WEST BENGAL STATE ELECTRICITY DISTRIBUTION COMPANY LIMITED.

TECHNICAL SPECIFICATION FOR 33/0.4KV,100 KVA STATION SERVICE TRANSFORMER

1. SCOPE :

1.1 This specification covers design, manufacture, assembly, testing at manufacturer's works, supply and delivery of 100 KVA,33/0.4 KV, Station Service Transformer for efficient and trouble free operation.

1.2 The transformer covered by this specification shall be complete in all respect. Any material or accessories which may not here specifically mentioned but which is usual and necessary for satisfactory and trouble free operation and maintenance of the transformer, shall be supplied without any extra charge.

2. LOCATION :

The transformers may be installed outdoor anywhere in West Bengal. The elevations of the sites above mean sea level shall not exceed 1000 metres.

3. SYSTEM DETAILS :

The 33 kV systems are non effectively earthed through grounding transformer & 0.4 KV systems are effectively earthed at the neutral points of the star connected secondary winding of the transformer.

4. WEATHER CONDITIONS :

01. The area is also subject to heavy monsoon rains, 80 to 90% of the annual precipitation being in the month of June to October.

Maximum temperature of air in shade	50 ^{0} C
Minimum temperature of air	4 ^{0} C
Maximum temperature of air in sun	60 ^{0} C
Maximum Humidity	98%
Average number of thunderstorm day per annum	100
Number of months of tropical monsoon rainy Condition per annum (June to October)	4.5
Average rainfall per annum	300 cm
Maximum wind pressure	250 kg/m ^{2}

0.2 For the purpose of this specification the maximum daily average ambient temperature shall be 40 ^{0} C average over 24 hours period.

5. STANDARDS :

01. Transformers covered by this specification shall, unless otherwise specified be built to conform to the latest Indian Electricity Rules, wherever applicable and the requirements of latest issue of ISS:1180 and ISS 2026, CBIP Standards and other ISS(all as per latest issues)

02. In the event of a conflict between the above standard and the specification the latter shall govern.

6. RATING AND GENERAL DATA FOR DISTRIBUTION TRANSFORMERS :

01. Core Type, three phase oil immersed step down two winding distribution transformers for outdoor installation with weather condition as stated above.

02. Rating: 100 KVA

03. Number of phase : three

04. Frequency : Transformer shall be suitable for continuous operation at the rated output and also with voltage variation of ±10% of rated voltage and a frequency variation of $\pm$3% from normal 50 c/s without exceeding the specified temperature rise.

05. Type of cooling : ONAN

06. Voltage Ratio : 33/0.4 KV at normal tap

07. Vector group reference : Dyn.11.

7. CONNECTIONS :

The primary (HV) winding shall be connected in delta and the secondary (L.V) winding in star with vector group Dyn,11.The neutral of the secondary (LV) winding shall be brought out to a separate insulated terminal.

The size (Cross section) of the neutral connection conductors and jumpers must be of same size as that of the phase connecting conductors and jumpers which shall be properly supported and insulated.

8. TEMPERATURE RISE :
For winding 55 ^{0} C (measured by resistance) and for top oil 45 ^{0} C (measured by thermometer) when tested in accordance with clause 4.0 of I.S.2026-1977 (latest) Pt-II.

9. Short Circuit Impedance : 4% at 75 ^{0} C, 50HZ with IS tolerance
Temp. rise will be c0nducted corresponding to loss figure at lowest tap position

10. TERMINAL ARRANGEMENT :
Bare on outdoor porcelain bushings for outdoor type transformers as per ISS/CBIP specification and other relevant specification. The top of the bushing shall be immersed in the oil when the oil level is at the minimum marking of the oil level gauge.The bushings rods should be locked in position so that twisting of leads is avoided during tightning of nuts of bushing rods. H.T. & L.T. studs are to be made of brass for terminal connections as per IS 1180 (Part-I) of 1989.

33 KV SIDE
The terminals shall be through outdoor type bushings conforming to IS-2009 and provided with Bi-metallic terminal connectors (rigid type) suitable for "Panther" ACSR conductor. Terminal connectors are to be supplied as per Technical specification of Clamps & Connectors.

L.V. SIDE
Connection from transformer L.V. terminal to the respective 400 V switchgears shall be made through three phase 4 core cable. L.T. terminals of transformers shall be brought out through LV bushing mounted on side wall mounted bushings. The neutral terminal shall be brought out along with the L.V. terminals through a separate bushing for connection to the respective switchgears neutral bus.

