED**

**(INCLUDING COMPLETELY SELF PROTECTED)**

**DISTRIBUTION TRANSFORMERS, type tested, BIS level-II 11kV/433V, Al Wd, CRGO core, 25, 63, 100 & 200 KVA RATING**

1 **SCOPE**:

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| 1.1 |  | This specification covers design, engineering, manufacture, assembly, stage testing, inspection and testing before supply and delivery at site of oil immersed, naturally cooled 3 phase 11 kV/433 V distribution transformers for outdoor use. |
| 1.2 |  | It is not the intent to specify completely herein all the details of the design and construction of equipment. However 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. |
| 1.3 |  | 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. |
| 1.4 |  | All outdoor apparatus, including bushing insulators with their mountings, shall be designed so as to avoid any accumulation of water. |
| 2 |  | STANDARD RATINGS: |
| 2.1 |  | The standard ratings shall be BIS level-II for 11 kV distribution transformers. |
| 3 |  | STANDARDS: |
| 3.1 |  | The materials shall conform in all respects to the relevant Indian/International Standards, with latest amendments thereof unless otherwise specified herein. Some of them are listed below: |

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| **Indian Standard** | **Title** | **International and Internationally recognized standards** |
| IS -2026 | Specification for Power Transformers | IEC76 |
| IS -1180 | Outdoor distribution Transformer up to and including 200 KVA |  |
| IS-335 | Specification for Transformer Oil | BS 148, D-1473, D-1 533-1 934 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 -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 | I EC 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. |  |

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| 3.2 |  | Material conforming to other internationally accepted standards, which ensure equal or better quality than the standards mentioned above, would also be acceptable. In case the bidders who wish to offer material conforming to other standards, the bidder shall clearly bring out the salient points of difference between the standards adopted and the specific standards in relevant schedule. Four copies of such standards with authentic English translations shall be furnished along with the offer. However, the decision of Nigam, in this regard, shall be final. |
| 4. |  | SERVICE CONDITIONS: |
| 4.1 |  | 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 -1). |
|  | i | Location : At various locations in the State of Jharkhand |
|  | ii | Maximum ambient air temperature (°C) : 50 |
|  | iii | Minimum ambient air temperature (°C) : -5 |
|  | iv | Maximum average daily ambient : 40  air temperature (°C) |
|  | v | Maximum yearly weighted average : 32  ambient temperature(°C) |
|  | vi | Maximum altitude above mean : 1000 meters  sea level (Meters) |
| Note: | |  |
| 1 |  | The equipment shall generally be for use in moderately hot and humid tropical climate, conducive to rust and fungus growth unless otherwise specified. |
| 5 |  | PRINCIPAL PARAMETERS: |
| 5.1 |  | The transformers shall be suitable for outdoor installation with three phase, 50 Hz, 11 kV system in which the neutral is effectively earthed and they should be suitable for service with fluctuations in supply voltage upto 12.5% to minus 12.5%. |
| 5.2 |  | **The transformer may be overloaded during upto 120% of its continuous rating in accordance with IEC Publication 354 or IS:6600. Bushings and other current carrying parts shall also be designed for this condition.** |
| 5.3 |  | **The transformer shall be capable of withstanding for two seconds without damage to any external short circuit, with the short circuit MVA available at the terminals of either winding with rated voltage on the other winding. If short circuit tests have been carried out on the particular design of transformer offered, the test results shall be supplied with the bid.** |

5.2 The transformers shall conform to the following specific parameters :

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| --- | --- | --- |
| **SI.No.** | **Item** | **11 kV Distribution Transformers** |
| 1 | System voltage (max.) | 12 kV |
| 2 | Rated voltage HV | 11 kV |
| 3. | Rated voltage LV | 433 – 250 V\* |
| 4. | Frequency | 50 Hz +/- 5%\* |
| 5 | No. of Phases | Three |
| 6 | Connection HV | Delta |
| 7 | Connection LV | Star (Neutral brought out) |
| 8. | Vector group | Dyn-11 |
| 9. | Type of cooling | ONAN |
| 10. | Continuous capacity | 25, 63, 100 & 200 KVA |

Audible sound levels (decibels) at rated voltage and frequency for liquid immersed distribution transformers shall be as below (NEMA Standards):

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| --- | --- |
| kVA rating | Audible sound levels (decibels) |
| 0-50 | 48 |
| 51-100 | 51 |
| 101-200 | 55 |

