

**SCHEDULE I-A OF GUARANTEED TECHNICAL PARTICULARS FOR SUPPLY OF  
OUTDOOR TYPE THREE PHASE 11/ 0.4 33 KV ALUMINUM WOUND (LEVEL-1 AS  
PER AMENDED BIS) DISTRIBUTION TRANSFORMERS OF 63 KVA RATING.**

|             |  |          |
|-------------|--|----------|
| <b>S.N.</b> | <b>Particulars</b>                                 | <b>:</b> |
| A.          | Name of Manufacturer &                             | :        |
| B.          | Place of manufacture                               | :        |
| C.          | Make   | :        |
| 1.          | Name of Tenderer                                   | :        |
| 2.          | Type :   | :        |
| 3.          | Rating   | :        |
|             | (a) Rated output (KVA)                             | :        |
|             | (b) Rated voltage-H.V. (Volts)                     | :        |
|             | (c) Rated Voltage-L.V. (Volts)                     | :        |
|             | (d) No load voltage ratio                          | :        |
|             | (e) No. of phases                                  | :        |
|             | (f) Frequency (c/s)                                | :        |
|             | (g) Vector Group                                   | :        |
| 4.          | Method of Cooling Radiator type                    | :        |
| 5.          | Internal Dimensions of Tank                        | :        |
|             | (a) Length (mm)                                    | :        |
|             | (b) Breadth (mm)                                   | :        |
|             | (c) Height (mm)                                    | :        |
|             | (d) Thickness of tank sheets:                      | :        |
|             | (i) Sides (mm)                                     | :        |
|             | (ii) Top & Bottom (mm)                             | :        |
| 6.          | <u>DETAILS OF CORE</u>                             | :        |
|             | (a) Diameter (mm)                                  | :        |
|             | (b) Window Height (mm)                             | :        |
|             | (c) Limb Center (mm)                               | :        |
|             | (d) Width of the main step                         | :        |
|             | (e) Whether yoke is plain or stepped inside window | :        |

- (f) Cross Sectional Area (sq.mm.) :
- (i) Gross :
- (ii) Nett :
- (Staking factor of 0.97 shall be taken)
- (g) Working flux density at rated voltage & frequency (Tesla) actual as per your design. :
- (h) Over fluxing without saturation :  
(Curve to be furnished by the manufacturer in support of his claim)
- (i) Insulation Material provided for core :
- (j) Grade of Material & Thickness of Lamination used (mm) :
- (k) Total min weight of stamping used in core and yoke (kg.) :  
(Please furnish core weight calculations, details of core steps and its drawing)
7. H.V. COIL CONSTRUCTION DETAILS :
- (a) Type of winding :
- (b) Type & Size of Conductor (Bare) mm :
- (c) Size of conductor insulated (mm) :
- (d) Cross Sectional area of Conductor (mm<sup>2</sup>)
- (i) Gross :
- (ii) Nett :
- (e) No. of Coils per Limb :
- (f) Outer Diameter of Coil (mm) :
- (g) Inner Diameter of Coil (mm) :
- (h) Mean Diameter of Coil (mm)
- (i) Insulation of Conductor :
- (j) Interlayer reinforcement details :
- i) Top & bottom layer :
- ii) In between all layers :
- iii) End turn insulation :
- iv) Whether wedges are provided at 50% turns of HV coil. :

- (k) Current at full load (Amp) :
- (l) Working current density as per your design (Amp/Sq.mm) :
- (m) Weight of bare conductor used in one leg of H.V. (Kg.) :
- (n) Weight of insulated conductor used in one leg of H.V. (Kg.) :
- (o) No. of turns per leg :
- (p) Length of mean turns (mm) :
- (q) Resistance of winding (with 5% tolerance)
  - a) at 20 °C (Ohms) :
  - b) at 75 °C (Ohms) :
- (r) I<sup>2</sup>R at 75°C. :
- (s) Axial Length (mm) :
- (u) Weight of oil soaked coils in one leg :

8. L.V. COIL CONSTRUCTION DETAILS :

- (a) Type of Winding :
- (b) Type, Number and Size of bare conductor. :
- (c) Size of insulated conductor :
- (d) Cross sectional area of bare conductor (sq.mm.)
  - (i) Gross :
  - (ii) Net As per IS:6160 :
- (e) No. of coils per limb :
- (f) Outer diameter of coil (mm) :
- (g) Inner Diameter of Coil (mm) :
- (h) Mean Diameter of Coil (mm) :
- (i) Insulation of Conductor :
- (j) Inter layer reinforcement details :
- (k) Current at full load (Amp) :
- (l) Current density as per your design :