11. LEADS :
All leads of the windings, connection of the windings or their wires to one another to terminal bushing shall be properly insulated and covered with insulation sleeves. The soldering materials shall have higher melting temperature above 300 ^{0} C and preferably above 400 ^{0} C for better thermal endurance and mechanical strength. The tenderer shall specifically mention the method and materials to be used by them for lead connection.

12. CONDUCTORS : Copper

13. Tank :

01. Tank wall must be fabricated from tested quality of mild steel sheets of adequate thickness.It should be shaped so as to make welding to a minimum . All welding shall be done electrically and relieved of welding stresses. All seams shall be double welded for absolute oil tightness. The tank wall shall be formed by stiffner of structural steel for general rigidity and to dampen transformer noise. It shall also withstand partial vacuum as per latest CBIP manual against standard atmospheric pressure. Maximum tolerance on the negative side of the steel sheets shall be 0.35 mm as per cl.8.22. of IS-1852- 1985 (Specification for Rolling and cutting tolerances for hot rolled steel products.).
Tank design shall be such that the core and winding assembly can be tanked or de-tanked freely and easily.
Inside wall of the tank and the M.S.Channel shall be painted with varnish or with hot oil resistance paint.
Horizontal&Vertical Stiffner shall be continuously welded on the tank wall.

02. The tank cover shall be bolted on to flanged rim of the tank with a weather proof, hot,/cold oil resistance, resilient gasket in between for oil tightness. If the gasket is compressible, metallic strips shall be provided to prevent over compression of the gasket. Bushing turrets, covers for pockets of thermometers and other devices shall be designed to prevent any ingress of rain water into the tank and the tank cover as a whole shall shed of all rain water. The tank cover should have downward bent edges on all sides so that the gasket under the top cover is protected from direct exposure to weather.

Gasket used between top cover and tank flange shall be of neoprene rubberised cork sheet and shall be provided with water tight compound between the tank flange and the gasket.

G.I. nuts, bolts, flat washers, spring washers shall be used and suitably space to press the tank cover.

03. Bushing turrets, access hole covers, pockets of thermometers shall be so designed to prevent any ingress or collection of water.

04. Conservators along with Silicagel breathers are to be provided inthe transformers. The conservator shall be liberally dimensioned such that with the lowest ambient temperature and no load on the transformer, the oil level shall not recede too low and with the highest ambient temperature and permissible overload on the transformer, the oil will not spill into the breather pipe or to the exterior to waste. The conservator shall be provided with oil level indicator with Minimum, Normal & Maximum temperature Markings. The inside diameter of the pipe connecting the conservator to the main tank shall be < 25 to 50 mm and it should be projected into the conservator in such a way that its end is approximately 20 mm above the bottom of the conservator.

Conservators shall not be provided with drain plug. Filling hole with cover shall be provided as usual. The conservator pipe hole fitted to the tank cover should be provided with a suitable slanted plate, if required so that while pouring oil into the transformer through the conservator, oil does not fall directly on the winding. Care should be taken so that free oil flow is not impeded. Explosion vents for transformers shall also be welded on the cover. Air release plug should be provided in the explosion vent, and in tank cover to release any entrapped air.

One suitable inspection hole with cover of adequate size should be provided on the tank top cover sothat bushing ends and tap changer assembly may be easily accessible through that hole.The inspection cover should be placed on turret and should be provided with lifting handle and air release plug. All the fitting on the top cover should be placed on the turret. An air release plug should also be provided at the topmost point of the H.V.Bushing turrets so that any accumulated air bubble therein may be released through Air release Plug.

Conservator tank shall be provided with plain oil gauge with maximum and normal marking visible from the G.L.

Conservator tank shall be provided with dehydrating breathers. Drain valve shall be provided on conservator.

The Buchholz relay shall have two contacts for alarm and for tripping. The relay shall also comprise drain cock, air vent, and facility of testing with air injection/mechanical testing facility.

05. OTI pocket is to be Provided.

06. Marshalling box is to be provided for housing OTI. OTI shall be DIAL Type Thermometer with mercury contacts.

07 PRESSURE TEST :

The tank shall be fixed with a dummy cover with all fittings including bushings in position and shall be subject to air pressure of 35 Kpa above atmosphere for 30 minutes. The permanent deflection of flat plate after pressure has been released shall not exceed the values given below :-

Length of plate	Deflection
Upto 750 mm	5 mm
751 to 1250 mm	6 mm

08. The manufacturers should submit pressure test certificate for the transformers tanks at least for each batch either conducted by them or by their fabricators, for which order is placed with them and the edges (both inside and outside) of the transformer tanks should be double welded electrically and scrupulously as per the specification.

