

**MATERIAL SPECIFICATION CELL**

TECHNICAL SPECIFICATION OF

11KV, 22KV & 33KV OUTDOOR OIL COOLED  
SINGLE PHASE SINGLE RATIO TYPE  
CURRENT TRANSFORMERS FOR METERING

## INDEX

Cl. No.	Contents
1.	Scope
2.	System Particulars
3.	Service Conditions
4.	Applicable Standards
5.	Principle Technical Parameters of Current Transformers
6.	General Technical Requirements of Current Transformers
7.	Tests
8.	Inspection
9.	Qualifying requirements
10.	Quality Assurance Plan
11.	Performance Guarantee
12.	Documentation
13.	Packing and Forwarding
14.	Information to be filled /furnished invariably by Bidder
15.	Schedule
<b>ANNEXURE</b>	
1.	Annexure A : Principle Technical Parameters of 11kV & 22kV Outdoor Oil Cooled, Single Phase, Single Ratio type Current Transformers for Metering
2.	Annexure B : Principle Technical Parameters of 33kV Outdoor Oil Cooled, Single Phase, Single Ratio type Current Transformers for Metering
<b>SCHEDULE</b>	
1.	SCCHEDULE 'A' - Guaranteed Technical Particulars of 11kV, 22kV & 33kV Outdoor Oil Cooled, Single Phase, Single Ratio type Current Transformers for Metering

## 1.0 Scope :-

- 1.1 This specification covers design, manufacture, assembly, testing before supply, inspection, packing & delivery and other basic technical requirements in respect of 11kV, 22kV, 33kV Outdoor Oil Cooled Single Phase, Single Ratio Type Current Transformers for Metering to be installed at various Generation Projects in MSEDCL, Maharashtra. The Outdoor Oil Cooled, Single Phase, Single Ratio Type Current Transformers for Metering to be supplied against this specification are required for vital installations where continuity of service is very important. The design, materials and manufacture of the Current Transformers shall, therefore, be of the highest order to ensure continuous and trouble-free service over the years.
- 1.2 The Outdoor Oil Cooled Single Phase, Single Ratio Type Current Transformers for Metering offered shall be complete with all parts necessary for their effective and trouble-free operation. Such parts will be deemed to be within the scope of the supply irrespective of whether they are specifically indicated in the commercial order or not.
- 1.3 It is not the intent to specify herein complete details of design and construction. The Outdoor Oil Cooled Single Phase, Single Ratio Type Current Transformers for Metering offered shall conform to the relevant standards and be of high quality, sturdy, robust and of good design and workmanship complete in all respects and capable to perform continuous and satisfactory operations in the actual service conditions at site and shall have sufficiently long life in service as per statutory requirements.

## 2.0 System Particulars:-

- |  |  |
|--|--|
| 2.1 Nominal System Voltage               | : 11kV, 22kV, 33kV   |
| 2.2 Voltage variation on supply side     | : $\pm 10\%$   |
| 2.3 Corresponding Highest System Voltage | : 12kV, 24kV, 36kV   |
| 2.4 Frequency                            | : 50 HZ with $\pm 3\%$ tolerance                           |
| 2.5 Transient condition                  | : -20% or +10% combined variation of voltage and frequency |
| 2.6 Number of phases                     | : 3 Phases   |
| 2.7 Neutral Earthing                     | : Solidly Effectively Earthed                              |

## 3.0 Service Conditions:-

- A) Outdoor Oil Cooled Single Phase, Single Ratio Type Current Transformers for Metering to be supplied against this specification shall be suitable for satisfactory continuous operation under the following tropical conditions.

- |  |    |
|--|----|
| 3.1 Maximum ambient Temperature (Degree C)         | 50 |
| 3.2 Maximum temperature in shade (Degree C)        | 45 |
| 3.3 Minimum Temperature of air in shade (Degree C) | 35 |

TECHNICAL SPECIFICATION OF 11KV, 22KV & 33KV OUTDOOR OIL COOLED SINGLE PHASE  
SINGLE RATIO TYPE CURRENT TRANSFORMERS FOR METERING

3.4 Relative Humidity (percent)	10 to 100
3.5 Maximum Annual rain fall (mm)	1450
3.6 Maximum wind pressure (kg/sq.m)	150
3.7 Maximum altitude above mean sea level (Meter)	1000
3.8 Isoceranic level (days per year)	50
3.9 Seismic level (Horizontal Acceleration)	0.3g

Moderately hot and humid tropical climate conducive to rust and fungus growth...

B) The climatic conditions are prone to wide variations in ambient conditions and hence the Outdoor Oil Cooled, Single Phase, Single Ratio Type Current Transformers for Metering shall be of suitable design to work satisfactorily under these conditions.