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| --- | --- | --- |
| 6 |  | **TECHNICAL REQUIREMENTS:** |
| 6.1.1 |  | **CORE MATERIAL** – CRGO |
| 6.1.2 |  | CRGO Material |
| 6.1.2.1 |  | The core shall be stack type of high grade, non-ageing, **Cold Rolled Grain Oriented (CRGO)** 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. |
| 6.1.2.2 |  | The core shall be constructed from high grade, non-ageing, **Cold Rolled Grain Oriented (CRGO) silicon steel of M3/M4 Grade (0.23-0.27 mm) or better grade** laminations only. No other core materials shall be entertained. Bidders are requested to note that only **PRIME CORE M3/M4 Grade (0.23-0.27 mm) materials or better grade** are to be used. BIS certificate of the CRGO core of manufacture shall be provided by the bidder. |
| 6.1.2.3 |  | The bidder should offer the core for inspection and approval by the purchaser during manufacturing stage. |
| 6.1.2.4 |  | 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. |
| 6.1.2.5 |  | No-load current shall not exceed 3% of full load current and will be measured by energising the transformer at 433 volts, 50 Hz on the secondary. Increase of voltage of 433 volts by 12.5% shall not increase the no-load current by 6% (maximum) of full load current. |
| 7. |  | **WINDINGS:** |
| 7.1 |  | Material: |
| 7.1.1 |  | HV and LV windings shall be wound from Double Paper covered , **aluminium conductor /strip**. |
| 7.1.2 |  | LV winding shall be such that neutral formation will be at top. |
| 7.1.3 |  | The winding construction of single HV coil wound over LV coil is preferable. |
| 7.1.4 |  | Inter layer insulation shall be Nomex /Epoxy dotted Kraft Paper. |
| 7.1.5 |  | Current density for HV and LV winding should not be more than 1.6 Ampere per sq mm for Aluminium Conductor. |
| 7.1.6 |  | The core/coil assembly shall be securely held in position to avoid any movement under short circuit conditions. |
| 7.1.7 |  | Joints in the winding must be strictly avoided. |
| 7.1.8 |  | **Number of HV coils per phase/ limb shall not be less than 4 nos. for DTR of rating 25 & 63 kVA and for 100 kVA and 200 kVA transformer the no. of HV coils per phase/ limb shall be minimum 6 nos.** |
| 7.1.9 |  | Minimum clearance between tank wall and HV windings/live parts, where the HV winding is 12 kV grade, clearance: 30 mm no additional insulating barrier shall be used in between. |
| 8 |  | **TAPS:** |
| 8.1 |  | No tapping shall be provided for transformers up to 200 kVA rating. |
| 9. |  | **OIL:** |
| 9.1 |  | The insulating oil shall comply with the requirements of IS 335: 1993/ IS 335:2018 (Type-II) or BS 1448 or with latest amendment. Use of recycled oil is not acceptable. The specific resistance of the oil shall not be less than 2.5 X1012 ohm-cm at 27 °C when tested as per IS 6103. |
| 9.2 |  | Oil shall be filtered and tested for break down voltage (BDV) and moisture content before filling. |
| 9.3 |  | The oil shall be filled under vacuum. |
| 9.4 |  | 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. |
| 9.5 |  | Minimum capacity of Transformer Tank Oil at first fill:-   |  |  |  | | --- | --- | --- | | **S. No.** | **Transformer rating (in kVA)** | **Tank Oil Capacity (in Litres)** | | 1 | 25 | 100 | | 2 | 63 | 180 | | 3 | 100 | 240 | | 4 | 200 | 320 | |
| 9.6 |  | At the time of procurement, a certain percentage of the total quantity may be asked with Easter Oil (relevant applicable IS). |

**10 INSULATION LEVELS:**

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| --- | --- | --- | --- |
| **SI. No.** | **Voltage (kV)** | **Impulse Voltage (kV Peak)** | **Power Frequency Voltage (kV)** |
| 1 | 0.433 | - | 3 |
| 2 | 11 | 95 | 28 |

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| 11 |  | **LOSSES**: |
| 11.1 |  | The bidder shall guarantee individually the no-load loss and load loss without any positive tolerance. The bidder shall also guarantee the total losses at 50% and 100% load condition (at rated voltage and frequency and at 75 °C). |
| 11.2 |  | The maximum allowable losses at rated voltage and rated frequency permitted at 75 °C for 11/0.433 kV transformers can be chosen by the utility from the values of BIS level-II rating as indicated below: |

