

## SECTION – IV

### 2) TECHNICAL SPECIFICATION OF 11KV METERING CTPT SETS

**1. SCOPE:** The specification provides for manufacture, testing before dispatch, supply and delivery of **10/5A (outdoor), 20/5A (outdoor), 40/5A (outdoor) & 10/5A (Indoor), 20/5A (Indoor), 40/5A (Indoor)** 11KV CTPT metering sets of class of accuracy **0.2S** as per the particulars given in the schedule attached.

**2. STANDARD:** Except where modified by this specification the component parts of the equipment shall comply with the following IS (with latest amendments from time to time)

i) Voltage & Current Transformers : IS 3156& IS-2705

ii) Transformer Oil: IS 335/93

HV Porcelain Bushing: IS2099 Galvanization: IS2633 Primary Terminals: IS 10601

**3. TYPE:** The metering transformer equipment should be of pole mounting type for outdoor use. They are to be used in 11KV Three phase with solidly earthed neutral and suitable for 3 phase 3 wire 50 cycles networks. The equipment is required for operation of trivector meters and should be oil cooled.

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:9KA for 1sec
- vii. class of accuracy: 0.2S
- viii. Rated burden per phase
  1. For CTs: The rated burden for CTs is 5VA\_per phase
  2. For PTs: The rated burden for PTs shall be 10VA per phase.
- IX. Frequency: 50HZ

#### 4. 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 bank, 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.

**5. SEALING :** Provision for sealing at 4 points on the secondary terminal box, inspection cover, the top cover of the bank 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.

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

## **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 magnetising currents due to any persisting over voltage does not produce injurious over heating. 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.

**8. Cable Box for incoming side for item No. a) & b) in schedule of material and cable box for outgoing side for item No. b) and bushings for outgoing side for item a) in schedule of material :**

1. Non - Detachable cable box shall be provided on HT side for incoming for item No. a & b and outgoing side for item No. (b) and bushings for outgoing side for item a) in schedule of material. 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 for M-seal indoor and terminations of 11KV XLPE upto 50sq.mm cables. The minimum clearance between phases and phases to earth shall be as per ISS. The tenderer shall quote for CT/PT sets having cable box for incoming side for item No. (a) & (b) in the schedule of material, cable box for outgoing side for item No. (b) in the schedule of material and bushing on the outgoing side for item No. (a) in the schedule of material.

2. Bushings for out-going side of CT/PT Set for item No. a) in schedule of material:

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 phase to phase clearance shall be as per IS.

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.

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.

The minimum clearance between indoor bush rod to cable box cover shall be 50 mm.

TERMINALS : Brass rods 12mm dia for Primary and 6 mm dia for secondary.

Bushing for outgoing side of CTPT set:

The porcelain portion of HT bushings shall be of standard make and conform to IS-2099/1996.

The dimensions of the bushings shall conform to IS- 3347/Part.III/1972. The minimum phase-to-phase clearance shall be as per IS.

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

- 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)
- e) Manufacturer's test certification may be furnished for every lot of offer.

#### **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.
- 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.
- 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.
- 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 metallicly 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 **27 mm diameter** and at a height of 330 mm +/- 5 mm from bottom to avoid replacement/ modification of secondary wires pipe when CTPT sets 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.  
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.

**10. OIL:** The insulation oil used in the tank shall comply with the requirements specified in latest relevant IS-335/93 as per Annexure I.

**11. GUARANTEED TECHNICAL PARTICULARS:** The technical particulars as specified in IS shall be guaranteed. Every tenderer should furnish the particulars required without fail and guarantee the values so furnished for the supplies.

## **12 TESTS:**

**12.1 TYPE TESTS:** The equipment offered shall be fully type tested from recognized standard laboratory 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 bidder 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.

**12.2. 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.

### **12.3. 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.

### **12.4 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.

### **12.5. 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)

**12.6. 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 offered)

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

Accuracy test (Determination of errors) shall be conducted on 100% offered quantity in the presence of Discom representative.

**13. 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 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.

**14. 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.

**15. Name Plate:** The purchase order No. and Date of the purchase order, the words "PROPERTY OF APCPDCL" should be etched on the Name plate.

The name plate is to be welded to the tank after galvanization.