- (A/mm<sup>2</sup>)
- (m) End turn insulation :
- (n) Weight of bare conductor used  
in one leg of LV (kg) :
- (o) Weight of insulated conductor  
used in one leg of LV (kg.) :
- (p) No. of turns per leg :
- (q) Length of mean turns (mm) :
- (r) Resistance of winding (with 5% tolerance)  
a) at 20 °C (Ohms) :  
b) at 75 °C (Ohms) :
- (s) I<sup>2</sup>R at 75°C :
- (t) Axial Length (mm) :
- (u) Weight of oil soaked coil in one leg :

#### 9. INSULATION DETAILS MATERIAL AND SIZE

- (a) H.V. Coil end packing :
- (b) L.V. coil end packing :
- (c) Inter coil spacer of HT sections :
- (d) Bottom yoke strip insulation at  
foot plate :
- (e) Yoke Insulation :
- (f) Clamp Insulation :
- (g) Inter Phase Barrier :
- (h) Core Wrap :
- (i) Cylindrical Insulation Between  
H.T. & L.T. :
- (j) Type of blocks used in between coils :
- (k) Weight of total insulating material  
in one T/F (oil soaked). :

(Enclose calculation of losses with complete details of factors assumed)

#### 10. DETAILS OF CLEARNACES (mm)

- (a) Internal clearance between inner  
walls of Tank & core coil

assembly unit

- (i) On length(Bushing side) :
- (ii) On Breadth Side(Non bushing side) :
- (b) Radial clearance between H.V. & L.V. Winding :
- (c) Phase of phase clearance between H.V. Limb :
- (d) Clearance from top of the live part of top changer to the inside of the top cover of the tank. :
- (e) Radial clearance of L.V. coil from core. :
- (f) Minimum clearance between LV Pole to earth)
- (g) Horizontal duct between H.T. Section coil :
- (h) End clearance of H.T. coil from Yoke (With angle shaped windings) :
- (i) Minimum clearance between core & tank bottom.
- (j) Angular ducts between LT & HT winding.

**Note: Above clearances include the thickness of insulation.**

11. **IMPULSE TEST VOLTAGE OF WINDING FOR 1.2/50 M.S. WAVE ACCORDING TO RELEVANT ISS :**

- (a) H.V. (KVP) :
- (b) L.V. (KVP) :
- 12. Volts per coil of H.V. Winding (Volts) :
- 13. Approximate volts per layer of H.V. winding (Volts) :
- 14. Performance reference temperature (°C) :
- 15. Core loss in watts (Guaranteed value without any positive tolerance) (Watts)
  - a) Normal Voltage :
  - b) Maximum Voltage :
- 16. Full Load losses at 75 °C (Watts) (Guaranteed value without any positive tolerance) :
- 17. Load loss at 50% load & at 75 °C (Guaranteed value without any positive tolerance) :
- 18. Total Losses at 100% load at 75 °C (Watts) :

- (Guaranteed value without any positive tolerance)
19. Total losses at 50% load at 75 °C :
- (Guaranteed value without any positive tolerance)
20. Magnetising (No Load) Current at
- a) 90% Voltage :
  - b) 100% Voltage :
  - c) 110% Voltage :
21. Regulation at normal full load and
- a) Unity P.F. and :
  - b) 0.8 P.F. :
22. Impedance voltage at rated voltage & frequency at 75°C. :
23. Percentage reactance at rated voltage & frequency at 75°C. :
24. Percentage resistance at 75°C. :
25. **PERCENTAGE IMPEDANCE AT 75°C.**
- (a) With respect to high voltage :
  - (b) With respect to low voltage :
26. Un-balance current as percentage of full load current :
27. **Efficiency at 75 °C**
- a) Unity P.F. and :
  - b) 0.8 P.F. :
  - i) 125% load :
  - ii) 100% load :
  - iii) 75% load :
  - iv) 50% load :
  - v) 25% load :
28. Permissible duration of overload following Continuous running at normal rated load in Ambient temperature of 50°C.
- (a) 10% overload :
  - (b) 20% overload :
  - (c) 30% overload :