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| --- | --- | --- | --- | --- | --- | --- | --- |
| Voltage Ratio | | | **Rating (kVA)** | **BIS level-II** | | | |
|  | Max. Losses at 50% loading (Watts) | Max. Losses at 100% loading (Watts) | Maximum iron loss (watts) | |
| 11 000/433 -250V | | | 25 | **190** | **635** | **75** | |
| 63 | **340** | **1140** | **125** | |
| 100 | **475** | **1650** | **192** | |
| 200 | **780** | **2300** | **310** | |
|  | |  | **Bids with higher losses than the above specified values would be treated as non-responsive. However, the manufacturer can offer losses less than above.**  **All the losses parameter mentioned after test in type test report shall only be considered.** | | | | |
| 12. | |  | **TOLERANCES:** | | | | |
| 12.1 | |  | **No positive tolerance shall be allowed on the maximum losses displayed on the label for both 50% and 100% loading values.** | | | | |
| 13. | |  | PERCENTAGE IMPEDANCE: | | | | |
| 13.1 | |  | The value of impedance of transformers at 75 °C shall be 4.5% with tolerance in accordance with IS 2026. | | | | |
| 14. | |  | Temperature rise: The temperature rise over ambient temp. (50 Degree Centigrade) **shall not exceed** the limits given below: | | | | |
| 14.1 | |  | Top **oil** temperature rise measured by thermometer : **35 °C** | | | | |
| 14.2 | |  | **Winding** temperature rise measured by resistance method : **40 °C** | | | | |
|  | |  | **Bids not meeting the above limits of temperature rise will be treated as non-responsive.** | | | | |
| 14.3 | |  | 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: | | | | |
| **15.1** | |  | **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.** | | | | |
| **15.2** | |  | **Purchaser shall reject the entire lot during the test at supplier's works, if the temperature rise exceeds the specified values.** | | | | |
| **15.3**  **15.4** | |  | **Purchaser shall reject any transformer during the test at supplier's works, if the impedance values differ from the guaranteed values including tolerance.**  **The other parameters should also comply with approved GTP or else purchaser can reject the tested transformer or the offered lot.** | | | | |
|  | |  |  | | | | |
| 16. | |  | INSULATION MATERIAL: | | | | |
| 16.1 | |  | 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. | | | | |
| 16.2 | |  | 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. | | | | |
| 17.1 | |  | **TANK** | | | | |
| 17.1.1 | |  | 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. | | | | |
| 17.1.2 | |  | All joints of tank and fittings shall be oil tight and no bulging should occur during service. | | | | |
| 17.1.3 | |  | Inside of tank shall be painted with varnish/hot oil resistant paint. | | | | |
| 17.1.4 | |  | The top cover of the tank shall be slightly sloping to drain rain water. | | | | |
| 17.1.5  17.1.6  17.1.8  17.1.7 | |  | 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.  **The tank cover should have 75-90 degree downward bent edges on all sides to protect the gasket under the top cover from direct exposure to wheather. The tank cover should have slightly slanted towards HV side so that water could not accumulate on the tank cover. Folded portion should be min 25-30 mm downward.**  **All sealing washers/ gaskets shall be made of oil and heat-resistant Nitrile/ Neoprene rubber/ synthetic rubber bonded cork type RC-70C gaskets. Gaskets made of netural rubber cork sheet are not permissible.**  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. | | | | |
| **17.2** | |  | **PLAIN TANK:** | | | | |
| 17.2.1 | |  | Conventional plain tank shall be constructed. The transformer tank and cover shall be fabricated from good commercial grade low Carbon Steel suitable for welding and of adequate thickness..**.**  The tank wall should be of thickness of following:-   |  |  |  |  | | --- | --- | --- | --- | | S. No. | Transformer Capacity | Top & Bottom | Sides | | 1 | Upto 100 kVA | 5 mm | 3.15 mm | | 2 | For 200 kVA | 6 mm | 4 mm | | **Tolerance as per IS: 1852 shall be applicable** | | | | | | | | |
| 17.2.2 | |  | In case of rectangular tanks upto 200 kVA the corners shall be fully welded at the corners from inside and outside of the tank to withstand a pressure of 80 kPa and vacuum of 250mm of mercury for 30 minutes.  In case of transformers of 100 kVA and below, there shall be no joints at corners and there shall not be more than 2 joints in total. | | | | |
| 17.2.3 | |  | 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. The space above oil level in the tank shall be filled with dry air or nitrogen conforming to commercial grade of IS 1747. | | | | |
| 17.2.4 | |  | The tank shall be reinforced by welded flats on all the outside walls on the edge of the tank. | | | | |
| 17.2.5 | |  | 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: | | | | |

(All figures in mm)

|  |  |
| --- | --- |
| **Horizontal length of flat plate** | **Permanent deflection** |
| Up to and including 750 | 5.0 |
| 751 to 1250 | 6.5 |
| 1251 to 1750 | 8.0 |
| 1751 to 2000 | 9.5 |
| 2001 to 2250 | 11.0 |
| 2251 to 2500 | 12.0 |
| 2501 to 3000 | 16.0 |
| Above 3000 | 19.0 |

