



GUJARAT ENERGY TRANSMISSION
CORPORATION LTD.

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TECHNICAL SPECIFICATION
FOR

**22 & 33 kV CURRENT & POTENTIAL
TRANSFORMERS**

(Including Tariff-Metering)

GETCO/E/22&33TS CT6 PT7/R4/Oct22

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TECHNICAL SPECIFICATION FOR **22 & 33 kV CURRENT AND VOLTAGE TRANSFORMERS**

SECTION – I

1.1 GENERAL DESIGN FEATURES OF CURRENT TRANSFORMERS

- 1.1.1 The current transformers shall be of outdoor type single phase, 50Hz, oil immersed, self-cooled suitable for operation in the climatic conditions specified. The current transformers shall be complete in all respects. The 22 & 33 kV C.T. shall be of Dead Tank design for all ratios.
- 1.1.2 The core shall be high grade, non-ageing, silicon laminated steel of low hysteresis loss and high permeability. The core material used in case of metering core shall be stated in the tender.
- 1.1.3 The current transformers shall be hermetically sealed to eliminate breathing and entering of air and moisture in the tank. Each C.T. shall be provided with a pressure-relieving device to release abnormal internal pressures.
- Current transformer provided with nitrogen cushion for compensation of oil volume variation should 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.
- 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.
- 1.1.4 The core of current transformers to be used for metering and instrumentation shall have saturation factor low enough to avoid damage to the instruments in the event of maximum short circuit current.
- 1.1.5 (a) The C.T. core to be used for protective relays shall be of accuracy class specified of appropriate class suitable for back up, over current and earth fault, differential and busbar protection.

- 1.1.5 (b) The tenderer shall give assurance for trouble free and maintenance free performance for a period of 60 months from the date of receipt at store; during which period, the CTs shall be repaired / reconditioned / replaced free of cost, immediately in case of any trouble. Therefore, the tender shall ensure that sealing of current transformer is properly achieved. In this connection the arrangement provided by the tenderer at various locations including the following ones shall be described supported by sectional drawings.
- i) Location of emergency of primary and secondary terminals.
 - ii) Interface between porcelain housing and metal tank.
 - iii) Cover of the secondary terminal box.
- 1.1.5(c) !!! Nuts and bolts (or screws used for fixation of interfacing porcelain bushings for taking out terminals) shall be provided on flanges cemented to the bushing and not on the porcelain i.e. flange type 22 / 33 kV bushing for IT. shall be provided.
- 1.1.5 (d) For gasketed joints, wherever used, nitrite butyl rubber gaskets /RC70C/RC80C shall be used. The O-rings shall be fitted in properly machined groove with adequate space for accommodating the gasket under compression.
- 1.1.6 WINDING AND TERMINALS:
- 1.1.6.1 The rating of the secondary winding shall be as specified under Section-II of this specification, ratio changing arrangement shall be provided on secondary winding for multi-ratio design, either a number of identical secondary winding may be provided to achieve desired ratios by series, parallel connection for the secondary winding or the secondary winding may be tapped. However, identical secondaries for tapped secondary winding shall meet requirement as specified. Different ratios specified shall be achieved by secondary taps only and primary reconnection shall not be accepted.
- 1.1.6.2 Primary and secondary windings shall be of electrolytic grade copper & shall have continuous thermal rating as specified for all ratios. However, the tenderer may furnish the additional cost (if any) adjustment for primary winding to be designed for extended primary current at 120% of rated primary current. (If so desired by the purchaser). The secondary winding

wherever tapped, shall be adequately reinforced to withstand normal handling without damage.