14. CORE :

1. The magnetic core shall be built of low loss Silicon steel, cold rolled grain oriented steel core may be of stack type or wound type.
2. The materials used for insulating the sheets, shall have high inter-lamination resistance and rust inhibiting property. It shall not be deteriorated by ageing from

hottest operating temperature and clamped pressure of the core dis-integrated due to mechanical modes of core vibration. It shall not have the least tendency to absorb moisture or to react with the dissolved particles in the insulting oil thus accelerating sludge formation.

3. The assembled core shall be securely clamped in the lines and in the uniform pressure so as to minimise the noise from the core.

4. The core-clamping frame shall be provided with lifting eyes for the purposes of tanking and untaking the active part of the transformers. The whole core shall be electrically connected by copper strip of adequate section to the core frame at two separate points for being eventually earthed through the tank to drain off electrostatic potential that may be built up.
   Core base and top and bottom of yoke shall be supported with M.S. Channel of proper size and properly bolted together for stack type core. For wound type cores suitable M.S. clamping device should be used to hold together core laminations firmly to prevent vibration or noise.

5. The supporting framework of the cores shall be so designed so as to avoid the presence of pockets which would prevent complete emptying of tank through the drain valve or cause trapping of air during filling.

6. Adequate provision shall be made to prevent movement of the core and winding relative to the tank during transport and installation or while in service.

7. The cores shall conform to :
   IS : 3024 - 1965 Electrical sheet steel &
   IS : 649 - 1983 method of test steel sheet.

8. Successful bidder will offer for care for inspection and/or approval by the purchaser during the manufacturing stage. The manufacturer's call notice for the purpose should be accompanied with the following documents as proof towards the use of prime core material:
   (i) Invoice of the supplier
   (ii) Mill's Test certificate
   (iii) Packing List
   (iv) Bill of Ladding
   (v) Bill of entry certificate to customs
   Core material shall be procured either from core manufacturer or through their accredited marketing organization of repute.

15. WINDING :

01. The winding shall be made of paper insulated continuous and smooth electrolytic copper conductor & shall be provided with the requisite number of windings and shall be designed to withstand the electromechanical stress exerted under short circuit conditions as per ISS:2026 – 1977.
Class 'A' insulation shall be used. Paper insulation shall be dry and free from punctures and other defects. Solid insulation shall be best quality. Wooden supports, if used, shall be well seasoned and compatible with hot transformer oil. The test certificate of the raw materials shall be made available by the Transformer manufacturer on request during Inspection & Testing.

02 The insulation level of the windings shall be as follows as per Part-III of IS-2026)

Voltage	Impulse Voltage(KV Peak)	Short duration Power frequency voltage (KV)
400V	-	3
33000V	170	70

03 The winding shall be so designed to reduce to a minimum the out of balance forces in the transformer (at all voltage ratings).

04 The winding shall also be designed such that all coil assembles of identical voltage rating shall be interchangeable and repairing of the winding can be made readily without special equipments.

05 BRACING OF WINDINGS:

(1) The windings and connections of all transformers shall be braced to withstand shocks which may occur during transport or due to switching/ short circuit and other transient conditions during service.

(2) Coil clamping rings, if provided, shall be of steel or of suitable insulating material. Axially laminated material other than bakelised paper shall not be used.

06 WINDING AND CONSTRUCTION:

The winding shall be assembled on the core co-axially for magnetic balance and symmetrically for electrical balance. Liberal ducts shall be provided for oil circulation and lowering hot spot temperature in the winding. Spacers, wedges shall be robust & hard insulations are so fitted in the winding that they will neither move, nor permit any relative movement of any part of the winding during normal service and under a terminal short circuit, with out causing mechanical injury to any insulation in the windings.

07(i) The stacks of windings shall receive adequate shrinkage treatment before final assembly. Adjustable devices shall be provided for taking up any possible shrinkage of coils in service.

ii) The coil clamping arrangement and the finished dimensions of any oil duct shall be such as will not impede free-circulation of oil through the ducts.

08 Conformation to IS standards relating of conductors and insulation. The following Indian standards specification shall govern the quality of conductor, covering insulation such as enamel, paper and insulating boards.