**4.0 Applicable Standards :-**

- 4.1 The design, manufacture and performance of the Outdoor Oil Cooled Single Phase, Single Ratio Type Current Transformers for Metering shall comply with all currently applicable statutes, regulations and safety codes. Nothing in this specification shall be construed to relieve the bidder off his responsibilities.
- 4.2 Unless otherwise specified, the Outdoor Oil Cooled Single Phase, Single Ratio Type Current Transformers for Metering offered shall conform to the latest applicable Indian, IEC, British, U.S.A. or International Standards and in particular, to the following:-

Sr. No.	Standards	Particulars
1.	IS 2165	Insulation coordination of highest voltages for equipments
2.	IS 16227 (Part-1) & (Part-2) /2016	Current Transformers
3.	IS 3202	Code of practice for climate proofing of electrical equipments
4.	IS 2071	Method of high Voltage Testing
5.	IS 2147	Degree of protection provided by enclosures for low voltages, Switchgear & Control
6.	IEC 185	Current Transformers
7.	IEC 270	Partial Discharge measurement
8.	IEC 44(4)	Instrument Transformer measurement of PDs
9.	IEC 60	High Voltage Test Techniques
10.	IEC 8263	Method of RIV Tests on high voltage Insulators
11.	IS 2099	High Voltage Porcelain Bushing

12.	IS 3347	Dimensions of porcelain transformer bushing
13.	IS 335	Insulation Oil for transformers & Switchgears

**5.0 Principal Technical Parameters of Current Transformers:**

The equipment covered under this specification shall conform to specific parameters given below:

**5.1 Principal Technical Parameters of 11kV Outdoor Oil Cooled Single Phase Single Ratio Type Current Transformers for Metering**

- i) Type of CT : Outdoor Oil Cooled, Single Phase, Single Ratio, Dead Tank, Hermetically sealed, CT
- ii) Type of mounting : Pedestal Type
- iii) Nominal System Voltage : 11kV
- iv) Corresponding Highest System Voltage : 12kV
- v) Frequency : 50 Hz with  $\pm 3\%$  tolerance
- vi) Neutral Earthing : Solidly Effectively Earthed
- vii) Lightning Impulse Withstand Voltage (kVp) : 75
- viii) One minute dry/wet power frequency Withstand Voltage primary (kV rms) : 28
- ix) Rated Short Time Withstand Current for 1 Second : 3 kA for 5/5A & 10/5A  
6.7 kA for 25/5A & 50/5A  
13.1 kA for 100/5A, 200/5A & 300/5A
- x) Rated Dynamic Withstand Current (kAp) : 2.5 Times STC
- xi) Minimum Creepage Distance (mm) : 300
- xii) Vertical clearance of porcelain housing (min.) (mm) : 370
- xiii) Power Frequency Over Voltage Withstand requirement for Secondary winding (kVrms) : 3kV
- xiv) Instrument Security Factor : 5 or less for Metering Core
- xv) The die-electric withstand values of External & Internal Insulation : 28 kV/75 kVp
- xvi) Rated Continuous Thermal Current (A) : 120% of the rated Primary current
- xvii) Temperature rise : As per IS: 16227(Part-1) & IS: 16227 (Part-2) 2016
- xviii) Max. Radio Interference Voltage : Less than 500 micro volts

xix) Single Core	: Metering
xx) CT Ratio	: 5/5A, 10/5A, 25/5A, 50/5A, 100/5A, 200/5A & 300/5A
xxi) Burden	: 15VA
xxii) Class of Accuracy	: 0.2S
xxiii) Primary Terminal requirement	: Two, Dia. as per CT ratio x 80mm length
xxiv) Mounting Frame size requirement (mm×mm) and mounting hole diameter(mm)	: 350mm×350mm, Mounting Holes - Dia. 30mm
xxv) Type of oil compensation provided	: Nitrogen cushion or SS Bellow
xxvi) Partial Discharge level	: As per IS: 16227(Part-1) & IS: 16227 (Part-2) 2016

#### 5.2 Principal Technical Parameters of 22kV Outdoor Oil Cooled Single Phase Single Ratio Type Current Transformers for Metering

i) Type of CT	: Outdoor Oil Cooled, Single Phase, Single Ratio, Dead Tank, Hermetically sealed CT
ii) Type of mounting	: Pedestal Type
iii) Nominal System Voltage	: 22kV
iv) Corresponding Highest System Voltage	: 24kV
v) Frequency	: 50 Hz with $\pm 3\%$ tolerance
vi) Neutral Earthing	: Solidly Effectively Earthed
vii) Lightning Impulse Withstand Voltage (kVp)	: 125
viii) One minute dry/wet power frequency Withstand Voltage primary (kV rms)	: 50
ix) Rated Short Time Withstand Current for 1 Second	: 3 kA for 5/5A 6.7 kA for 10/5A 13.1 kA for 25/5A, 50/5A 26.2 kA for 100/5A, 200/5A & 300/5A
x) Rated Dynamic Withstand Current (kAp)	: 2.5 Times STC
xi) Minimum Creepage Distance (mm)	: 600
xii) Vertical Clearance of porcelain housing (min.)(mm)	: 450
xiii) Power Frequency Over Voltage Withstand requirement for Secondary winding (kVrms)	: 3kV