- 1.1.6.3 The primary terminals shall be of standard size of 30mm dia x 80mm length for all CTs rated upto 1200 Amps. For higher values of primary current, each primary terminal shall be made out of two such rods of 30mm dia x 80mm length in parallel. The primary terminals shall be of heavily tinned electrolytic grade copper. The maximum thickness of tinning shall be 15 microns.
- 1.1.6.4 The secondary terminals shall be brought out in a compartment for easy access. Secondary terminal studs shall be provided with atleast three nuts and adequate plain and spring washers for fixing the leads. The studs, nuts and washers shall be of brass, duly nickel plated. The minimum out side diameter of the studs shall be 6mm. The length of atleast 15mm shall be available on the studs for inserting the leads. The horizontal spacing between centers of the adjacent studs shall be atleast 1.5 times the outside circum dia of the units.
- 1.1.6.5 The current transformer shall be provided with suitable test tap for measurement of capacitance, tan delta as well as partial discharges, in factory as well as at site. Provision shall be made of a screw on cap for solid and secured earthing of the test tap connection when not in use. A suitable caution plate shall be provided duly fixed on the cover of the secondary terminal box indicating the purpose of the test tap and necessity of its solid earthing as per prescribed method, before energising the C.T.
- 1.1.7 TERMINAL BOX OF CURRENT TRANSFORMER:
- 1.1.7.1 The exterior of the terminal box shall be hot dip galvanized. A cable box along with necessary glands for receiving control cables suitable for mounting on bottom plate of the terminal box shall be included in the scope of supply. A door with locking arrangement shall be provided on the front of the terminal box. A duplicate set of secondary terminal connected through a suitable link shall be provided in the terminal box to avoid undue pressure to internal leads and failure of studs.
- 1.1.8 TEMPERATURE RISE:
- 1.1.8.1 The maximum temperature rise of the current transformer and its oil, winding and external surface of the core and other parts shall be as

specified in Table –5 of IS: 16227 (Part – I) 2016.

1.2 BUSHING AND INSULATORS:

- 1.2.1** The porcelain insulator used in manufacturing the bushings shall be homogenous free from laminating, cavities and other flaws or imperfection that might affect the mechanical or dielectric qualities. All bushings of identical ratings shall be interchangeable. The bushing shall confirm to the latest edition of IS: 2099. The puncture strengths of the bushings shall be entirely free from external and internal corona. The protected and total creepage distance of the bushings shall be suitable for heavily polluted atmosphere i.e. the total creepage distance shall be 600 / **900** mm (minimum) *for 22 / 33 kV respectively.*
- 1.2.2** For C.T. the bushings shall be oil filled, free from oil leakage and shall be designed to prevent accumulation of explosive gases and to provide adequate oil circulation to remove internal heat. Oil used in the bushings shall be the same as that used in the C.T. Suitable means shall be provided to accommodate conductor expansion and there should not be any undue stress on any part of the equipment due to temperature changes. They shall be equipped with oil level indicator and means for sampling and draining oil from the bushings.
- 1.2.3** Oil filled condenser type porcelain bushings conforming to the latest edition of IS: 2099 shall be used for current transformers. The insulation of bushings shall be coordinated, with that of the instrument transformer such that the flashover if any will occur only external to the current transformers. The bushings should not cause radio interference when operating at rated voltage.
- 1.2.4** The quantity of insulating oil for the first filling of oil in each CT and the complete specifications of the oil shall be stated in the tender. The oil shall confirm to the requirements of latest edition of IS: 335 subject to the requirements of the contractor's specification being fulfilled, the actual oil to be used shall be at the desecration of the purchaser. The insulating oil required for first filling of current transformer shall be included in offer. The manufacturer of CT shall measure the PPM value of oil before filling inside the CT and shall keep record of the same.

1.3 TERMINAL CONNECTORS AND EARTHING TERMINALS:

- 1.3.1 Bimetallic terminal connectors suitable for ACSR *Dog or PANTHER or ZEBRA* conductor shall be supplied and they shall be suitable for both vertical and horizontal connections of the transmission lines conductor or station bus-bar. *Requirement of the same shall be decided during detailed engineering.* Two grounding terminals suitable for receiving grounding connectors shall be provided in the current transformers. The terminal connectors shall be suitable for short time current of 25 kA for 3 sec.