29. RMS value of symmetrical short circuit current which the transformer can withstand and its duration according to clause 9.1 of ISS:2026 or CL:1001 of BSS with latest amendment thereof. :
30. Increase in temperature of winding at full load by resistance method in an ambient temperature of 50°C. :
31. Increase in temperature of oil by thermometer at full load in an ambient temperature of 50°C. :
32. Temperature of hottest spot in the winding at full load in an ambient temperature of 50°C. :
33. Terminal arrangement of H.V. side :
34. Terminal arrangement of L.V. side :
35. **PARTICULARS OF H.V. BUSHING** :
- (a) Name of Manufacturer :
- (b) Type :
- (c) Confirming to ISS :
- (d) Dry withstand voltage for one minute :
- (e) Wet withstand voltage for 30 minutes :
- (f) Voltage rating :
- (g) Impulse withstand voltage  
1/50  $\mu$  sec. wave :
- (i) Positive :
- (ii) Negative :
- (h) Total creepage distance in air (mm) :
- (i) Height of bushing above transformer tank. :
- (j) Material & Size of HV terminal spends.
36. **PARTICULARS OF L.V./ NEUTRAL BUSHING** :
- (a) Name of Manufacturer :
- (b) Type :
- (c) Confirming to ISS :
- (d) Voltage rating :
- (e) Dry withstand voltage for 1 minute :

- (f) Wet Withstand voltage for 30 min. :
- (g) Total creepage distance in air (mm) :
- (h) Material and Size of LT terminal studs :
37. Time constant of transformer :
38. Radiation
- i) Heat dissipation by tank walls (excluding top & bottom) :
- ii) Heat dissipation by cooling tubes :
- iii) Diameter and thickness of cooling Tubes :
- iv) Whether calculation sheet for selecting cooling area to ensure that the transformer is capable of giving continuous rated output without exceeding temperature rise is enclosed. :
39. **TRANSFORMER OIL**
- (a) Grade of Oil :
- (b) Dielectric strength :
- (c) Resistivity :
- (d) Acidity :
- (e) Tan Delta :
- (f) Name of Supplier (only reputed make shall be accepted) :
40. **Quantity of transformer oil**
- a) First filling :
- b) Drained out :
41. **WEIGHT OF THE FOLLOWING**
- (a) Tank & Fitting (Kg) :
- (b) Core coil assembly (Kg) :
- (c) All HV & LV coil (Kg) :
- (d) Core stampings(only) (Kg) :
- (e) Transformer oil (Kg) :
- (f) Total weight of transformer including oil (Kg.) :

42. **OVERALL DIMENSIONS OF TRANSFORMER**

- (a) Length (mm) :
- (b) Breadth (mm) :
- (c) Height (mm) :
43. Conservator dimensions :
44. Name of material, number, weight and size used for clamping of core & winding :
- (a) Core Clamp :
- (b) Tie Rod :
- (c) Core Bolt :
- (d) Bottom Foot Plate :
45. Line lead support details
46. Silica Gel breather size:
47. Clearance in air between :
- (a) Phase to Phase (HV Side) :
- (b) Phase to Earth (HV Side) :
- (c) Phase to Phase (LV) side :
- (d) Phase to Earth (LV Side) :
48. Type Testing:
- (a) Is the offered 11/0.4 KV Conventional Type (3 Star rated) Distribution Transformer type tested? :
- (b) If yes, when and where it was Type Tested? :
- (b) Is there any deviation in the technical specifications of offered transformer, if yes give details :
- (d) Details of type test reports:

|   | Name of test   | Date of test | Whether test report enclosed or not (Y/N) | If yes no. of sheets enclosed |
|---|--|--------------|---|-------------------------------|
| 1 | Impulse voltage withstand test at 95 KVP                   |              |   |                               |
| 2 | Temperature rise test                                      |              |   |                               |
| 3 | Short circuit withstand test: Thermal and dynamic ability. |              |   |                               |
| 4 | Magnetic Balance Test.                                     |              |   |                               |
| 5 | Air Pressure Test: As per IS – 1180.                       |              |   |                               |
| 6 | Noise-level measurement.                                   |              |   |                               |
| 7 | Un-balanced current test:                                  |              |   |                               |
| 8 | Measurement of zero-phase sequence impedance.              |              |   |                               |
| 9 | Measurement of Harmonics of no-load current                |              |   |                               |