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| 17.2.6 |  | **The body of the tank should have embossing on any face (excluding top & bottom) as ‘JBVNL’ min. 75 mm and year of manufacturing.** |
| 17.2.7 |  | **Serial No. of transformer of the offered lot of inspection must be punched on the body of each transformer (excluding top and bottom).** |
| 17.2.8 |  | The tank shall further be capable of withstanding a pressure of 0.8 kg/ sq.cm (g) and a vacuum of 0.7 kg/sq.cm (g) without any deformation. |
| 17.2.9 |  | The radiators can be tube type or fin type or pressed steel type to achieve the desired cooling to limit the specified temperature rise. |
| **18** |  | **CONSERVATOR:** |
| 18.1 |  | The conservator shall be provided on transformers of rating 63 kVA and above for plain tank. |
| 18.2 |  | When a conservator is provided, 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 (1%")] normal size thread with cover. In addition, the cover of the main tank shall be provided with an air release plug. |
| 18.3 |  | 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 500g of silica gel conforming to IS 3401 for transformers upto 200 kVA. |
| 18.4 |  | 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 the oil shall be contained in the conservator. |
| 18.5 |  | 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. |
| 18.6 |  | 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. |
| 18.7 |  | **A suitable oil level gauge (Magnetic type of dia 100 mm) shall be fitted on the transformers and so located that it can be easily read from ground level. The gauge fitted with the conservator shall be graduated for temperatures of 5 Degree C, 30 Degree C and + 98 Degree C.** |
| **19** |  | **SURFACE PREPARATION AND PAINTING:** |
| 19.1 |  | GENERAL |
| 19.1.1 |  | All paints, when applied in a normal full coat, shall be free from runs, sags, wrinkles, patchiness, brush marks or other defects. |
| 19.1.2 |  | 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. |
| **19.2** |  | **CLEANING AND SURFACE PREPARATION:** |
| 19.2.1 |  | 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. |
| 19.2.2 |  | Steel surfaces shall be prepared by shot blast cleaning (IS9954) to grade Sq. 2.5 of ISO 8501 -1 or chemical cleaning including phosphating of the sheet quality (IS 3618). |
| 19.2.3 |  | 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. |
| **19.3** |  | **PROTECTIVE COATING:** |
| 19.3.1 |  | As soon as all items have been cleaned and within four hours of the subsequent drying, they shall be given suitable anti-corrosion protection. |
| **19.4** |  | **PAINT MATERIAL:** |
| 19.4.1 |  | 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 |
| 19.4.2 |  | For external surfaces one coat of thermo setting powder paint or one coat of epoxy primer followed by two coats of synthetic enamel/polyurethene base paint. These paints can be either air drying or stoving. |
| 19.4.3 |  | 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. |
| **19.5** |  | **PAINTING PROCEDURE:** |
| 19.5.1 |  | All prepared steel surfaces should be primed before visible re-rusting occurs or within 4 hours, whichever is sooner. Chemical treated steel surfaces shall be primed as soon as the surface is dry and while the surface is still warm. |
| 19.5.2 |  | 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 thickens by more than 25%. |
| **19.6** |  | **DAMAGED PAINTWORK:** |
| 19.6.1 |  | Any damage occurring to any part of a painting scheme shall be made good to the same standard of corrosion protection and appearance as that was originally applied. |
| 19.6.2 |  | Any damaged paint work shall be made good as follows: |
| 19.6.2.1 |  | The damaged area, together with an area extending 25 mm around its boundary, shall be cleaned down to bare metal. |
| 19.6.2.2 |  | A priming coat shall be immediately applied, followed by a full paint finish equal to that originally applied and extending 50 mm around the perimeter of the original damage. |
| 19.6.2.3 |  | The repainted surface shall present a smooth surface. This shall be obtained by carefully chamfering the paint edges before and after priming. |
| **19.7** |  | **DRY FILM THICKNESS:** |
| 19.7.1 |  | To the maximum extent practicable the coats shall be applied as a continuous film of uniform thickness and free of pores. Overspray, skips, runs, sags and drips should be avoided. The different coats may or may not be of the same colour. |
| 19.7.2 |  | Each coat of paint shall be allowed to harden before the next is applied as per manufacturer's recommendation. |
| 19.7.3 |  | Particular attention must be paid to full film thickness at the edges. |
| 19.7.4 |  | The requirements for the dry film thickness (DFT) of paint and the materials to be used shall be as given below: |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| SI. 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. | Liquid paint  a) Epoxy (primer) | outside | 01 | 30 |
| b) P.U. Paint (Finish coat) | outside | 02 | 25 each |
| c) Hot oil paint/ Varnish | inside | 01 | 35/10 |

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| **19.8** |  | **TESTS FOR PAINTED SURFACE:** |
| 19.8.1 |  | The painted surface shall be tested for paint thickness. |
| 19.8.2 |  | The painted surface shall pass the cross hatch adhesion test and impact test as acceptance tests and Salt spray test and Hardness test as type test as per the relevant ASTM standards. |
| **Note** | | **Supplier shall guarantee the painting performance requirement for a period of not less than 5 year** |
| **20** |  | **BUSHINGS:** |
| 20.1 |  | The bushings shall conform to the relevant standards specified and shall be of outdoor type. The bushing rods and nuts shall be made of brass material min 12 mm (upto 100 kVA) and min 18 mm (for 200 KVA) diameter for both HT and LT bushings. The bushings shall be fixed to the transformers on side with straight pockets and in the same plane or the top cover for transformers above 100 KVA.**.** For transformers of 100 kVA and below the bushing can be mounted on pipes.The tests as per latest IS 2099 and IS 7421' shall be conducted on the transformer bushings.   |  |  |  |  | | --- | --- | --- | --- | | S. No. | Transformer Capacity | HT | LT | | 1 | Upto 100 kVA | 12 mm | 12 mm | | 2 | For 100 kVA | 12 mm | 18 mm | |
| 20.2 |  | For 11 kV, 17.5 kV class bushings and for 0.433 kV, 1.1 kV class bushings shall be used. |
| 20.3 |  | Bushing can be of porcelain/epoxy material. Polymer insulator bushings conforming with relevant I EC can also be used. |
| 20.4 |  | Bushings of plain shades as per IS 3347 shall be mounted on the side of the Tank / on top cover. |
| 20.5 |  | 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 |