1) IS: 2067-1975: Wrought Aluminium Wire for electrical purposes
2) IS:7404(Pt.I & II)1974:Paper covered copper conductor.
3) IS: 1397-1967: Kraft paper
4) IS: 335-1983 : New insulating oil.
5) IS: 1576-1967
   IEC: B-2.1
   IEC: B-3.1 Solid Press Board for electrical purposes.
   IEC: B-4.3
6) IS: 4800-1968: For enamelled round winding wire.

16. Bushings :

All bushing shall confirm to the requirements of latest revision of IS:3347. Bushings must be well processed,homogeneous and free from cavities and other flaws. Glazing must be uniform in colour and free from blisters, burns and other defects.

The clearances in air between live and conductive parts and live conductive part to earthed structures shall be as follows:

Nominal System Voltage KV rms	Test Voltage Inpulse KVP	Clearances Phase to Phase (mm)	Phase to Earth (mm)	Arcing Horn gap
0.400	-	85	40	-
33	170	350	320	86*

The minimum creepage distance of 33 KV bushings should be 900 mm.

17. TAP CHANGER/TAPPINGS :-

The OFF load tap changing shall be effected by an external 3 phase gang operated tap changing switch. The operation shaft shall be brought out of the tank and provided with hand wheel so that it can be operated at standing height from plinth level and be easily accessible. The tap position should correspond to the voltage variation of (+)5% to (-)7½% in step of 2.5% at HV side with its normal position at 3.

A visual tap position indicator shall be provided near the operating handle and provision shall be made to pad lock the handle in each tap position. The locking arrangement shall be such that pad lock can not be inserted unless required contacts corresponding to the tap position are correctly connected with full contact pressure.

All contacts of the tapping shall be silver plated and held in position under strong contact pressure.

Taps shall be provided on high voltage windings. At each tap position, rated output shall be available within allowable range of voltage variation.

The tap position marking should increase in clockwise direction and there should be a stopper in between maximum position i.e. 1 and minimum position i.e. 6. The tap position marking should be such that they are easily visible and permanent.

18. COOLING ARRANGEMENT:

1. The transformer shall be suitable for loading of 100% continuous maximum rating with "ONAN" cooling without exceeding the thermal limit.
2. The transformer shall be fitted with round or elliptical cooling tubes bent and welded to tank or radiators consisting of a series of separate circular or eliptical tubes, or a pressed steel plate assembly formed into elipital oil channels, welded at their top and bottom to the tank.
3. The round cooling tubes shall be made of mild steel(ERW) having a minimum wall thickless of/ 1.50 mm and a clean bright internal surface free from rust and scale. They shall be suitably branched to protect them from mechanical shocks normally met in transportation and to damp the modes of vibration transmitted by the active part of the transformer in service. The elliptical tubes or elliptical oil channels of pressed steel plate at least of 18 SWG (or 1.25mm Thickness).
4. The manufacturer will have to provide information regarding wall surface area of tank radiator cooling tubes separately as part of the guaranteed technical particulars.

19 PAINTING:

1. The surface to be painted shall be completely cleaned & made free from all rust, scale or foreign adhering matter on grease. The cleaning & derusting can be done by sand blasting or other approved method.
2. All steel surface in contact with insulating oil as far as accessible shall be painted with heat resistant, oil insulable, insulating varnish or paint.
3. All steel surface exposed to wheather, shall be given a primary coat of Zinc chromate and two coats of dark admiral gray paints. (IS 104 & IS 2932) OR Powder coating painting as specified by CEA/REC
4. All paints shall be carefully selected to withstand tropical heat and extremities of weather. The paint shall not scale off or winkle or be removed by abrasion due to normal handling.
5. All nuts and bolts used in the transformer for external fittings shall be galvanished or zinc passivated and painted with body paint.

20. TEST & INSPECTION (AS PER I.S.S)

01. ROUTINE TEST.

All transformers shall be subject to routine tests at the manufacturers Works. The following tests are to be carried out.

a) Measurement of winding resistance at all taps.
b) Ratio, polarity and phase relationships .
c) Impedances voltage.
d) Load losses.
e) No load less and no load current.
f) Insulation resistance.
g) Induce over voltage withstand.
(h) Separate source voltage withstand.
(i) Characteristic requirement of oil sample will be as per IS-1866, 1983 amended up to 1987.
(j) Unbalance current: The maximum value of unbalance current in transformer shall not exceed 2% of full load current as per CBIP manual for transformer.
(k) Magnetising current at rated voltage & frequency and 112.5% of rated voltage & frequency should not exceed the limit as per IS 1180(part-I) 1989 CL.22.6
(l) Insulation resistance between windings & wings to earth at 75 ^{o}C
m) To facilitate testing, arrangement should be made for Carrying out Heat Run tests for one transformer.

