

TECHNICAL SPECIFICATION FOR 11KV/110V, 0.2S CLASS ACCURACY CTPT sets of assorted ratio 10/5A (Indoor)

1. SCOPE:

This specification covers the design, manufacture, and assembly testing at manufacturer's works and supply and delivery at destination of outdoor oil immersed 11KV/110V, 0.2s class accuracy of CTPT sets of assorted ratios.

2. **STANDARDS:-** The equipment shall conform in all respects to the latest version of relevant I.S. indicated below as applicable.

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|--|--|
| i) Current Transformers | : IS 2705 (Parts I to IV) (Latest version) |
| ii) Voltage Transformers | : IS 3156 (or latest version thereof) |
| iii) H.V. Porcelain Bushings | : IS 2099 |
| iv) Oil | : IS 335/2018 |
| v) Galvanization | : IS 2633 |
| vi) Primary Terminals | : IS 10601 |
| vii) Insulation coordination | : IS 2165 |
| viii) Dimensions of porcelain Bushings | : IS 3347 |
| ix) Method of high voltage rating | : IS 2071 |

The tender shall go through the above I.S. (or latest version thereof) thoroughly before making his offer.

3. **CLIMATIC CONDITIONS:-** The materials to be supplied against this specification shall be suitable for satisfactory continuous operation under the following tropical conditions

<u>Location</u>	At various locations in the state of Andhra Pradesh
Max. ambient air temperature (deg.C)	50
Max. ambient air temperature in a closed box (deg.C)	60
Min. ambient air temperature (deg.C)	7.5
Average daily ambient air temp. (deg.C)	35
Max. Relative Humidity (%)	100
Max. altitude above mean sea level (m)	1000
Average Annual rainfall(mm)	925
Max. wind pressure(kg/sq. m.)	200
Isoceraunic level(days per year)	40 to 50
Seismic level(Horizontal acceleration)	0.3 g.
Permitted Noise Level	45 dB

Moderately hot and humid tropical climate is conducive to rust and fungus growth. The climatic conditions are also prone to wide variations in the ambient conditions, Smoke is also present in the atmosphere, Heavy lighting also occurs during June to October.

4. 11KV/110V CTPT sets: (Metering Cubicle Equipment)-

4.1 **TYPE:-** The CTPT sets (Metering Cubicle equipment) shall be pole mounting/plinth mounted for outdoor use. They are to be used in 11KV, 3-Phase with solidly earthed neutral system and shall be suitable for 3-Ph, 3-wire, 50Hz Networks. The equipment is required for operation of tri-vector meters and shall be oil cooled.

4.2. The CTPT sets shall have the following ratings.

- i. Rated Voltage: 11KV
- ii. Highest systems voltage: 12KV
- iii. Insulation level: 12KV
- iv. Standard impulse withstand voltage: 75KV
- v. One minute power frequency withstand voltage
 - a. primary: 28KV
 - b. Secondary: 3KV

- vi. Short time thermal current and its duration (STC):
 6KA for 1sec for 5/5A, 10/5A ratio and
 9KA for 1sec for 20/5A, 40/5A & 75/5A ratios
- vii. Class of accuracy: 0.2S
- viii. Rated burden per phase
 a. For CTs: 5VA per phase
 b. For PTs: 10VA per phase
- ix. Frequency: 50HZ