20.6 Minimum external phase to phase and phase to earth clearances of bushing terminals shall be as follows:

|  |  |  |
| --- | --- | --- |
| Voltage | Clearance | |
|  | Phase to phase | Phase to earth |
| 11 kV | 255 mm | 140 mm |
| LV | 75 mm | 40 mm |

|  |  |  |
| --- | --- | --- |
| 20.7 |  | Arcing horns shall be provided on HV bushings. |
| 20.8 |  | 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. |
| 20.9 |  | The bushings shall be of reputed make supplied by those manufacturers who are having manufacturing and testing facilities for insulators. |
| 20.10 |  | The terminal arrangement shall not require a separate oil chamber not connected to oil in the main tank. |
| **21** |  | **TERMINAL CONNECTORS:** |
| 21.1 |  | The LV and HV bushing stems with provision of CSP/protective features as stipulated in cl # 27 & 28 of technical specification shall be provided with suitable terminal connectors as per IS 5082 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** |  | **LIGHTNING ARRESTORS:** |
| 22.1 |  | 9 kV, 5 kA metal oxide lightning arresters of reputed make conforming to IS 3070 Part-Ill, one number per phase shall be provided.(To be fitted under the HV bushing with Gl earth strip 25x4 mm connected to the body of the transformer with necessary clamping arrangement) Lightening arrestors with polymer insulators in conformance with relevant IEC can also be used.  **Type test report of lighting arrestor shall be uploaded at the time of bid or shall be provided at the time of inspection by the supplier.** |
| **23** |  | **TERMINAL MARKINGS:** |
| **23.1** |  | High voltage phase windings shall be marked both in the terminal Nigams 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** |  | **FITTINGS:** |
| **24.1** |  | 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 |
|  | vii | HV bushings - 3 Nos. |
|  | viii | LV bushings - 4 Nos |
|  | ix | Pulling lugs |
|  | x | Stiffener |
|  | xi | Radiators - Number. and length may be mentioned (as per heat dissipation calculations)/ corrugations. |
|  | xii | 9 kV, 5 kA lightning arresters on HT side - 3 No. |
|  | xiii | Magnetic oil level gauge, |
|  | xiv | Drain cum sampling valve, |
|  | xv | Top filter valve |
|  | xvi | Oil filling hole having p. 1 - *%*" thread with plug and drain plug on the conservator. |
|  | xvii | Silica gel breather |
|  | xviii | Base channel 75x40 mm for up to 200 kVA, 460 mm long with holes to make them suitable for fixing on a platform or plinth. |
|  | xix | Pressure relief device or explosion vent. |
| **25** |  | **FASTENERS:** |
| 25.1 |  | 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. |
| 25.2 |  | Bolts or studs shall not be less than 6 mm in diameter except when used for small wiring terminals. |
| 25.3 |  | All nuts and pins shall be adequately locked. |
| 25.4 |  | 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. |
| 25.5 |  | All ferrous bolts, nuts and washers placed in outdoor positions shall be treated to prevent corrosion, by hot dip galvanising, except high tensile steel bolts and spring washers which shall be electro-galvanised / plated. Appropriate precautions shall be taken to prevent electrolytic action between dissimilar metals. |
| 25.6 |  | 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 Nigam 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. |
| 25.7 |  | 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. |
| 25.8 |  | Taper washers shall be provided where necessary. |
| 25.9 |  | Protective washers of suitable material shall be provided front and back of the securing screws. |
| **26** |  | **OVERLOAD CAPACITY** |
| 26.1 |  | The transformers shall be suitable for loading as per IS 6600. |
| **27** |  | **COMPLETELY SELF PROTECTED (CSP) TRANSFORMERS:** |
| 27.1 |  | CSP transformer is to be provided for ratings up to 200 kVA |
| **28** |  | **PROTECTION FEATURES:** |
| 28.1 |  | External Weather proof HV fuse on the HV side of transformer. |
| 28.1.1 |  | The fuse is mounted normally inside of the primary bushing for the three phases and is connected to the high voltage winding through a terminal block. This has to protect that part of the electrical distribution system which is ahead of the distribution transformers from faults which occur inside the distribution transformer i.e., either in the windings or some other part of the transformer. It shall be ensured that this fuse does not blow for faults on the secondary side (LT side) of the transformer i.e., the blowing characteristics of the fuse and LT breaker shall be so coordinated such that the fuse shall not blow for any faults on the secondary side of the transformer beyond LT breakers and those faults shall be cleared by the LT breaker only. |
| 28.2 |  | Externally weather proof Mounted LT Breaker on the LV Side of the Transformer: |
| 28.2.1 |  | 3 Pole LT circuit breaker: All LT faults after the breaker shall be cleared by this breaker. As such it shall be designed for perfect coordination with the HT fuse link. The bidder shall furnish the time / current characteristics of LT circuit breaker and 11 kV fuses for various current multiples. |
| 28.2.2 |  | The two characteristics shall be drawn on the same sheet to indicate coordination between the circuit breaker and fuse. The bidder shall carry out coordination test as indicated above and this forms one of the tests for acceptance test. |
| 28.2.3 |  | The breaker shall be coordinated thermally with the transformer design to follow closely the variations of oil temperature due to fluctuating loads and ambient temperatures. |
| **28.2.4** |  | **Arrangements shall be provided to enable the circuit breaker to be closed and opened manually standing on ground without opening of LV Box.** |
| 28.2.5 |  | The cross section of the current carrying parts of the breaker shall withstand the full load current at a current density not more than 2.5 A/sq. mm (for additional mechanical strength the area should be more). |
| 28.2.6 |  | **Rated short circuit breaking capacity of the breaker shall not be the following. The circuit breaker shall confirm to IS 13947 and should be reputed make like Siemens/ Havells/ ABB/ SCHNEIDER/C&S only.**  Rating of MCCB shall be 240V, 3P with long barrel lugs of 35, 50, 70 & 120 sqmm (minimum) for 25, 63, 100 & 200 kVA Transformer respectively.   |  |  |  |  | | --- | --- | --- | --- | | **S. No.** | **Transformer Capacity (In kVA)** | **Short Circuit Capacity** | **Rated current Capacity** | | **1** | **25** | **10 kA** | **40** | | **2** | **63** | **16 kA** | **100** | | **3** | **100** | **16 kA** | **160** | | **4** | **200** | **25 kA** | **400** | |
| **29** |  | **LOAD MANAGEMENT SIGNAL LIGHT:** |
| 29.1 |  | A signal light shall be provided to give information about the loading condition of the transformer. It shall forewarn any overloading problem at the installation such that replacement of the existing transformer with a higher capacity transformer can be planned. The signal light mechanism shall not reset itself when the load drops from the overloaded condition. The signal light shall remain lighted once the signal light contacts close due to overload and can be turned off by manual operation. (The signal light shall not give indication for momentary overloading).  Loading indication shall be available in adjustable steps of 10% starting from 70% to 110% |