- |     |   |        |
|-----|---|--------|
| 49. | Whether you will use specified Aluminium alloy or brass/ copper with suitable bimetallic arrangement for HV/LV connector?   | Yes/No |
| 50. | Have you submitted drawings and calculations of cross sectional area of core?   | Yes/No |
| 51. | Have you submitted calculation for computation of losses 100% and 50% load at 75 deg. C. as per design data of offered transformer? Whether the name plate gives all particulars As required in tender?     | Yes/No |
| 53. | Whether the offer confirms to the limits of :<br>Temperature rise mentioned in the specification  | Yes/No |
| 56. | Whether engraving of Unique. No. ( letter /digit size approx 10mm & engraving depth approx 0.5 mm ) on the top channel of core coil assembly & on inside portion of top cover of transformer shall be done. | Yes/No |
| 57. | Whether MS Plate of size 150 × 100 x 2 mm shall be continuously welded on the same side wall on which name plate is fixed.  | Yes/No |
| 58. | Whether engraving of name of firm, Unique No, Rating of transformer, PO NO and Date of inspection etc on M.S Plate ( as per above column no. 56 ) as per approved Drawing shall be done.                    | Yes/No |

**IMPORTANT NOTES :**

- (1) CROSS SECTIONAL AREA OF CORE IS TO BE SUBSTANTIATED BY DRAWINGS AND CALCULATIONS.
- (2) MAXIMUM FLUX DENSITY AT RATED VOLTAGE AND FREQUENCY IS TO BE SUPPORTED BY CALCULATIONS.
- (3) WEIGHT OF STAMPINGS IN CORE ASSEMBLY MUST BE SUBSTANTIATED BY CALCULATIONS.
- (4) COMPUTATION OF NO LOAD CURRENT AT 90%, 100% AND 110.0% MAY BE SUPPORTED BY CALCULATIONS.
- (5) COMPUTATION OF NO LOAD AND FULL LOAD LOSS AT 75 DEG.C. MAY BE SUPPORTED BY CALCULATIONS.
- (6) DETAILS OF CLEARANCES AS GIVEN IN CLAUSE: 11 INCLUDE THICKNESS OF.

**SCHEDULE IB****ADDITIONAL DETAILS**

| <b>Sl. No.</b> | <b>Description</b>                             |          |
|----------------|--|----------|
| 1.             | Core Grade                                     |          |
| 2.             | Core diameter                                  | mm       |
| 3.             | Gross core area                                | sq cm    |
| 4.             | Net core area                                  | sq cm    |
| 5.             | Flux density                                   | Tesla    |
| 6.             | Mass of core                                   | kg       |
| 7.             | Loss per kg core at the specified flux density | watt     |
| 8.             | Core window height                             | mm       |
| 9.             | Center to center distance o the core           | mm       |
| 10.            | No. of LV Turns                                |          |
| 11.            | No. of HV Turns                                |          |
| 12.            | Size of LV conductor bare/covered              | mm       |
| 13.            | Size of HV conductor bare/covered              | mm       |
| 14.            | No. of parallels                               |          |
| 15.            | Current density of LV winding                  | A/sq mm. |
| 16.            | Current density of HV winding                  | A/sq mm. |
| 17.            | Wt. of the winding for Transformer             | kg       |
| 18.            | Wt. of the HV winging of Transformer           | kg       |
| 19.            | No. of LV Coils/phase                          |          |
| 20.            | No. of HV Coils/phase                          |          |
| 21.            | Height of LV Windings                          | mm       |
| 22.            | Height of HV Windings                          | mm       |
| 23.            | ID/OD of HV winding                            | mm       |
| 24.            | ID/OD of LV winding                            | mm       |
| 25.            | Size of the duct in LV winding                 | mm       |
| 26.            | Size of the duct in HV winding                 | mm       |
| 27.            | Size of the duct between HV and LV             | mm       |
| 28.            | HV winding to tank LV winding clearance        | mm       |
| 29.            | HV winding to tank clearance                   | mm       |
| 30.            | Calculated impedance                           | %        |
| 31.            | HV to earth creepage distance                  | mm       |
| 32.            | LV to earth creepage distance                  | mm       |