4.3 DESIGN:

- a) The equipment shall be designed to ensure satisfactory operation under all conditions of service to facilitate easy inspection, cleaning and repairs.
- b) The design shall incorporate every reasonable precaution and provisions for safety of all those concerned in the operation and maintenance of the equipment.
- c) All out-door apparatus shall be so designed that water cannot be collected at any point and enter the CT/PT set. The top cover of the tank, secondary terminal cover, cable box and inspection cover are suitably bent at the edges so that gaskets are not exposed to moisture.
- d) All connections and terminals shall be of sufficient size for carrying the specified currents continuously without undue heating.
- e) On outdoor equipment all bolts, nuts, washers in contact with non-ferrous parts shall be of brass.
- f) All ferrous parts including bolts & nuts liable to corrosion, forming integral parts of the equipment shall be smoothly and continuously hot dip galvanized.
- g) The secondary terminal box, inspection cover and oil gauge shall be arranged as shown in the drawing.
- h) The core shall be high grade non-ageing electrical silicon laminated steel of low hysteresis loss and high permeability to ensure high accuracy, at both normal and over current/voltage.
- i) All winding shall be of insulated high grade electrolytic copper wire and the manufacturing of the units shall be done in completely closed and air-conditioned room otherwise fiber glass insulation sleeves are to be provided for primary winding. Details of winding and core shall be furnished.
- j) The CTPT set should have three CTs and one three phase PT with star/star connection.

4.4 INSULATING OIL:

Insulating oil required for first filling of the instrument transformers shall be covered in tenderer's scope of supply. The oil shall meet the requirements of latest edition of IS 335/2018. Use of other insulating material such as quartz sand is not permitted. The oil quantity shall be minimum of 60litres.

4.5 SEALING: Provision for sealing at 4 points on the secondary terminal box, inspection cover, the top cover of the tank and cable box shall be made. This may be made by providing a hole of adequate size to pass the sealing wire, of above 14 SWG. A hole on tail of corner bolts shall be provided.

4.6 FLUCTUATION IN VOLTAGE AND FREQUENCY: For continuous operation, entire equipment shall be subjected to variation of voltage up to plus 20% and -30% and frequency of plus or minus 5 percent.

4.7 INSTRUMENT TRANSFORMERS:

- a) The voltage and current transformers shall have normal continuous rating as per the schedule of requirement. Voltage transformer shall be provided with bridged current limiting resistance fuses on the high voltage side.
- b) The voltage transformer shall be so designed that the increased magnetizing currents due to any persisting over voltage does not produce injurious overheating. Phase barriers shall be provided.

- c) The peak value of the rated dynamic current shall not be less than 2.5 times the rated short time thermal current unless stated otherwise (4.62 of ISS 2705/Part I of 1992 or latest version).
 - d) Modified polyester enamel copper wire is to be used for winding and it shall conform to IS-4800/Part-V (latest version).
 - e) The terminals of the instrument transformer shall be clearly marked by distinctive letters as stated in Appendix C of ISS/3156/Part-I/1965 (latest version) for voltage transformer and Appendix 'C' of IS-2705/Part-I/1992 (latest version) for current transformers.
 - f) The winding shall be neatly laid and anchored.
 - g) The metering set tank and other metal parts shall be galvanized, as per latest IS applicable.
- 4.8 Requirement of Cable Box and bushings: (for indoor type CTPT set it shall be of incoming Cable/ Outgoing Cable and for outdoor type CTPT set it shall be of incoming cable/ Outgoing Bushings)
- a) Non - Detachable cable box shall be provided on HT side for incoming for both indoor & outdoor type. The position of cable shall be located such that it will not foul with the belting angles. Provision for sealing at 4 points shall be made. Suitable cable glands shall be supplied along with boxes. The cable box shall be suitable not only for 11KV XLPE 35sq.mm cables and for higher ratings also. Indoor bushings should be fixed with suitable flanges and firmly fixed to avoid oil leakages. Good quality of Neoprene gaskets to be used. The clearance from cover to live terminal shall be at least 70mm. The minimum clearance between phases and phases & phases to earth/body shall be 150mm. Incoming cable chamber dimensions (minimum) shall be as follows: 500mm(length)x360mm(width)x340mm(depth). The minimum clearance from live bushing to top cover shall be 110mm & live bushing to bottom gland shall be 250mm. Dimensional tolerance allowed is +/- 5% only.
 - b) Bushings for out-going side of CTPT Set for outdoor type: The porcelain portion of HT bushings shall be of standard make and conform to IS-2099/1996. Insulation sheet barriers like Bakelite or fiber glass shall be provided in between the phases to cover the length of bushing stud. The dimensions of the bushings shall confirm to IS-3347/part-III/1972. The minimum clearance between phases and phases & phases to earth/body shall be 360mm.
 - c) The bushings shall be of reputed manufacturers like M/s.Jayshree Insulators, M/s.WS Industries, M/s.BHEL, M/s.Allied Ceramics, M/s.India Potteries, M/s.Venkateswara Ceramic Industries, M/s.IEC, CJI / Prime Insulator and Sampath Ceramics who are having complete testing facilities.
- Or
- The bushings shall be of reputed manufacturers who are having complete testing facilities and shall be as per relevant IS.
- d) All the collar bolts & nuts for Bushings shall be GI/Steel only.**
- e) The bushing stems shall be provided with suitable bimetallic connectors so as to connect the jumper without disturbing the bushing stem. Insulation sheet barriers like Bakelite or Fiberglass shall be provided in between the phases to cover the length of bushing stud in cable box.
 - f) The minimum clearance between indoor bush rods to cable box cover shall be 50 mm.
 - g) TERMINALS: Brass rods 12mm diameter for Primary and 6 mm diameter for secondary.
 - h) The porcelain portion of HT bushings shall be of standard make and confirm to IS-2099/1996.