xiv) Instrument Security Factor	: 5 or less for Metering Core
xv) The die-electric withstand values of External & Internal Insulation	: 50kV/125kVp
xvi) Rated Continuous Thermal Current (A)	: 120% of the rated Primary current
xvii) Temperature rise	: As per IS: 16227(Part-1) & IS: 16227 (Part-2) 2016
xviii) Max. Radio Interference Voltage	: Less than 500 micro volts
xix) Single Core	: Metering
xx) CT Ratio	: 5/5A, 10/5A, 25/5A, 50/5A, 100/5A 200/5A & 300/A
xxi) Burden	: 15VA
xxii) Class of Accuracy	: 0.2S
xxiii) Primary Terminal requirement	: Two, Dia. as per CT ratio x 80mm length
xxiv) Mounting Frame size requirement (mm×mm) and mounting hole diameter(mm)	: 350mmx350mm, Mounting Holes - Dia. 30mm
xxv) Type of oil compensation provided	: Nitrogen cushion or SS Bellow
xxvi) Partial Discharge level	: As per IS: 16227(Part-1) & IS: 16227 (Part-2) 2016

### 5.3 Principal Technical Parameters of 33 kV Outdoor Oil Cooled Single Phase Single Ratio Type Current Transformers for Metering

i) Type of CT	: Outdoor Oil Cooled, Single Phase, Single Ratio, Dead Tank, Hermetically sealed CT
ii) Type of mounting	: Pedestal Type
iii) Nominal System Voltage	: 33kV
iv) Corresponding Highest System Voltage	: 36kV
v) Frequency	: 50 Hz with $\pm 3\%$ tolerance
vi) Neutral Earthing	: Solidly Effectively Earthed
vii) Lightning Impulse Withstand Voltage (kVp)	: 170
viii) One minute dry/wet power frequency Withstand Voltage primary (kV rms)	: 70
ix) Rated Short Time Withstand Current for 1 Second	: 3kA for 5/5A, 6.7kA for 10/5A, 13.1 kA for 25/5A, 50/5A 26.2 kA for 100/5A, 200/5A 300/5A & 400/5A

x) Rated Dynamic Withstand Current (kAp)	: 2.5 Times STC
xi) Minimum Creepage Distance (mm)	: 900
xii) Vertical Clearance of porcelain housing (min.) (mm)	: 450
xiii) Power Frequency Over Voltage Withstand requirement for Secondary winding (kVrms)	: 3kV
xiv) Instrument Security Factor	: 5 or less for Metering Core
xv) The die-electric withstand values of External & Internal Insulation	: 70kV/170kVp
xvi) Rated Continuous Thermal Current (A)	: 120% of the rated Primary current
xvii) Temperature rise	: As per IS: 16227(Part-1) & IS: 16227 (Part-2) 2016
xviii) Max. Radio Interference Voltage	: Less than 500 micro volts
xix) Single Core	: Metering
xx) CT Ratio	: 5/5A, 10/5A, 25/5A, 50/5A 100/5A, 200/5A, 300/5A & 400/5A
xxi) Burden	: 15VA
xxii) Class of Accuracy	: 0.2S
xxiii) Primary Terminal requirement	: Two, Dia. as per CT ratio x 80mm length
xxiv) Mounting Frame size requirement (mm×mm) and mounting hole diameter(mm)	: 450mmx450mm, Mounting Holes - Dia. 30mm
xxv) Type of oil compensation provided	: Nitrogen cushion or SS Bellow
xxvi) Partial Discharge level	: As per IS: 16227(Part-1) & IS: 16227 (Part-2) 2016

## 6.0 General Technical Requirements of Current Transformers:

### 6.1 Insulation :-

The insulation of the CT shall be so designed that the internal insulation shall have higher electrical withstand capability than the external insulation. The designed dielectrics withstand values of external and internal insulations shall be clearly brought out in the GTP. The dielectric withstand values specified in this specification are meant for fully assembled CT. The temperature rise on any part of equipment shall not exceed the maximum temperature rise limits specified in IS 16227 (Part-1) & (Part-2) 2016.



## 6.2 Porcelain Housing:-

The porcelain housing shall be of a single piece construction without any joint or coupling. The housing shall be made of homogeneous, vitreous porcelain of high mechanical and dielectric strength. Glazing of porcelain shall be of uniform brown or dark brown colour with a smooth surface arranged to shed away rainwater or condensed water particles (fog). The profile of porcelain shall be aerodynamic type as per IEC 815.

- 6.2.1 The vertical clearance of porcelain housing shall be at least 370mm for 11 kV and 450mm for 22 kV & 33kV CT.
- 6.2.2 Details of attachment of metallic flanges to the porcelain for pressure release valve, and primary / secondary terminals shall be brought out in the offer.

## 6.3 Metal Tanks:-

- 6.3.1 The metal tanks shall have bare minimum number of welded joints so as to minimize possible locations of oil leakage. The metal tanks shall be made out of mild steel. The thickness of the metal tank shall be more than 3.00 mm. Actual thickness provided shall be specified by the tenderer.
- 6.3.2 The bottom of the tank shall be adequately accessible for periodical maintenance of open surface.

## 6.4 Surface finish:-

The metal tanks shall be coated with at least two coats of zinc rich epoxy painting. All the ferrous hardware, exposed to atmosphere, shall be hot dip galvanized. All other fixing nuts, bolts, washers in the electrical current path shall be made out of stainless steel.