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| **30** |  | **TESTS:** |
| 30.1 |  | 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 at the time of bidding. The bidder shall furnish two sets of type test reports along with the offer. Offers without type test reports will be treated as non-responsive. |
| 30.2 |  | Special tests other than type and routine tests, as agreed between purchaser and bidder shall also be carried out as per the relevant standards. |
| 30.3 |  | The requirements of site tests are also given in this clause. |
| 30.4 |  | 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. |
| 30.5 |  | The procedure for testing shall be in accordance with IS1180/2026 as the case may be except for temperature rise test. |
| 30.6 |  | Before despatch each of the completely assembled transformers shall be subjected to the routine tests at the manufacturer's works. |
| **31** |  | **ROUTINE TESTS** |
| 31.1 |  | Voltage Ratio measurement, polarity, phase sequence and vector group. Bushing positions shall have permanent markings at this stage of production. |
| 31.2 |  | No Load current and losses at service voltage and normal frequency. |
| 31.3 |  | Measurement of Load loss at full load and 75 degree C. |
| 31.4 |  | Measurement of Impedance voltages/ short circuit impedance at rated current and frequency. |
| 31.5 |  | Resistance of windings at each tap, cold (at or near the test bed temperature). |
| 31.6 |  | Insulation resistance. |
| 31.7 |  | Induced over voltage test (DVDF test). |
| 31.8 |  | Separate source voltage withstand test. |
| 31.9 |  | 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. |
| 31.10 |  | Oil samples (one sample per lot) to comply with IS 1866. |
| 31.11 |  | Measurement of no load loss and no-load current at full, 50%, 75%, 90%, 110%, 112.5% and 120% rated voltage. |
| 31.12 |  | Pressure and vacuum test for checking the deflection on transformer tank on one unit for each rating. |
| 31.13 |  | Power frequency voltage withstand tests on HV and LV windings. |
| 31.14 |  | Bushing routine test: in accordance with IEC 137/ IS 3347. |
| 31.15 |  | Oil dielectric and moisture content test: conforming to IEC 156 or IS 335. |
| 31.16 |  | Routine test certificates shall include in addition to the test results, the purchaser’s order number, the transformer serial number, outline drawing number and transformer KVA rating. Any other applicable tests shall be conducted at the discretion of purchaser without any extra cost to purchaser. |
| **32** |  | **TYPE TESTS** |
| **32.1** |  | 1. Tenderers must submit attested/ certified copy of complete volume of type test certificates (short ckt & Lightning Impulse withstand voltage and , temperature rise test etc.) as per relevant ISS issued from CPRI / ERDA, Vadodara / National Test House Govt. of India, only for the tendered item, failing which the tender shall be rejected. The copy of test certificates must contain approved drawings, test report no & date, name of test, name of material, rating, transformer serial no etc. The Test report submitted shall not be more than three years old as on the date of bid opening. 2. The submitted type-test reports must be in conformity to the technical specification of this NIT, failing which, offer will be rejected. 3. Specification (GTP) of the offered transformer must conform to the specification of the NIT, failing which the offer will be **rejected**. 4. If the offered item [Guaranteed Technical Particulars (GTP)] is not proto-type of type tested design but conforming the technical specification of NIT, then one transformer will randomly be selected and sealed by the Inspecting Authority of JBVNL, at the time of pre-despatch inspection, from the manufactured and offered **1st lot** and the tenderer would have to get this transformer type tested at **CPRI/** ERDA, Vadodara / National Test House Govt. of Indiaat his own cost. In such case 90% (ninety percent) payment of ordered value shall be made and balance 10% (ten percent) payment shall be released after submission of successful type test reports. If offered item is proto type of type tested design, fresh type test is not required, as offered design is already type-tested. |
| 32.3 |  | **Routine Test:**   * Ratio, polarity, phase sequence and vector group, dimension & weight. * No Load current and losses at service voltage and normal frequency. * Load losses at rated current and normal frequency. * Impedance voltage test. * Resistance of windings * Insulation resistance. * DVDF test. * Separate source voltage withstand test. * 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. * Oil samples (one sample per lot) to comply with IS 1866/335.. * Measurement of no load losses and magnetizing current at rated frequency and 90%, 100% and 110% rated voltage. * Pressure and vacuum test for checking the deflection. |
| 32.4 |  | **In addition to the above type tests following additional tests may be conducted at CPRI, if Nigam desires, to do so, at the cost of the supplier.** |
|  | **a.** | Temperature rise test on one transformer of each rating and measurement of hot resistance 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 |
|  | **b.** | Air Pressure Test: As per IS - 1180. |
|  | **c.** | Magnetic Balance Test. |
|  | **d.** | Measurement of Un-balanced current: The value of unbalanced current indicated by the ammeter shall not be more than 2% of the full load current. |
|  | **e.** | Noise-level measurement. |
|  | **f.** | Measurement of zero-phase sequence impedance |
|  | **g.** | Measurement of Harmonics of no-load current 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: |
|  | **h.** | Polarization Index test P.I. value shall be not less than 1.5. P.I.= IR at 600 sec/ IR at 60 sec. |
|  | **i.** | Oil leakage test: The criterion of leakage shall be discoloration by oil of white wash applied externally to suspected parts at an oil temperature of 90 degree C or other method, as approved by the Purchaser. |