i) **Cable Box Bushing (Incoming side of CTPT set):** Cable Box Bushing of incoming side shall be of porcelain type.

j) The tests as per IS-2099/1962 shall be conducted on the transformer bushings as detailed below:

Dry flash over voltage

Wet flash over voltage

Dry 1 Minute withstand voltage

Impulse withstand voltage (1.2/50 Micro Seconds –ve wave)

Manufacturer's test certification may be furnished for every lot of inspection

k) **SECONDARY TERMINAL BOX:** The hole provided in the secondary terminal box shall be minimum of 28mm diameter in size.

l) The clearance between secondary CT terminal and PT terminal should be 50 mm minimum.

4.9 STEEL TANK:

- a) The Oil filled container incorporating the voltage transformers and current transformers should be fitted with incoming and outgoing primary terminals and secondary terminal box. The secondary terminal box shall be arranged on sides. The general arrangement shall be with cable box on the incoming side and 3 bushings on the outgoing side for outdoor type and with cable box on incoming & outgoing side for indoor type.
- b) The tank shall be built with plate of 5 mm thick top and 3.15mm sides and bottom and with all fittings shall be capable of withstanding without leakage or distortion at the standard test pressure. All joints of the tank and fittings shall be hot oil tight and no leaking should occur during service. The main tank dimensions (minimum) shall be as follows: 550mm (height) x 275mm (width) x 530mm (length at the middle). Dimensional tolerance allowed is +/-5% only.
- c) It shall be provided with an oil gauge. The oil gauge glass shall be fixed appropriately. The tank shall be provided with necessary lifting lugs. Oil gauge shall indicate maximum & minimum oil levels clearly.
- d) The secondary terminal box cover, cable box cover, tank cover and inspection cover and other vertical joints where gaskets are used shall be suitably bent with necessary sealing arrangement. This will have to safeguard against seepage of water into tank in case of damaged gasket.
- e) The Gasket shall be dovetailed without joints to prevent moisture entry. In case of dovetailed joint, they shall not be more than two. The Gasket shall be of good quality Neoprene or rubberized gasket.
- f) **EARTHING:** Two earthing terminals shall be adequate size protected against corrosion and metallically clean and identified by means of the sign marked in a legible and indelible manner on or adjacent to the terminals.
- g) All bolts should be provided with 2 flat washers and a spring washer with a nut.
- h) Conservator should not be provided for these CTPT sets.
- i) The Secondary terminal box incoming hole should be 28mm diameter and at a height of 330 mm +/- 5 mm from bottom to avoid replacement/ modification of secondary wires pipe when CTPT set is replaced. The secondary terminals size should be 6 mm diameter, 25 mm stem length, 2 flat washers with 3 nuts of brass material should be provided. The terminals should be provided at least 70 mm height from incoming hole and clearances shall be as per IS to avoid shorting terminals due to secondary wires pipe.
- j) The following details of equipment shall be provided on a name plate with at least 10 mm letters. The name plate is to be welded to the tank after galvanization.
 - 1. Make, 2. Ratio, 3. Class of accuracy, 4. Serial No: & 5. Month & year of manufacturing.
- k) 18 months guarantee embossed plate shall be welded opposite side of name plate.
- l) **MOUNTING ARRANGEMENT :** The under base of all CTPT sets shall be provided with two 75x40mm GI channels and foundation dimensions shall be as per enclosed drawing and