1.4 GALVANIZING:

- 1.4.1 All ferrous parts of current transformers including bolts, nuts etc., shall be hot dip galvanized as per IS : 2629 – 1966 (latest edition)

1.5 TESTS AND TEST REPORTS:

- 1.5.1 Reports of all type tests as stipulated in the latest edition of IS : 16227 for current transformer shall be submitted along with the tender.
- 1.5.2 Routine test as per the latest edition IS: 16227 for current transformers shall be carried out on each current transformer

1.5.2.1 Acceptance Tests to be performed on CT in presence on purchaser's representative

1	Power-frequency voltage withstand tests on primary terminals (10% of offered lot)
2	Partial-discharge measurement (10% of offered lot)
3	Power-frequency voltage withstand tests between sections (10% of offered lot)
4	Power-frequency voltage withstand tests on secondary terminals (10% of offered lot)
5	Tests for accuracy (10% of offered lot)
6	Verification of markings (10% of offered lot)
7	Determination of the secondary winding resistance(10% of offered lot)
8	Test for rated knee point e.m.f. and exciting current at rated knee point e.m.f. (10% of offered lot)
9	Inter-turn overvoltage test(10% of offered lot)
10	Measurement of capacitance and dielectric dissipation factor(100% of offered lot)

Test no. 1 to 6 shall only be performed on 100% tariff metering CTs in an NABL accredited/Govt lab..

- 1.5.3 The type test reports for type tests list of which is as given below carried out as per IS: 16227 (latest edition) for specified CTs shall be submitted. The same shall not be older than seven years and shall be valid as on the last date of submission of bid. The type test reports of ST rating not older than ten years prior to bid opening shall be submitted for terminal connectors as per IS : 5561 with the offer and those of insulators,

confirming to applicable standard shall also be submitted. **The type test reports shall not be older than Ten years and shall be valid as on the last date of submission of bid.**

Type Test Reports to be Submitted for CT

- 1 Temperature Rise Test
- 2 Lightning impulse voltage test on primary terminals
- 3 High voltage power frequency wet withstand test on CT
- 4 Test of Accuracy
- 5 Degree of protection IP55 for secondary terminal box
- 6 Short Time Current tests

Equipment offered shall have Type Test Certificates from accredited laboratory (accredited based on ISO/IEC Guide 25 / 17025 or EN 45001 by the National accreditation body of the country where laboratory is located), as per IEC / IS / technical specification.

IMPORTANT NOTE: *In case of non-submission of some of the type test reports, the bidder shall confirm the submission of same before commencement of supply, without affecting delivery schedule, from NABL accredited laboratory, free of cost. In absence of this confirmation, the offer will be evaluated as non submission of type test report.*

If bidder has submitted all valid type / special / additional test reports as per requirement of technical specifications then the same are not required to be repeated. However, those tests which are covered under acceptance/ additional/ routine tests will be required to be carried out during the inspection, which is not a repetition.

- a) The manufacturer shall use 5KV motorized meggar for measuring IR values of CTs.
- b) The manufacturer shall carryout Partial Discharge test and tan delta test (*value not more than 0.5%*) as per relevant ISS, and shall keep record of the same.
- c) If so required, the purchaser shall select one CT of each ratio from the first lot or any subsequent lot of CTs, which shall be type tested in presence of purchaser's representative at third party Govt., recognized laboratory. The balance CT from the first offered lot or any subsequent lot shall be inspected and tested for routine tests.
- d) The manufacturer shall offer CTs for routine tests inspection in line with delivery schedule of A/T.
- e) Record of each manufacturing process shall be maintained by the manufacturers, and shall be shown to the inspector, on demand at the time of inspection.

- 1.5.4 All test reports and oscillogram shall be submitted and got approved from the purchaser before dispatching the equipment.

1.6 QUALITY ASSURANCE PLAN:

The tenderer shall invariably furnish following information along with his offer failing which his offer shall be liable for rejection. Information shall be separately given for individual type of Instrument 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

Name of sub-suppliers for 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 tenderer representative, copies of test certificates.