02 TYPE TESTS :

In addition to the routine tests, the following type tests,if required, are to be made by the manufacture, who does not have type tests Report of identical transformers.
(Ref :clause 19.05)

a) Dynamic short circuit withstand test to be conducted as per Cl.16.11 & 16.11.4.4 of IS:2026 (Part-I) 1977

b) Impulse voltage withstand test to be conducted as per Cl.13 of relevant IS

c) Temperature rise test –will be conducted on one transformer for every lot offered for inspection.
If records of type tests (a) & (b) above on a transformer which in essential details, is representative of the one being purchased, are furnished the purchaser may accept these as evidence test instead of actual test.

d) Pressure test mentioned in the clause at 13.04 & 13.05
WBSEDCL or its appointed authorised agency may witness the said tests at the manufacturers premises.

03 The manufacture will have to submit thermal calculation of short circuit withstand ability for 2 seconds and 3 seconds.

04 Performance under external short Circuit condition and limit of temperature rise.
All transformers shall be capable of withstanding, without damage the thermal and mechanical effects of a short circuit at the terminals of any of windings for 2 secs. The temperature in the windings after 2 secs. of over current must not exceed 200^0C for Al and 250 ^{0}C for Cu windings

After the above tests, the transformer shall be subjected to all or a part of the routine test. The criteria for evaluation of test results shall be the same as that for the test to determine the dynamic ability to withstand short circuit in accordance with ISS 2026.

WBSEDCL may also make a testing arrangement for carrying out short circuit tests with duration not exceeding 2 secs. in a suitable place.
The transformer Subjected to such test shall be examined for temperature rise within specified limit for any damage or displacement of any parts within the transformer.

The transformer so tested shall not exhibit more than 2 percent variation in percentage reactance after the short circuit test form the original measured value before testing according to clause 16.11.5.4 of IS 2026 (Part-I), 1977.

The selection of transformer for such test shall be carried out at the discretion of the Company from any lot of transformers of same capacities offered for inspection and testing before delivery.

The cost of to and fro transportation to the test premises for the above testing shall be borne by the Suppliers/Manufactures of the Transformers.

05. 1.The bidder should submit Type Test Report from CPRI/ NABL/Govt. approved laboratories along with their offer having identical technical parameters as that of the tendered item failing which their offer may not be technically accepted.

2. However, if it is found that the bidder has submitted Tests Report but those have not been conducted on identical design of equipment/material as per specification of WBSEDCL, the same may be accepted subject to the following condition :-

WBSEDCL at his discretion request the successful bidders to conduct Type Tests/special tests on identical design as per specification of WBSEDCL. Such Type Tests/special tests if required to be carried out at NABL/Govt. approved Laboratories for which no extra cost will be charged to WBSEDCL.

06. Transformers shall have to be tested for Dynamic Short Circuit withstand Test and Impulse voltage withstand test at CPRI/ NABL Accredited Laboratory or any other Govt. recognized Test House. Transformers for such tests are to be manufactured as per relevant technical specification and approved drawing and should be offered for preliminary testing like routine and temperature rise test prior to type tests, by WBSEDCL's testing wing. After successful completion of preliminary tests, transformers may be sent for type tests. Type tested passed transformers, duly witnessed and sealed by WBSEDCL's Testing Wing are to be retained at the manufacture's premises with WBSEDCL seals for comparison of the transformers to be offered. The transformers to be manufactured and supplied should have identical design, dimension and drawings as that of approved design, dimensions and drawings of the type tested transformers.

07. INSPECTION :

The transformer may be stage inspected at the factory of the manufacture. The manufacture shall intimate in advance in writing to the purchaser about the stages of manufacture & subsequent readiness of the transformers to enable him to carry out stage inspection & final inspection and testing of the finished transformers.

The stage inspection will be carried out at the discretion of the purchaser during the process of manufacturing of the transformers. The manufacturer need not stop the process of production because of programme of stage inspection of the Purchaser.

While offer for final inspection the following point should invariably betaken care of.

i) Name plates should be welded/rivetted on the tanks of the transformer.

ii) The bolts connecting the top cover of the transformer with the tank at the two opposite comers are to be provided with holes at their lower portions which would go beyond nuts so that the transformers may be sealed by inserting sealing wire in these holes.