uniform for all sets with only +/- 2 mm tolerance, to avoid modification of structure/ plinth, whenever CTPT set is replaced.

- m) Phase barriers to be provided in such a way that they will not obstructing the 11KV cable fixing.
- n) The star point inside the tank to be properly insulated to avoid damage.
- o) The location of pressure relief valve shall be situated by the side under the shadow of the top cover of the unit.
- p) Anti tracking silicon based high voltage insulating spray shall be additionally applied.
- q) Outdoor bushings comes with round oil seals with the metal parts shall be provided.

5) TESTS:

5.1 TYPE TESTS: The equipment offered shall be fully type tested from recognized standard laboratory (accredited by NABL) by the bidder as per the relevant standards. The bidder shall furnish three copies of type test certificates with the bid. These type test certificates shall be got approved by the purchaser before commencement of supply. The bidders also furnish type test certificates for bushings and oil along with the bid. The type tests shall be conducted and type test certificates for the tests carried out on prototype of same specification shall be enclosed with tender. **The type tests Certificates shall not be more than 10 years old as on the date of opening of bid.**

5.2. ACCEPTANCE AND ROUTINE TEST:

All acceptance and routine tests as stipulated in the relevant standards shall be carried out by the supplier in presence of purchaser's representatives. Immediately after finalization of the programme of acceptance/routine testing, the manufacturer shall give advance intimation to the purchaser, to enable him to depute his representative for witnessing the tests.

5.3. TYPE TESTS FOR CTs :

- a) Short time current Test.
- b) Temperature rise test.
- c) Lightning Impulse Test.
- d) High Voltage Power frequency wet withstand voltage test.
- f) Determination of errors or other characteristics according to the requirements of the appropriate designation or accuracy class.

5.4. TYPE TESTS FOR PTs:

- a) Determination of errors according to the requirements of the appropriate accuracy class.
- b) Temperature rise test.
- c) Impulse Voltage test.

5.5. TYPE TESTS FOR TRANSFORMER BUSHINGS:

- a) Dry flash over voltage.
- b) Wet flash over voltage.
- c) Dry 1 Minute withstand voltage.
- d) Impulse withstand voltage (1.2/50 Micro Seconds –ve wave)

5.6. ACCEPTANCE AND ROUTINE TESTS:

The following shall be conducted as per IS: 3156 (Latest version).

- a) Verification of Terminal marking and polarity.
- b) Power frequency dry withstand tests on primary windings.
- c) Power frequency dry withstand tests on secondary windings.
- d) Determination of errors according to the requirements of the appropriate

accuracy class.

e) Temperature rise test.

f) Air pressure test on empty tank of transformer opened for physical verification test (One for every lot of inspection offered)

g) **One CTPT set from the offered lot for inspection shall be subjected to temperature rise test irrespective of ratios.**

h) Accuracy test (Determination of errors) shall be conducted on 100% offered quantity in the presence of DISCOM authorized representative Or Accuracy test (Determination of errors) shall be conducted on offered inspection lot as per IS in the presence of DISCOM authorized representative.