- (ii) Information and copies of test certificates as in (i) above in respect of bought out accessories (ii) list of manufacturing facilities available. In this list the tender 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.
- (iii) Level of automation achieved and list of areas where manual processing still exists.
- (iv) List of areas in manufacturing process, where stage inspections are normally carried out for quality control and details of such tests and inspections.
- (v) Special features provided in the equipment to make it maintenance free.
- (vi) List of testing equipment available with the tenderer for final testing of instrument transformer and test plant limitation. If any vis-à-vis the

type, special acceptance and routine tests specified in the relevant standards. These limitations shall be very clearly brought out in Schedule 'C' i.e. schedule of deviations.

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TECHNICAL SPECIFICATION
SPECIFIC REQUIREMENTS OF 22 & 33 kV CURRENT
TRANSFORMERS

SECTION – II

2.1 SCOPE:

2.1.1 This section covers the specific technical requirements, climatic and isoceraunic conditions and systems particulars for which current transformers shall be offered as per the general technical requirements given in Section – I of this specification and the schedule of requirements specified herein for the various sub-stations.

2.2 CLIMATIC & ISOCERAUNIC CONDITIONS:

2.2.1 The climatic conditions under which the equipment shall operate satisfactorily are as follows:

(a)	Maximum ambient temperature of air in Shade (°C)	50
(b)	Minimum ambient temperature of air in shade (°C)	4
(c)	Maximum daily average ambient temperature (°C)	40
(d)	Maximum yearly average ambient temperature (degree cent.)	30
(e)	Maximum relative humidity (%)	95
(f)	Average number of thunder storm days / annum.	15
(g)	Average annual rainfall (cm.)	150
(h)	Maximum wind pressure (Kg/m ²)	150
(i)	Height above mean sea level (mtrs.)	Not exceeding 1000

2.2.2 All equipments offered shall be suitable for continuous satisfactory operation at the full rated capacity under the above climatic conditions.

2.2.3 Since the sub-station may be near sea-shore or industrial area, the equipment offered shall be suitable for heavily polluted atmosphere.

2.3 SYSTEM DETAILS:

i)	Nominal system voltage	KV	22	33
ii)	Maximum rated voltage	KV	24	36
iii)	Minimum rated voltage	KV	20	30
iv)	Frequency	HZ	50	50
v)	Number of phases		3	3
vi)	Neutral earthing		-- Solidly Earthed --	

2.4 TYPE & RATING OF CURRENT TRANSFORMER:

2.4.1 The 22 & 33 KV Current transformer shall have the rating as given below:

Sr No.	PARTICULARS	22 KV CLASS CT	33 KV CLASS CT	22/33kV Class CT
1)	CT Ratio	a) 600-450-300/1-1-0.577Amps. b) 300-150-75/1-1-1 Amps. c) 300-150/1-1-0.577Amps. <i>d) 300-150-100/1-1-1 Amps</i> <i>e) 600-450-300/1-1-1 Amps</i>	a) 1200-600-300/1-1-1 Amps. b) 150-100 / 1-1-1 Amps. c) 300-150 /1-1-0.577 Amps.	As given in Schedule-A
2)	Core	1 2 3	1 2 3	1 - -
3)	Purpose	Core Metering - 1 Core Relaying - 2 Core Differential - 3	Core Metering - 1 Core Relaying - 2 Core Differential - 3	Core-Tariff-metering -- --
4)	Rated burden (VA) (Lowest Ratio) (at minimum tap)	30 (Core – 1) 30 (Core – 2) --- (Core – 3)	50 (Core – 1) 50 (Core – 2) --- (Core – 3)	5VA -- --