## 6.5 Insulating Oil :-

Insulating oil required for first filling of the CT shall be covered in bidder's scope of supply. The oil shall meet the requirements of latest edition of IS- 335.

## 6.6 Prevention of oil leakages & entry of moisture:-

- 6.6.1 As specified elsewhere in this specification, the CT shall be guaranteed for a trouble free and maintenance free performance for a period as specified. Therefore, the bidder shall ensure that the sealing of CT is properly achieved. In this connection the arrangement provided by the bidder at various locations including the following ones shall be described, supported by sectional drawings.
  - i) Locations of emergence of primary and secondary terminals.
  - ii) Interface between porcelain housing and metal tanks
  - iii) Cover of the secondary terminal box
- 6.6.2 Nuts and bolts or screws used for fixation of the interfacing porcelain bushings for taking out terminals shall be provided on flanges cemented to the bushings and not on the porcelain.
- 6.6.3 For gasket joints, wherever used nitrite butyl rubber gaskets shall be used. The gasket shall be fitted in properly machined groove with adequate space for accommodating the gasket under compression.

### 6.7 Oil Level Indicators:-

- 6.7.1 For compensation of variation in volume of the oil due to temperature variation, nitrogen cushion or Stainless Steel bellows shall be used. Rubber diaphragms shall not be permitted for this purpose.
- 6.7.2 CT provided with nitrogen cushion for compensation of oil volume variation shall be provided with prismatic type oil sight window at suitable location so that the oil level is clearly visible with naked eye to an observer standing at ground level. If metal bellow is used for the above purpose, a ground glass window shall be provided to monitor the position of metal bellow.

### 6.8 Earthing:

Metal Tank of CT shall be provided with two separate earthing terminals for bolted connection to 50 mm x 8 mm MS flat to be provided by the MSEDCL, for connection to station earth-mat. The size of two numbers of earthing terminals shall be 12 mm dia x 30 mm length, HDG, with one plain washer and one nut.

### 6.9 Lifting arrangement:

CT shall be provided with suitable lifting arrangement, to lift the entire unit. The lifting arrangement (lifting eye) shall be positioned in such a way as to avoid any damage to the porcelain housing, primary terminals or the tanks during the process of lifting for installation / transport. The general arrangement drawing shall show clearly the lifting arrangements provided such as lifting eye, lug, guides etc.

### 6.10 Name Plate:

The CT shall be provided with non-corrosive, legible nameplates, with the information specified in relevant standards, duly engraved / punched on it.

### 6.11 Mounting details

Mounting details for fixing the C.T. on supporting structure shall be strictly in accordance with specified details as follows:

For 11 kV & 22 kV Current Transformer requirement of Mounting Frame size is 350mmx350mm with mounting holes of dia.30mm.

For 33kV Current Transformer requirement of Mounting Frame size is 450mmx450mm with mounting holes of dia.30mm.

- 6.12 The terminal connectors required for connection of the CT to MSEDCL's bus bar shall be arranged by the MSEDCL.
- 6.13 Enamel, if used for conductor insulation, shall be either polyvinyl acetate type or amide type and shall meet the requirements of IS- 4800. Polyester enamel shall not be used. Double cotton cover, if used, shall be suitably covered to ensure that it does not come in contact with oil.
- 6.14 Oil filling and / or oil sampling cocks, if provided to facilitate factory processing, shall be permanently sealed before dispatch of the CT.
- 6.15 Test tap shall not be provided.

### 6.16 CT Design :

- 6.16.1 The CT shall be of dead tank design and shall be so constructed that it can be easily transported to site within the allowable transport limitation, even in horizontal position, if the transport limitation so demands. The C.T. shall be hermetically sealed and method of such sealing shall be detailed in the offer and shall be subject to the approval of the MSEDCL.

- 6.16.2 The CT secondary terminals shall be brought out in a weatherproof terminal box. The terminal box shall be provided with removable gland plate and glands. The cable glands shall be suitable for 1100 volts grade PVC insulated, PVC sheathed multi core stranded 6 sq.mm copper conductor cable. This terminal box shall be dust and vermin proof. The dimensions of the terminal box and its opening shall be adequate to enable easy access and working space with the use of normal tools.
- 6.16.3 Polarity shall be invariably marked in each primary and secondary terminal. Facility shall be provided for short circuiting and grounding of the CT secondary terminals inside the terminal box.
- 6.16.4 The CT shall be provided with a rating plate with dimensions and marking as per IS-16227. The markings shall be punched and not painted. The serial number and code of the supplier shall also be punched on the tank to identify the unit in case of loss or damage to the rating plate.
- 6.16.5 The CT shall be vacuum filled with oil after processing and thereafter hermetically sealed to eliminate breathing and to prevent air and moisture entering into the tank. Oil filling and / or oil sampling cocks, if provided to facilitate factory processing should be permanently sealed before dispatching the CT. The method adopted for hermetic sealing shall be described in the offer.
- 6.16.6 The casting of base collar etc. shall be die-cast and tested before assembly to detect cracks and voids if any.
- 6.16.7 The instrument security factor of metering core shall be low enough, but not greater than 5. This shall be demonstrated on all the ratios of metering core in accordance with procedure specified in IEC-185 or IS 16227-2016.