6. INSPECTION : All acceptance tests shall be conducted at the time of inspection and at the place of manufacture unless otherwise specifically agreed upon by the manufacturer and purchaser at the time of purchase. The manufacturer shall afford the inspector representing the purchaser all reasonable facilities without charges to satisfy him that the material is being furnished in accordance with the specification.

The purchaser has the right to have the tests carried at supplier's cost by an independent agency whenever there is a dispute regarding the quality of supply.

The purchaser reserves the right to insist for witnessing the acceptance/routine testing of the bought out items. The supplier shall give 15 days for local supply/30 days (in case of foreign supply) advance intimation to enable the purchaser to depute his representative for witnessing the acceptance and routine tests.

The lot will be accepted into stock only if the materials satisfy the above tests and will be rejected if fails to conform to the standards. The same process will be followed for II-consignment (in case of rejection of I-lot) and if the materials fail in 2nd time also the total order will be cancelled. If the material is rejected by the inspection authority, you have to offer fresh inspection of material duly attending the remarks of the inspection authority and all the inspection charges in this connection shall be borne by supplier only.

7. DRAWINGS AND LEAFLETS: Two sets of drawings showing clearly the general arrangements, sectional views, fitting details, electrical connection and design features of each component part should accompany the tender. Technical leaflets giving the operating instructions should also be furnished along with the tender. Tenders without these details are liable to be rejected. The literature and drawing are to be sent along with each equipment while dispatching, after approval by this office.

8. DEPARTURE FROM SPECIFICATION: If the tenderer wishes to depart from this specification in any respect, he shall draw the attention to such points of departure explaining fully the reasons there for. Unless this is done the requirements of this specification will be deemed to have been accepted in every respect.

9. Name Plate: The purchase order No. and Date of the purchase order, warranty period, the words "PROPERTY OF EASTERN POWER DISTRIBUTION COMPANY OF AP Ltd." should be etched on the Name plate. The name plate is to be welded to the tank after galvanization.

10. GUARANTEE TECHNICAL PARTICULARS: The technical particulars as per IS (or Latest version thereof) shall be guaranteed and guaranteed technical particulars as per Annexure shall be furnished by the bidder along with his offer.

11. Warranty: The material offered shall have a warranty of 18 months. The warranty clause 53 of GTC shall be followed.

12. PACKING AND FORWARDING: The equipment's shall be packed in crates suitable for vertical / horizontal transport as the case may be and suitable to withstand handling during transport and outdoor storage during transit. The supplier shall be responsible for any damage to the equipment during transit, due to improper and inadequate packing. The easily damageable material shall be carefully packed and marked with the appropriate caution symbols. Wherever necessary, proper arrangement for lifting such as lifting hooks etc. shall be provided. Any material found short inside the packing cases shall be supplied by supplier without any extra cost.

Each consignment shall be accompanied by a detailed packing list containing the following information.

- a) Name of the consignee.
- b) Details of consignment.
- c) Destination
- d) Total weight of consignment
- e) Sign showing upper / lower side of the crate
- f) Handling and unpacking instructions
- g) Bill of material indicating contents of each package.