**16. Important Note:**As per the instructions of Director, Ministry of Power, Govt. of India vide Lr.No.25-11/6/2018-PG, dt.2-07-2020.

**a) All equipment, components and parts imported for use in the manufacturing of above material shall be tested to check for any kind of embedded malware/Trojans/Cyber threat and for adherence to Indian standards.**

**b) All such testings shall be done in certified laboratories that will be designated by the Ministry of Power (MoP).**

**c) Any import of equipment/components/Parts from "Prior reference" countries i.e., CHINA, PAKISTAN or by persons owned by, controlled by, or subject to the jurisdiction or the directions of these "prior reference" countries will require prior permission of the Government of India.**

**d) Where the equipment/components/parts are imported from "prior reference" countries, with special permission, the protocol for testing in certified & designated laboratories shall be approved by the Ministry of Power (Mop).**

**e) The above shall apply to any item imported for end use or to be used as a component, or as a part in manufacturing, assembling of any equipment or to be used or any activity directly or indirectly related to power supply system.**

**CHIEF GENERAL MANAGER/P&MM  
APCPDCL::VIJAYAWADA**

## ANNEXURE – I

### **GUARANTEED TECHNICAL PARTICULARS FOR TRANSFORMER OIL**

Sl.No.	Characteristic	Particulars
1.	Appearance	The oil shall be clear and transparent and free from suspended matter or sediments and should conform to IS-335/93 or latest versions
2.	Density at 27 degrees C (Max.)	0.89 g/cm
3.	Kinematics viscosity at 27 degrees C (Max.)	27 CST
4.	Interfacial tension at 27 degrees C (Min.)	0.04 N/M
5.	Flash point, pen sky-Marten (closed) (Min.)	140 Degree C
6.	Pour Point (Max.)	-10 Degree C.
7.	Neutralization value :	
	a) Total acidity (max.)	0.01
	b) In-organic acidity/alkalinity	Nil
8.	Corrosive sulphur	Non – Corrosive
9.	Electric strength (break down voltage/minute	
	a) New unfiltered oil	30 KV (rms)
	b) After filtration	50 KV (rms)
10.	Dielectric dissipation factor (Tan delta at 90 Degree C (Min.)	0.005
11.	Specific resistance (resistivity)	
	a) At 90 degree C (Min)	$30 \times 10^{12}$ ohms – cm
	b) At 27 Degree C (Min)	$500 \times 10^{12}$ ohms – cm
12.	Oxidation stability	
	a) Neutralization value after oxidation (Max.)	0.2 mg KOH/g
	b) Total sludge after oxidation (Max.)	0.05% by weight
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.)	$2.5 \times 10^{12}$ ohms – cm
	ii) At 90 Degree C (Min)	$0.20 \times 10^2$ ohms – cm
	b) Dielectric dissipation factor Tan delta at 90 degree C (Max.)	0.20
	c) Total sludge value (Max.)	0.5
	d) Total acidity (Max.)	0.5
14.	Presence oxidation inhibitor	Nil
15.	Water content (Max.)	50 ppm



## **ANNEXURE – II**

### **(TO BE FILLED IN BY THE TENDERER) GUARANTEED TECHNICAL PARTICULARS (TO BE FURNISHED ALONG WITH THE TENDER)**

#### **I. VOLTAGE TRANSFORMER :**

1. Maker's Name and Address :
2. Type
3. Ratio of the rated primary voltage to the corresponding rated secondary voltage.
4. System voltage expressed in symbolic notation
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 withstand 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 in minutes
9. Maximum temperature rise
10. Continuous percentage over load

#### **III. Details of Cable Boxes & Bushings :**

#### **IV. OIL :**

1. Grade of oil
2. Quantity of oil for first filling   a) Litres  
  b) Kgs

#### **V. TANK :**

1. Dimension and thickness.
2. Standard pressure that can be withstand.

**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.
4. The oil gauge glass shall be fixed appropriately.
5. Insulation sheet barriers like bakelite or fiber glass shall be provided in between phases to over the length of bushing stud.
6. 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.

THE ABOVE PARTICULARS ARE HEREBY GUARANTEED.

**Name of the Firm :**

Signature :

Date Designation :