6.16.8 **Primary Winding:**

Primary Winding shall be wound type made out of high conductive copper. Conductors used for the primary winding shall be rigid or housed in rigid metallic shell. Unavoidable joints in the primary winding shall be welded type. For primary winding, current densities shall not exceed the limit 1.6 A/Sq.mm.

The design density for short circuit current as well as conductivity of the metal used for primary winding shall meet the relevant requirement of IS:16227-2016. The tenderer shall, in his offer furnish detailed calculations for selection of winding cross section.

The cross section area of primary winding, cross section area of secondary winding, number of primary turns , number of secondary turns , current density etc. shall be mentioned by the tenderer.

The primary winding shall be designed for extended primary current at 120% of rated primary current.

6.17 **Secondary Winding:**

Suitably insulated copper wire of electrolytic grade shall be used for secondary windings. Type of insulations used shall be described in the offer.

- 6.18 The excitation current of the CT shall be as low as possible.

6.19 **Primary Terminals:**

Each primary terminal shall be made out of 1 rod (stud) of dia. as per CT ratio x 80 mm length. The primary terminal shall be of heavily tinned electrolytic copper of 99.9% conductivity. The minimum thickness of tinning shall be 15 microns.

**6.20 Secondary Terminals:**

Secondary terminal studs shall be provided with at least 3 nuts and adequate plain and spring washer for fixing the leads. The studs, nuts and washer shall be made of brass duly nickel-plated. The minimum outside diameter of stud shall be 6 mm. The length of at least 15 mm shall be available on the studs for inserting the leads. Horizontal spacing between centers of adjacent studs shall be at least 1.5 times the circum dia of the nuts.

6.21 CT characteristics shall be such as to provide satisfactory performance for burdens ranging from 25 % to 100% of rated burden over a range of 5 % to 120% of rated current in case of metering CTs.

6.22 Expansion chamber at the top of porcelain insulator should be suitable for expansion of oil.

6.23 Following accessories/fittings shall, but not restricted to, be supplied along with the CT.

i) Pressure release device.

ii) Oil level indicator.

iii) Lifting lugs.

iv) The CT shall be so constructed that it can be easily transported to the site within the allowable transport limitations even in horizontal position, if the transport limitations so demand.

**7.0 Tests :**

**A) Type Test :**

The Current Transformer offered in the Bid should have been successfully type tested at NABL laboratories for the tests indicated as follow in line with the IS 16227 (Part-1) & (Part-2) 2016 and technical specification. These Type Tests should have been carried out within five years prior to the date of opening of tender. The bidder shall be required to submit complete set of the type test reports along with the offer.

Type Tests :

- 1) Temperature Rise Test
- 2) Impulse Voltage Withstand Test on Primary Terminals
- 3) Wet Test for outdoor Type Transformers
- 4) Tests for accuracy
- 5) Short Time Current Test

Successful tenderer shall submit all above type test reports of offered CT as per IS 16227 (Part-1) & (Part-2) 2016 to the office of the Chief Engineer (Testing & QC) Cell & get it approved as per Tender conditions.

**B) Acceptance & Routine Tests :-**

All acceptance and routine tests as stipulated in the IS 16227 (Part-1) & (Part-2) 2016 amended up-to-date for current transformer shall be carried out by the supplier in the presence of MSEDCL's representative without any extra cost to the MSEDCL before dispatch.

The bidder shall have full facilities to carry out all the acceptance and routine test as per the IS 16227 (Part-1) & (Part-2) 2016 amended up-to-date.

After finalization of the program of type/acceptance/routine testing, the supplier shall give three weeks advance intimation to the purchaser, to enable him to depute his representatives for witnessing the tests.

Acceptance & Routine Tests:

- 1) Power frequency voltage Withstand Test on Primary Terminals
- 2) Partial discharge measurement
- 3) Power frequency voltage Withstand Test on secondary Terminals
- 4) Tests for accuracy
- 5) Verification of marking
- 6) Determination of the secondary winding resistance
- 7) Determination of the secondary winding loop time constant
- 8) Inter turn over voltage test

**8.0 Inspection:-**

- i) The inspection may be carried out by the purchaser at any stage of manufacture. The successful bidder shall grant free access to the purchaser's representative at any reasonable time when the work is in progress. All facilities must be made available by supplier/ manufacturer for unrestricted inspection of the works, raw material & manufacture of all the accessories & for conducting necessary tests as declared therein.
- ii) The supplier shall keep the purchaser informed, in advance, of the time of starting and of the progress of manufacture of current transformer in its various stages so that arrangement should be made for inspection.
- iii) No current transformer shall be dispatched from its point of manufacture unless the current transformer has been satisfactorily inspected and tested.
- iv) Inspection and acceptance of any current transformer under this specification by the purchaser shall not relieve the supplier of his obligation of furnishing current transformer in accordance with the specification and shall not prevent subsequent rejection, if the current transformer is found to be defective.