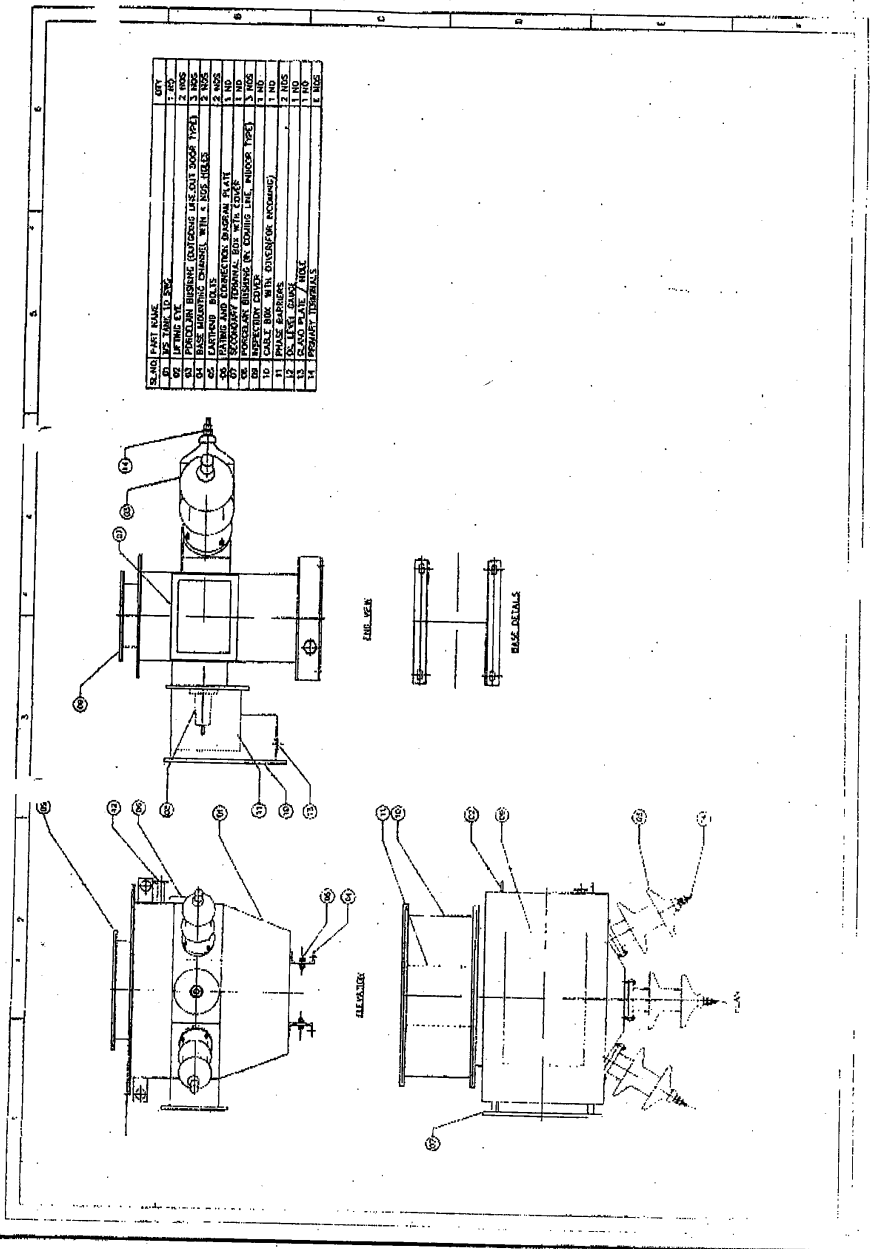
The supplier shall ensure that the packing list and bill of material are approved by the purchaser before dispatch.

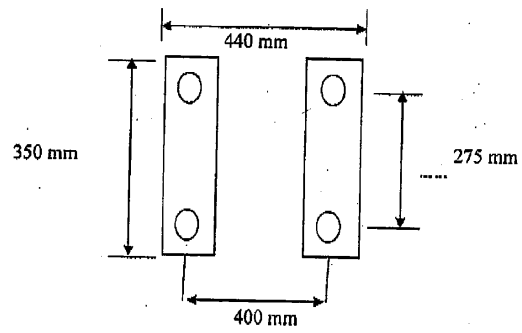
13. The bidder shall indicate the source of all materials. He shall also indicate the name of the supplier and make of Conductor, Transformer Oil Electrical Steel Laminations and Construction Steel etc.