5)	Class of accuracy	0.5 5 P PX	0.5 5 P PX	0.2S
6)	i) Rated accuracy / limit factor ii) Instrument security factor.	10 at minimum ratio for all 22 KV CTs. 5 or less at minimum ratio for all 22 KV CTs	10 at minimum ratio for all 33 KV CTs. 5 or less at minimum ratio for all 33 KV CTs	ISF shall be less than 5 at all ratios
7)	Minimum knee point voltage (at highest ratio)	600 V for (a) 600 V for (b) 650 V for (c)	600 V for (a) 600 V for (b)	--
8)	Exciting current at knee point voltage.	As per IS : 16227	As per IS : 16227	--
9)	Resistance of secondary winding.	As per IS : 16227	As per IS : 16227	--
10)	Basic insulation level KV (Peak)	150	170	150/170
11)	Power frequency voltage KV (rms)	55	70	55/70
12)	Short time withstand current for 3.0 seconds (KA)	25	25	25
13)	Minimum creepage distance (mm) heavily polluted atmosphere : Total (mm)	600	900	600/900

2.4.2 The ratings specified shall be guaranteed at all primary connections. Any changes in the particulars of the CTs that may be required for the protective relays (protective relays being procured separately) actually

ordered shall have to be met by the supplier of CTs without any extra cost.

2.4.3 All current transformers shall meet the requirements of this specification for $\pm 3\%$ variation in rated system frequency of 50 Hz.

2.4.4 EARTH QUAKE & WIND DESIGN LOADS:

Each CT including its supporting structure shall be designed to withstand repeated earthquake acceleration of $0.08 \times 2g$ with wind loads of 150 Kg/m^2 on the projected area (non-simultaneous) without damage to component parts and without impairment of operation.

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APPENDIX – I**SCHEDULE OF GUARANTEED TECHNICAL PARTICULARS
FOR 22/33KV CURRENT TRANSFORMERS****(To be filled in and signed by the Tenderer)**

1) Manufacturer's Name

2) Type

3) Rated voltage

4) Rated primary current

5) Rated secondary current

6) No. of cores:

	Rated output -----	Class of accuracy -----	Accuracy limit factor -----
Core - 1			
Core - 2			
Core - 3			

7) Secondary Voltage :

Knee Point
voltage &
corresponding
exciting currentResistance
of the
secondarySecondary
limiting

Core – 1

Core – 2

Core – 3

8) Short time thermal rating of primary winding (Amps.)

For 3 Seconds

9) Rated dynamic current of

Primary (Pack value)

10) Rated continuous thermal current

- 11) Temperature rises at rated continuous thermal current over ambient temperature at site for
 - a) Winding
 - b) Oil at the tap
 - c) Exposed current carrying parts
 - d) Reference ambient temperature
- 12) 1-Minute power frequency dry withstand test voltage for primary winding (KV rms)
- 13) 1-Minute power frequency wet withstand voltage for primary winding (KV rms)
- 14) 1.2/50 microsecond impulse withstand test voltage (KV peak).
- 15) One minute power frequency withstand test voltage for secondary winding (KV rms.)
- 16) Minimum total creepage distance (mm)
- 17) Magnetizing curve of C.T. core.
- 18) Characteristics :
 - a) Ratio & phase angle curves
 - b) Magnetization curves
 - c) Ratio correction factor curves
 - d) Limit of composite error at rated primary saturation current (for protective C.T. Core)
- 19) Variation in ratio and phase angle error due to variation in :
 - a) Voltage by 1 %

- b) Frequency by 1 Hz
- 20) Current density in primary winding
for each ratio.
- 21) Weight of oil kg / litres
- 22) Total weight (kg.)
- 23) Mounting details.
- 24) Overall dimensions. (mm)
- 25) Cross-section of the primary conductor
alongwith cross section of each wire
and total nos. of such wires.
- 26) Nos. of primary turns.
- 27) Dimensional details drawings of primary
Terminals complete (to be attached with
GTP), in offer invariably.
- 28) Whether the design of the CTs is with
dead tank arrangement or not.