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| 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 | 9.5 |
| 2001 to 2250 | 11.0 |
| 2251 to 2500 | 12.0 |
| 2501 to 3000 | 16.0 |
| Above 3000 | 19.0 |

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|  | **h.** | 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 which ever 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. |
|  | **i.** | 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. |
|  | **j.** | 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. |
| **33.** |  | **ACCEPTANCE TESTS:** |
| 33.1 |  | At least 10% transformers of the offered lot (minimum of one) 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 18:11*80* and IS:2026. |
| 33.2 |  | Checking of weights, dimensions, fitting and accessories, tank sheet thickness, oil quality, material, finish and workmanship as per GTP and contract drawings. |
| 33.3 |  | 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 |
| 33.4 |  | Temperature rise test on one unit of the total ordered quantity |
| **34** |  | **TESTS AT SITE:** |
|  |  | The purchaser reserves the right to conduct all tests on transformer after arrival at site and the manufacturer shall guarantee test certificate figures under actual service conditions. |
| **35.** |  | **INSPECTION:** |
| **35.1** |  | 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:   1. Invoice of supplier. 2. Mill's certificate 3. Packing list. 4. Bill of landing, 5. Bill of entry certificate by custom. |
| **36** |  | **INSPECTION AND TESTING OF TRANSFORMER OIL:** |
| 36.1 |  | 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, after taking out the sample from the manufactured transformers and tested in the presence of purchaser's representative. |
| 36.2 |  | To ensure about the quality of transformers, the inspection shall be carried out by the purchaser's representative at following two stages:- |
| 36.2.1 |  | Online anytime during receipt of raw material and manufacture/ assembly whenever the purchaser desires. |
| 36.2.2 |  | At finished stage i.e. transformers are fully assembled and are ready for despatch. |
| 36.3 |  | The stage inspection may be carried out, if Nigam, desires to do so. |
| 36.4 |  | 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 assembly 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 core shall be dismantled (only in case of CRGO material) to ensure that the CRGO laminations used are of good quality. Further, within 20 days after successful stage inspection, 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. |
| 36.5 |  | 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. |
| 36.6 |  | 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. |
| 36.7 |  | The manufacturer shall provide all services to establish and maintain quality of workman ship 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. |
| 36.8 |  | Purchaser shall have every right to appoint a third party inspection to carryout the inspection process. |
| 36.9 |  | 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 have every right to reject the entire lot or penalize the manufacturer, which may lead to debarring/ blacklisting, among other things. |
| **37.** |  | **QUALITY ASSURANCE PLAN:** |
| 37.1 |  | 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. |
| 37.2 |  | 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. |
| 37.3 |  | Information and copies of test certificates as above in respect of bought out accessories. |
| 37.4 |  | List of manufacturing facilities available. |
| 37.5 |  | Level of automation achieved and list of areas where manual processing exists. |
| 37.6 |  | List of areas in manufacturing process, where stage inspections are normally carried out for quality control and details of such tests and inspection. |
| 37.7 |  | 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 posses 0.5S accuracy class instruments for measurement of losses. |
| 37.8 |  | Quality Assurance Plan (QAP) with hold points for purchaser's inspection. |
| 37.9 |  | The successful bidder shall within 30 days of placement of order, submit following information to the purchaser: |
| 37.9.1 |  | List of raw materials as well as bought out accessories and the names of sub-suppliers selected from those furnished along with offer. |
| 37.9.2 |  | Type test certificates of the raw materials and bought out accessories. |
| 37.9.3 |  | The successful bidder shall submit the routine test certificates of bought out accessories and central excise passes/ relevant document for raw material at the time of routine testing. |
| **38.** |  | **DOCUMENTATION:** |
| 38.1 |  | The bidder shall furnish along with the bid the dimensional drawings of the items offered indicating all the fittings. |
| 38.2 |  | Overall Dimensional tolerances. |