**9.0 Qualifying requirements:-**

The Bidder should have proven experience of not less than 5 years in design, manufacture, supply, and testing at works for the current transformer offered of equal or higher voltage class. The current transformer offered by the Bidder should be in successful operation at least for 2 years as on the date of submission of the tender.

**10.0 Quality Assurance Plan :-**

- A) The Bidder shall invariably furnish the following information along with his offer, failing which his offer shall be liable for rejection. Information shall be given for offered Current Transformer.
  - i) Statement giving list of important raw materials, including but not limited to:
    - a. Conductor
    - b. Insulation

- c. core
- d. Porcelain
- e. Oil
- f. Sealing material
- g. Insulated Wire

Names of sub suppliers for the raw materials, list of standards according to which the raw materials are tested, list of Tests normally carried out on raw materials in presence of bidder's representative, copies of Test Certificates.

- ii) Information and copies of Test Certificates as in (i) above in respect of bought out materials.
  - iii) List of manufacturing facilities available. In this list the bidder shall specifically mention whether lapping machine, vacuum drying plant, air-conditioned dust free room with positive air pressure for provision of insulation, Oil leakage testing facility, facility for testing tan- delta of insulation at rated voltage etc. are available as in house testing facilities or hired services.
  - iv) Level of automation achieved and list of areas where manual processing still exists.
  - v) List of areas in manufacturing process, where stage inspections are normally carried out for quality control and details of such tests and inspections.
  - vi) Special features provided in the equipment to make it maintenance free.
  - vii) List of testing equipments available with the bidder for final testing of CT & test plant limitation, if any, vis-à-vis the type, special, acceptance and routine tests specified in relevant standards.
- B) The successful Bidder shall submit following information to the MSEDCL.
- i) List of raw materials as well as bought out accessories and the names of sub suppliers selected from those furnished along with offer.
  - ii) Test Certificates of the raw material and bought out accessories.
  - iii) Quality assurance plan (QAP) with hold points for purchaser's inspection. The quality assurance plan and MSEDCL's hold points shall be discussed between the MSEDCL and supplier, before the QAP is finalized.
- C) The successful Bidder shall submit the routine test certificates of bought out accessories at the time of routine testing of the fully assembled Current Transformer.

### **11.0 Performance Guarantee:**

The equipment offered shall be guaranteed for satisfactory performance for a period of 30 months from the date of receipt of complete equipment at site in good condition or 24 months from the date of satisfactory commissioning, whichever is earlier. In case of failure within this period, the supplier shall make necessary



repairs / replacement of the faulty current transformer at no extra cost to the MSEDCL.

## 12.0 Documentation:-

### A) List of Drawings & Documents :-

The bidder shall furnish two sets of the following drawings along with his offer.

- a) General outline and assembly drawings of the equipment
  - b) Sectional views showing :-
    - i) General Constructional features of Current Transformer, dimensions of conductor, depth of insulation, clearance between paper insulation & the inside of porcelain, grading stages used for primary insulation, whether & how a semi conducting tape is used to cover metal foils etc.
    - ii) The Sectional view shall show the materials / gaskets / sealing used for perfect hermetic sealing and arrangement for compensation of oil volume variation.
    - iii) The insulation, the winding arrangements, method of connection of the primary / secondary winding to the primary / secondary terminals etc.
    - iv) Porcelain housing used and its dimensions along with the mechanical and electrical characteristics, as well as volume of oil.
  - c) Arrangement of secondary Terminal box & details of connection studs provided.
  - d) Name Plate
  - e) Schematic drawing
  - f) Type Test reports in case the equipment has already been type tested.
  - g) Test reports, literature, pamphlets of the bought out items, and raw material
  - h) Bill of material and packing list.
  - i) Pressure release device / SS Bellow, Note on PRD & SS Bellow
  - j) Oil level indicator
  - k) Drain plug
  - l) Bushing drawing
- B) The successful bidders shall submit three sets of final versions of all the above said drawings in line with Technical Specifications to the office of Chief Engineer (Testing & QC) Cell & get it approved as per Tender conditions.
- C) Adequate copies of acceptance and routine Test Certificates, duly approved by the MSEDCL, shall accompany the dispatched consignment.
- D) The manufacturing of the current transformers shall be strictly in accordance with the approved drawings and no deviation shall be permitted without the written approval of the MSEDCL. All manufacturing and fabrication work in connection with the current transformers prior to the approval of the drawing shall be at the supplier's risk.

- E) One set of nicely printed and bound volume of operation, maintenance and erection manuals in English language per Current Transformer of each voltage rating shall be submitted by the supplier to respective consignees along with the dispatch documents of each unit. The manual shall contain all the drawings and information required for erection, operation and maintenance of the Current Transformer. The manual shall also contain a set of all the approved drawings, Type Test reports etc.
- F) Approval of drawings by MSEDCL shall not relieve the supplier of his responsibility and liability for ensuring correctness and correct interpretation of the drawings for meeting the requirement of the Technical Specification, latest revision of applicable standards, rules and codes of practices. The equipment shall conform in all respects to high standards of engineering, design, workmanship and latest revisions of relevant standards at the time of ordering and MSEDCL shall have the power to reject any work or materials which, in his judgment, is not in full accordance therewith.