21 Contract Drawings :

i)The General outline drawing giving details of dimensions and fittings should be submitted for each type of transformer indicating thereon physical centre line & position od centre of gravity.

ii) Cross sectional drawing showing various parts including core coil assembly.
iii)Sketches for rating plate, Net weight of core & winding , tank, oil, total weight, P.O. No., property column & guaranteed loss figures.

21.2 Guaranteed Technical Particulars of equipment offered as per Schedule–A should be submitted by the Tenderers Performance guaranteed shall be based on guaranteed Technical Particulars (G.T.P.)

22 Over Load Capacity :

Each transformer shall be capable of carrying sustained overload as stated in IS: 6600.

23 Over Fluxing:

Over fluxing in the core shall be limited to 10% so that the flux density in the core does not exceed 1.9. Tesla (19000 lines/ sq.cm)

The maximum flux density in any part of the core under such condition shall not exceed 19000 lines/Sq.cm. on the basis of M4, M5 & M6 grades as per BS 601: Part-2: 1973 (Specification for sheet and for magnetic circuits of electrical apparatus oriented Steel)

24 Transformer Oil:-

The oil shall be as specified in iS:335-1980 and it shall be free from moisture and have uniform quality throughout.

25 a. The outdoor apparatus including bushing insulators shall be designed so as to avoid pocket in which water can collect.

b. All mechanism shall be so as to prevent sticking of "dew" to avoid rust and corrosion.

c. All apparatus shall be designed to minimise the risk or accidental short circuit caused by animals, birds or verurin.

26 Internal Earthing Arrangement :

All metal parts of the transformer with the exception of the individual core laminations, core bolts and associated clamping plates shall be maintained at some fixed potential and core should be earthed att two points.

27 Anything not covered by this specification will be as per relevant I.S.S./IEC Specificiation.

28. MAXIMUM ALLOWABLE LOSS VALUES AND % IMPEDANCE.

KVA Ratting	Voltage Ratio	No. load loss. In watts	Load loss at 75^0C in watts	Percentage Impedance
100 KVA	33/0.400 KV	350	1850	4%

No load loss and load loss figures as mentioned above are without any positive tolerance. Tolerance i.r.o. percentage impedance will be as per ISS-2026-1977.

29. a) Capitalisation of Losses :

Bidder shall state the transformer losses viz. a) Iron loss b)Copper loss separately. Transformer losses will be taken into account during bid evaluation. The losses at rated load, rated voltage & frequency shall be guaranteed.

i)Capitalised value of iron loss(No load loss) per KW= **= Rs.3,19,218 /-**

ii)Capitalised value of copper loss(Load loss) per KW= **Rs.95,754 /-**

If any losses after Routine Tests are found beyond guaranteed value declared in the bid offered, penalty will be imposed for the excess loss over the corresponding guaranteed value by applying the above stated values. For fraction of a KW, penalty shall be applied pro-rata, but no bonus will be applied on vice-versa. The result of routine test on the sample selected from a lot would be applied to the specific lot. No changes in guaranteed figures will be allowed after bid opening.

30 . Store Testing :-

The materials/equipment delivered to consignee stores will be subjected to inspection/ testing in presence of your authorized representative for which due notice in advance will be furnished by the CE/Addl. C.E. (DTD). If any discrepancy/dispute in quality arises in any sample selected from a lot, the supplier shall have to replace that specific lot at the Supplier's cost and WBSEDCL reserves the right to take any penal action whatsoever without any further reference. For higher loss values obtained during above tests, 'Capitalisation of losses' Clause of this specification will be applicable on you .

Loss values whichever is higher as obtained during factory test and store test, shall be considered for LOSS CAPITILASATION.
However for transformers, covered by 100% quantity checking by routine test at manufacturer's premises, store testing shall have to be done at the discretion of CE/Addl.CE testing if necessary.

31.00 Asset Codification no. –

Asset codification no. for the ordered quantity shall be communicated to the supplier after placement of order. Necessary Engrave/Embossing (cold punch) shall be done on the main tank with 28 no font size and DTR name and diagram plate with font size not less than that used for marking KVA rating of the DTR.