14. SCHEDULE OF REQUIREMENTS DESIRED DELIVERY AND PRICES:

The schedule of requirements and desired deliveries are indicated in Annexure – 2

The schedule of prices shall indicated as per price schedule form of Annexure - 2





Foundation Dimensions of CTPT set

GUARANTEED TECHNICAL PARTICULARS FOR TRANSFORMER OIL
(All the characteristic shall be as per IS:335/2018 or latest version thereof)

Sl.No.	Characteristic	Particulars
1.	Appearance	
2.	Density at 27 degrees C (Max.)	
3.	Kinematics viscosity at 27 degrees C (Max.)	
4.	Interfacial tension at 27 degrees C (Min.)	
5.	Flash point, pen sky-Marten (closed) (Min.)	
6.	Pour Point (Max.)	
7.	Neutralization value :	
	a) Total acidity (max.)	
	b) In-organic acidity/alkalinity	
8.	Corrosive sulphur	
9.	Electric strength (break down voltage/minute	
	a) New unfiltered oil	
	b) After filtration	
10.	Dielectric dissipation factor (Tan delta at 90 Degree C(Min.))	
11.	Specific resistance (resistivity)	
	a) At 90 degree C (Min)	
	b) At 27 Degree C (Min)	
12.	Oxidation stability	
	a) Neutralization value after oxidation (Max.)	
	b) Total sludge after oxidation (Max.)	
13.	Ageing characteristics after accelerating ageing (open breaker method with copper catalyst) for 96 Hrs. as per ASTM D 1934-1978.	
	a) Specific resistance (Resistivity)	
	i) At 27 Degree C (Min.)	
	ii) At 90 Degree C (Min)	
	b) Dielectric dissipation factor Tan delta at 90 degree C (Max.)	
	c) Total sludge value (Max.)	
	d) Total acidity (Max.)	
14.	Presence oxidation inhibitor	
15.	Water content (Max.)	

**(TO BE FILLED IN BY THE BIDDER SEPARATELY FOR EACH RATIO)
GUARANTEED TECHNICAL PARTICULARS OF METERING CUBICLES**

I	VOLTAGE TRANSFORMER:	
1	Maker's name and country:	
2	Type	
3	Ratio of the rated primary voltage to the corresponding rated secondary voltage	
4	System voltage expressed in symbolic notion.	
5	Rated burden in volt-amperes per phase.	
6	Rated frequency: Cycles per second.	
7	Class designation: i.e. Accuracy	
8	Limits of error: a) Ratio error	
	b) Phase difference in minutes	
9	Maximum temperature rise.	
10	Maximum voltage that can be withstood by the primary for one minute: kv	
11	Insulation strength	
12	One-minute power frequency dry withstand test voltage on secondary winding	
13	Winding wire	
14	Interlayer insulation	
II	CURRENT TRANSFORMER	
1	Maker's name.	
2	Type	
3	Ratio of the rated primary current to the corresponding rated secondary current	
4	Rated burden in volt-amperes	
5	Rated frequency: Cycles per second	
6	Class designation: i.e. Accuracy.	
7	Over current factor and time.	
8	Limits of error: a) Ratio error	
	b) Phase difference: minutes	
9	Maximum temperature rise	
10	Continuous percentage over load	
11	Short circuit current and duration.	
III	Details of Cable Boxes & Bushings	
IV	OIL	
1	Grade of Oil	
2	Qty. of oil for first filling a) Litres.	60 litres (Minimum)

	b) Kgs.	
V	TANK	
1	Dimension and thickness. (tolerance if any)	
2	Standard pressure that can be withstood.	
VI	GENERAL:	
1	The design shall incorporate every reasonable precaution and provisions for safety of all those concerned in the operation and maintenance of the equipment	
2	All outdoor apparatus shall be so designed that water cannot collect at any point	
3	On outdoor equipment all bolts, nuts, washers in contact with non-ferrous parts shall be of phosphor bronze	

THE ABOVE PARTICULARS ARE HEREBY GUARANTEED.

Name of the Firm :

Signature :

Date Designation :