### **13.0 Packing & Forwarding :-**

- i) The current transformers shall be packed in wooden crates of good quality and shall be suitable for vertical / horizontal transportation as the case may be, and suitable to withstand handling during transport and outdoor storage in stores before erecting. 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.
- ii) 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
- iii) The supplier shall ensure that the packing list and bill of material are approved by the MSEDCL before dispatch.

### **14.0 Information to be filled / furnished invariably by Bidder:**

The offer shall be complete in all respects, failing which the same is liable for rejection. Guaranteed technical particulars for current transformer shall be elaborate and complete in all respects.



**15.0 Schedule :-**

The bidder shall fill in the following Schedule which forms part of the Tender Specification and offer. If the schedule is not submitted duly filled in with the offer, the offer shall be liable for rejection.

SCHEDULE – ‘A ‘ - Guaranteed Technical Particulars of 11kV, 22kV & 33kV  
Outdoor Oil Cooled, Single Phase, Single Ratio, Current  
Transformers for Metering.

**ANNEXURE – A**

**Principal Technical Parameters of 11kV & 22kV Outdoor Oil Cooled, Single Phase, Single Ratio, Current Transformers for Metering**

Sr. No.	Item	Specification	
1.	Type of CT/Installation	Outdoor Oil Cooled, Single Phase, Single Ratio, Dead Tank, Hermetically sealed CT	
2.	Type of mounting	Pedestal Type	
3.	Suitable for frequency	50 Hz with $\pm 3\%$ tolerance	
4.	Method of Earthing system to be connected to	Solidly Effectively Earthed	
5.	Rated Continuous Thermal Current (A)	120% of the rated Primary current	
6.	Acceptable limit of temperature rise above the specified ambient temperatures for continuous operation at rated current	As per IS: 16227(Part-1) & IS:16227(Part-2) 2016	
7.	Max. Radio Interference Voltage at 1.1 times rated voltage	Less than 500 micro volts	
8.	Core details		
Purpose of core	11 kV CT	22 kV CT	
	Single Core for Metering	Single Core for Metering	
CT Ratio	5/5A, 10/5A, 25/5A, 50/5A, 100/5A, 200/5A, & 300/5A	5/5A, 10/5A, 25/5A, 50/5A, 100/5A, 200/5A & 300/5A	
VA Burden	15VA	15VA	
Class of Accuracy	0.2S	0.2S	
	Technical Particulars	11 kV	22 kV
9.	Rated Voltage / HSV (kVrms)	11kV/12kV	22kV/24kV
10.	Lightning Impulse Withstand Voltage (kVp)	75	125
11.	One minute dry/wet Power frequency Withstand Voltage primary (kV rms)	28	50

TECHNICAL SPECIFICATION OF 11KV, 22KV & 33KV OUTDOOR OIL COOLED SINGLE PHASE  
SINGLE RATIO TYPE CURRENT TRANSFORMERS FOR METERING

12.	Rated Short Time Withstand Current for 1 Second duration (kArms)	3 kA for 5/5A & 10/5A 6.7 kA for 25/5A, 50/5A 13.1 kA for 100/5A, 200/5A & 300/5A	3 kA for 5/5A 6.7 kA for 10/5A 13.1 kA for 25/5A, 50/5A 26.2 kA for 100/5A, 200/5A, & 300/5A
13.	Rated Dynamic Withstand Current for 1 Second duration (kAp)	2.5 Times STC	
14.	Minimum Creepage Distance (mm)	300	600
15.	Primary Terminal requirement	Two, Dia. as per CT ratio × 80 mm length	
16.	Mounting Frame size requirement (mm×mm), mounting holes diameter (mm)	350mm×350mm, Mounting Holes - Dia. 30mm	
17.	Power Frequency Over Voltage Withstand requirement for Secondary Winding (kVrms)	3kV	
18.	Instrument Security Factor	5 or less for Metering Core	
19.	The die-electric withstand values of External & Internal Insulation	28kV/75kVp	50kV/125kVp
20.	Type of oil compensation provided	Nitrogen cushion or SS Bellow	
21.	Partial Discharge level	As per IS: 16227(Part-1) & IS:16227(Part-2) 2016	
22.	Suitable test tap for measurement of capacitance, tan-delta	Not to be provided	

**ANNEXURE - B**

**Principal Technical Parameters of 33 kV Outdoor Oil Cooled, Single Phase,  
Single Ratio, Current Transformers for Metering**