If cold punch on the tank is not possible then separate property plate(details marking of the plate shall be submitted with the transformer drawing for approval) shall be welded to the tank with the following details:-

1. **Ratings :**
2. **Manufacturer's Sl.No. :**
3. **Manufacturer's Name :**
4. **P.O. No. :**
5. **Year of Manufacturing:**
6. **Property of : WBSEDCL**
7. **Asset Code Number : (10 digit alpha numeric numbers as allotted by the purchaser)**

Again the following points shall have to be noted

a) **Front Size of letter shall be 28 i.e. 7 mm x 5.5 mm**
b) **Letters shall be distinctly engraved by cold Punch**
c) **Plate size shall be minm 125mm X 170mm and shall be electrical run Welded be throughout its perimeter**
d) **Material of Plate shall be Mild Steel and not less than 3mm thick.**
e) **Plate shall be welded on the transformer tank at visible position and height.**

32.00 TESTING EQUIPMENTS

i) **KV Meter for 33KV system**
ii) **Volt Meter (0- 1000V)**
iii) **Milliammeter for leakage current (0 -100ma)**
iv) **Power Analyzer of reputed Make(should display 3-Ph current, voltage,watt and∑3ΦPower**
v) **Megger – 2.5KV**
vi) **Thermometer (preferably Digital)-0 -100°C**
vii) **TTR Meter**
viii) **Winding Resistance measurement (Preferably ELTEL or reputed make)**
ix) **Digital Multimeter to measure magnetizing current & core balance of 11KV system.**
x) **Clamp on Ammeter (0- 300A)**

ALL THE ABOVE TESTING EQUIPMENTS SHALL BE AVAILABLE IN THE TESTING LAB AND SHOULD BE CALIBRATED FROM NABL ACCRIDIATED LABORATORY.
COPY OF CALIBRATION CERTIFICATES AS PER GCC CLAUSENO. 8 SHALL BE AVAILABLE WITH THE BIDDER AS AND WHEN REQUIRED.

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SCHEDULE OF GUARANTEED TECHNICAL PARTICULARS SCHEDULE-A

(As per clause no.21.2 of the Specification)

(To be furnished and signed by the tenderer)

Item Size :100 KVA

Sl.No.	Particulars		
1	Name of the manufacturer	::	
2	Country of origin	::	
3	Applicable standard	::	
4	Maximum continuous rating in KVA	::	
5	No load voltage ratio (In KV/KV)	::	
6	Rated frequency (in HZ)	::	
7	Number of phases	::	
8	Type of Cooling	::	
9	Connections		
	(i) H.V. Winding		
	(ii) L.V. Winding		
10	Vector Symbol		
11	(i) Temperature also under normal operation condition above ambient temperature	::	
	(a) Top oil (in Deg.C.)	::	
	(b) Winding (in Deg.C)	::	
	(ii) Maximum hot spot temperature of winding (in Deg.C)	::	
12	Magnetising current referred to H.V. at rated frequency	::	
	(a) At 90% rated voltage (in Amps)	::	
	(b) At 100% rated voltage (in Amps)	::	
	(c) At 110% rated voltage (in Amps)	::	
13	Power factor of magnetising current at 100% rated voltage & frequency	::	
14	No load current at rated voltage and rated frequency (in Amps)	::	

15	No load loss in watt at rated frequency & voltage	::	
16	Load loss in Watt at 75 Deg C. at rated output and frequency	::	
17	Percentage Regulation at full load at 75 Deg.C.	::	
	(a) At unity power factor	::	
	(b) At 0.8 power factor lagging	::	
18	Efficiencies at 75 Deg.C. (in percentage)	::	
	(a) At full load	::	
	(i) At unity power factor	::	
	(b) At ¾ full load	::	
	(i) At unity power factor	::	
	(ii) At 0.8 power factor lagging	::	
	(c) At ½ full load		
	(i) At Unity power factor		
	(ii) At 0.8 Power factor lagging		
19	Impedence voltage on rated kVA base at rated current and frequency at 75 Deg.C (in percentage)	::	
20	(a)Resistance voltage at rated current and frequency at 75 Deg.C (in percentage)	::	
	(b) Reactance voltage at rated current and frequency at 75 Deg.C (in percentage)	::	
21	Resistance at H.V. base at 75 Deg.C a) HV (between lines) (ohms) b) LV (between lines) (ohms)	::	
22	Reactance at H.V. base at 50 c/s	::	
23	Withstand time without injury for three phase dead short circuit at terminal (in seconds):	::	
24	Short time current rating for short circuit with duration	::	
	(a) H.V. Winding (in K Amps)	::	
	(b) L.V. Winding (in K Amps)	::	
	(c) Duration in seconds)	::	