| 38.3 |  | Weight of individual components and total weight. |
| 38.4 |  | 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. |
| 38.5 |  | Typical general arrangement drawings of the windings with the details of the insulation at each point and core construction of transformer. |
| 38.6 |  | Typical general arrangement drawing showing both primary and secondary sides and end-elevation and plan of the transformer. |
| **39.** |  | **PACKING AND FORWARDING:** |
| 39.1 |  | 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. |
| 39.2 |  | The marking on each package shall be as per the relevant IS. |
| **40.** |  | **GUARANTEE:** |
| 40.1 |  | The manufacturers of the transformer shall provide a guarantee of **36 months** from the last supply. In case the distribution transformer fails within the guarantee period the purchaser will immediately inform the supplier who shall take back the failed DT within 15 days from the date of the intimation at his own cost and replace/repair the transformer within forty five days of date of intimation with a roll over guarantee. |
| 40.2 |  | The outage period i.e. period from the date of failure till unit is repaired/ replaced shall not be counted for arriving at the guarantee period. |
| 40.3 |  | In the event of the supplier's inability to adhere to the aforesaid provisions, suitable penal action will be taken against the supplier which may inter alia include blacklisting of the firm for future business with the purchaser for a certain period. |
| 41 |  | **SCHEDULES:** |
| 42. |  | The bidder shall fill in the Schedule of Deviations which will be part of the offer. If the schedule are not submitted duly filled in with the offer, the offer shall be liable for rejection. |
| 43 |  | **DEVIATIONS :** |
| 43.1 |  | The bidders are not allowed to deviate from the principal requirements of the Specifications. However, the bidder is required to submit with his bid in the relevant schedule a detailed list of all deviations without any ambiguity. In the absence of a deviation list in the deviation schedules, it is understood that such bid conforms to the bid specifications and no post-bid negotiations shall take place in this regard. |
| 43.2 |  | The discrepancies, if any, between the specification and the catalogues and / or literatures submitted as part of the offer by the bidders, shall not be considered and representations in this regard shall not be entertained. |
| 43.2 |  | If it is observed that there are deviations in the offer in guaranteed technical particulars other than those specified in the deviation schedules then such deviations shall be treated as deviations. |
| 43.4 |  | All the schedules shall be prepared by vendor and are to be enclosed with the bid. |
| **44.** |  | **Label design, manner of display of BIS rating in the Distribution Transformer** |
| 44.1  45.  **46.** |  | Material of the lable shall be non detachable weather proof type. The Design of the Label, manner of display of label and its colour scheme will be in accordance with the notification of Bureau of Energy Efficiency, New Delhi /Indian Standard.  **Testing Equipment:**   1. Kilo Volt Meter (0-30 kV) for 11 kV system. 2. Volt Meter (0-1000 V) 3. Milliammeter for leakage current (0-100 ma) 4. Power Analyzer of reputed make (should display 3-Phase current, voltage, watt, and E3-Ph Power. 5. Megger – 2.5 kV & 5 kV (preferably motarised). 6. Thermometer (preferably Digital) 0-1000 C. 7. TTR Meter. 8. Winding Resistance measurement (Preferably ELTEL or reputed make) 9. Digital Multimeter measure magnetizing current & core balance of 11 kV system. 10. Clamp on ammeter (0-400/500 A) 11. Instrument for measuring the thickness of different layers of painting. 12. Instrument/ Equipment required for testing of painting as per IS 1180 (Part 1) of 2014. 13. Equipment for pressure test as per Clause no.21.5 of IS 1180 (Part 1), 2014. 14. Equipment for Oil leakage test as per Clause no.21.5 of IS 1180 (Part 1), 2014. 15. 4 (Four) nos. ambient pots as per relevant ISS for measurement of ambient temperature during Temperature rise Test. 16. Instrument for measurement of Dry Paint Thickness.   **All the above testing equipment shall be available in the testing Lab and should be calibrated from NABL Accredited Laboratory. Copy of Calibrated certificates as per GCC clause No.8 shall be available with the bidder, as and when required.**  **Manufacturer/ Bidder who have offered BIS Level-II type tested material and fulfilling all the parameter as per IS 1180, 2014, but Iron loss, volume of Oil, nos. of HV coil etc. is not matching as per technical specification of NIT, then bidder shall have to conduct type test on one Distribution Transfomer from 1st offered Lot for inspection against Cl. No. 33.1 (IV) apart from quality control in Cl. No.43 in the event if order is placed.** |