Sr. No.	Item	Specification
1.	Type of CT/ Installation	Outdoor Oil Cooled, Single Phase, Single Ratio, Dead Tank, Hermetically sealed CT
2.	Type of mounting	Pedestal type
3.	Suitable for system frequency	50 Hz with $\pm 3\%$ tolerance
4.	Method of Earthing system to be connected to	Solidly Effectively Earthed
5.	Rated continuous thermal current (A)	120% of the rated primary current
6.	Acceptable limit of temperature rise above the specified ambient temperatures for continuous operation at rated current	As per IS: 16227 (Part-1) & IS: 16227 (Part-2) 2016
7.	Max. radio interference voltage at 1.1 times the rated voltage	Less than 500 micro volts
8.	Current Ratio for Nominal system Voltage of 33KV	5/5A, 10/5A, 25/5A, 50/5A, 100/5A, 200/5A, 300/5A & 400/5A
9.	Rated Voltage / HSV (kV rms)	33kV / 36kV
10.	Lightning Impulse Withstand Voltage(kVp)	170
11.	One minute dry /wet power frequency withstand voltage primary (kV rms)	70
12.	Rated short time withstand current for 1 Second Duration (kA rms)	3kA for 5/5A, 6.7kA for 10/5A, 13.1kA for 25/5A & 50/5A 26.2kA for 100/5A, 200/5A, 300/5A & 400/5A
13.	Rated dynamic withstand current for 1 second duration (kAp)	2.5 Times STC
14.	Minimum creepage distance (mm)	900
15.	Primary Terminal requirement	Two, Dia. as per CT ratio $\times 80$ mm length

TECHNICAL SPECIFICATION OF 11KV, 22KV & 33KV OUTDOOR OIL COOLED SINGLE PHASE  
SINGLE RATIO TYPE CURRENT TRANSFORMERS FOR METERING

16.	Mounting Frame size requirement (mm×mm), mounting holes diameter (mm)	450mmx450mm, Mounting Holes - Dia. 30mm
17.	Power frequency over voltage withstand requirement for Secondary winding (kVrms)	3kV
18.	Core details (Single Core)	
	1. Purpose	Metering
	2. Ratio	5/5A, 10/5A, 25/5A, 50/5A, 100/5A, 200/5A, 300/5A & 400/5A
	3. Burden	15VA
	4. Class of accuracy	0.2S
19.	Instrument Security Factor	5 or less for Metering Core
20.	The die-electric withstand values of External & Internal Insulation	70kV/170kVp
21.	Type of oil compensation provided	Nitrogen cushion or SS Bellow
22.	Partial Discharge level	As per IS: 16227(Part-1) & IS:16227(Part-2) 2016
23.	Suitable test tap for measurement of capacitance, tan-delta	Not to be provided

**SCHEDULE 'A'**

**Guaranteed Technical Particulars of 11kV, 22kV & 33kV  
Outdoor Oil Cooled, Single Phase, Single Ratio type  
Current Transformers for Metering**

Sr. No.	Particular of GTP Parameter	Type
1.	Manufacturer's Name & address	TEXT
2.	Type of equipment	TEXT
3.	Type of Mounting	TEXT
4.	Equipment Conforming to Standards	TEXT
5.	Rated Voltage / Highest System Voltage in KV	TEXT
6.	Rated Primary Current (Amp)	TEXT
7.	Rated Secondary Current (Amp)	TEXT
8.	Frequency (HZ)	TEXT
9.	Ratio of Current Transformer	TEXT
10.	Details of Cores	
i)	Number of Cores	TEXT
ii)	Purpose	TEXT
iii)	Burden (VA)	TEXT
iv)	Class of Accuracy	TEXT
11.	Rated Short Time Withstand Current for 1 Sec. duration	TEXT
12.	Rated Dynamic Withstand Current (KAp)	TEXT
13.	Method of Earthing system to be connected to	TEXT
14.	One minute Dry Power Frequency Withstand Voltage (KV rms) of Primary Winding	TEXT
15.	One minute Wet Power Frequency Withstand Voltage (KV rms) of Primary Winding	TEXT
16.	1.2/50 micro-second Impulse Withstand Voltage (KVP)	TEXT
17.	The die-electric Withstand values (KVp)of external & internal insulation	TEXT
18.	One minute Power Frequency Withstand Voltage (KV rms) of Secondary Winding	TEXT
19.	Minimum Creepage Distance (mm)	TEXT
20.	Weight of oil (kg/Ltrs.)	TEXT
21.	Total Weight (kg)	TEXT
22.	Mounting details	TEXT

TECHNICAL SPECIFICATION OF 11KV, 22KV & 33KV OUTDOOR OIL COOLED SINGLE PHASE  
SINGLE RATIO TYPE CURRENT TRANSFORMERS FOR METERING

23.	Overall dimension	TEXT
24.	Type of Winding	TEXT
25.	Material of Winding	TEXT
26.	Size & Cross Section of Primary Winding	TEXT
27.	Size & Cross Section of Secondary Winding	TEXT
28.	No. of Primary Turns	TEXT
29.	No. of Secondary Turns	TEXT
30.	Current Density of Primary & Secondary Winding (max. - 1.6A/sq.mm)	TEXT
31.	Primary Terminal	TEXT
32.	Type of Insulation	TEXT
33.	Whether Current Transformer confirms to Temperature Rise limits	TEXT
34.	Type of oil compensation	TEXT
35.	Type of pressure release device provided	TEXT
36.	Partial Discharge level	TEXT
37.	Rated continuous Thermal Current (120% of the rated Primary Current)	TEXT
38.	Instrument Security Factor (ISF $\leq 5$ )	TEXT
39.	Class of Insulation	TEXT
40.	Actual clearance between live part & ground (mm)	TEXT