25	Permissible over loading with time at max amb temp a) 125%load after running with 50% load with steady temp rise. (hrs.) b) 120% load after running with 100% load with steady temp rise. (hrs.)	::	
26	Core :		
	(i) Type :		
	(ii) At 112.5% rated voltage at 50 HZ (in line/sq cm)		
	(iii) Thickness of Stampings (in mm)	::	
	(iv) Type of Insulation between core lamination	::	
	(v) Approximate area of Cross Section of Core and yoke (in sq.mm)	::	
	(vi) Material of Core clamping plate	::	
	(vii) Thickness of Core clamping plate (in mm)	::	
	(viii) Insulation of Core clamping plate	::	
	(ix) Describe location/Method of Core grounding	::	
27	Terminal Arrangement	::	
	(i) high voltage	::	
	(ii) low Voltage	::	
28	Positive Sequence Impedance between HV & LV winding on rated KVA base at rated current and frequency at 75 Deg.C. Winding temperature (in percent).	::	
29	Zero Sequence Impedance at reference temperature of 75 Deg.C (in percent)	::	
30	Details of windings :	::	
	(i) Type of Winding :	::	
	a) High Voltage ;	::	
	b) Low Voltage	::	

	(ii) Material of the winding conductor	::	
	(a) High Voltage :	::	
	(b) Low Voltage :	::	
	(iii) Current density of winding at rated KVA	::	
	(a) High Voltage (Amp per sq.cm)	::	
	(b) Low voltage (Amps per Sq.cm)	::	
	(iv) Insulating material used for	::	
	(a) High Voltage Winding	::	
	(b) Low Voltage Winding	::	
	(v) Insulating material used between	::	
	(a) High voltage and low voltage winding	::	
	(b) Low Voltage winding and Core	::	
31	Insulation withstand Test Voltages	::	
	(i) Lightning Impulse withstand test voltage (KV Peak)	::	
	(ii) Power frequency withstand test voltage (in KV rms for 1 mtn)	::	
	(iii) Induced over voltage withstand test voltage (in KV rms)	::	
32	Current in the winding at rated KVA	::	
	(I) Low voltage (in Amps)	::	
	(ii) High Voltage (in Amps)	::	
33	Voltage per turn (KV per turn)	::	
34	Ampere turn	::	

35	Number of turns	::		
	(i) Low Voltage	::		
	(ii) High Voltage	::		
36	Bushing	::	High Voltage	Low Voltage
	(i) Make	::		
	(ii) Type	::		
	(iii) Applicable standard	::		
	(iv) Insulation withstand test voltage	::		
	(a) Lightning Impulse withstand test voltage (1.2 x 50 micro seconds (in KV Peak)	::		
	(b) Power frequency withstand test voltage (in KV for 1 min)	::		
	(v) Creepage distance in air	::		
	(i) Total (in mm)	::		
	(ii) Protected (in mm)	::		
	(vi) Minimum height of the bushing			
37	Minimum clearance (in mm)	::		
	Between live conductive parts and live conductive parts to earthed structure		In Oil: Between Phases / Phase to Ground	In Air: Between Phases / Phase to Ground
	(i) H.V.	::		
	(ii) L.V.	::		
38	Approximate weight of Transformer (in Kgs)	::		
	(i) Core with clamping	::		
	(ii) Coil with Insulation	::		
	(iii) Core and winding	::		
	(iv) Tank and fitting with accessories	::		

	(v) Untanking weight	::	
	(vi) Oil required for the transformer	::	
	(vii) Total weight with Core, Winding, oil and fittings	::	
39	Details of Tank	*::*	
	(i) Type of tank	::	
	(ii) Approximate thickness of Sheet (in mm)	::	
	(a) Sides	::	
	(b) Bottom	::	
	(c) Cover	::	
	(iii) Vacuum withstand capacity	::	
	(iv) Dimension of base channel (in mm x mm)	::	
40	Oil quality	::	
	(i) Applicable standard	::	
	(ii) Total quality of oil (in litres)	::	
41	Approximate overall Dimensions (in mm)	::	
	(a) Length	::	
	(b) Breadth	::	
	(c) Height	::	
	(d) Minimum height of bottom most portion bushing from bottom of base channel	::	
42	Minimum clearance height for lifting tank cover (in mm)	::	

Signature :
Name :
Designation :

Company Seal :