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NOTE :

- 1) Instead of giving reference of drawing No. / IS Literature etc. actual values / figures must be furnished wherever required otherwise it will be completed to consider that the details in GTP are not furnished & technical Bid will be evaluated accordingly.
- 2) The details against each point of GTP are required to be submitted alongwith the tender, otherwise, tender is liable for rejection.
- 3) List of orders executed for specified rating of CTs & PTs during last five years performance reports thereof be submitted.

TECHNICAL SPECIFICATION FOR **22 & 33 kV VOLTAGE TRANSFORMERS**

1.0 SCOPE :

This specification is intended to cover the design, manufacturing, assembly, testing at manufacturer's works, supply and delivery of voltage transformers for metering and relaying service in 22 / 33KV phase system.

1.1 TYPE AND RATING :

The voltage transformers shall be of outdoor type, single phase oil immersed, self cooled suitable for operation in 3 phase solidly grounded system as per system details under the climatic conditions specified at clause – 2.3 and 2.2 respectively, under Section – II.

The voltage transformers shall have the following ratings:

Nominal system voltage :	22 kV	33 kV	22kV/33kV Tariff-metering
Highest system voltage :	24 kV	36 kV	24kV/36kV
Frequency	-- 50 Hz --		
Earthing	-- solidly earthed --		
Number of Windings	-- Two --	-- One --	
Ratio : windings – I	12.7 / 19.05 kV // 63.5 V		
--- do -- - II	12.7 / 19.05 kV // 110 V	----	
Rated Burden winding – I	100 VA	10VA	
--- do --- - II	200 VA	----	
Class of accuracy winding. – I	0.5 (Metering)	0.2(tariff-metering)	
--- do --- - II	3 P (Protection)	----	
over voltage factor :	1.2 continuous 1.5 for 30 seconds		
Total minimum creepage distance	600	900 mm	600/900mm
Lightning impulse withstand voltage	150	170 kVp	150/170kVp
One minute P.F. withstand (dry & wet) voltage	55	70 kV (rms)	55/70kVrms

1.2 STANDARDS :

The voltage transformers shall conform in all respects to the latest issue of IEC, recommendations publication No. 61869 and IS 16227 (latest issue) except wherein specified otherwise, where the equipment conforms to any other standard the salient points, differences between the standards adopted and the British standards shall be clearly brought out in the tender.

Equipment meeting any other authoritative standard which ensures an equal or better quality than the standard mentioned above is also acceptable.

1.3 CLIMATIC CONDITIONS :

The climatic conditions prevailing at site is as specified at clause –2.2 of Section – II. of 22/33 KV CTs.

1.4 GENERAL :

1.4.1 The voltage transformers shall be oil immersed and self cooled suitable for the services indicated conforming to the modern practice of design and manufacture.

1.4.2 The core shall be of high grade, non-aging, electrical silicon laminated steel of low hysteresis loss and high permeability to ensure high accuracy at both normal and over voltage.

1.4.3 The potential transformers shall be nitrogen gas filled at the top and hermetically sealed to eliminate breathing and prevent air and moisture from entering the tank. These shall be provided with oil level gauge and shall be provided internal pressures relieving capable of releasing abnormal internal pressures.

1.5 WINDINGS :

1.5.1 PRIMARY WINDING :

The primary winding shall be of electrolytic grade copper. All primaries of potential transformers will be connected in phase to neutral with the neutral point solidly earthed. The neutral of the system is also solidly earthed. The primary terminal shall be of heavily tinned electrolytic grade

copper and shall be of standard size 30 mm dia x 80 mm long and tinning shall be adequate.

1.5.2 **SECONDARY WINDING :**

The secondary winding shall be of electrolytic grade copper. Secondary terminal shall be nickel plated brass. All potential transformers for phase to ground connection shall be provided with two separate windings rated for 110V and 63.5V for connection in star and delta winding respectively. The star winding to be used for metering and relaying (distance relays) shall be accuracy class specified or appropriate class. The rated burden of this winding shall not be less than specified above.

The delta winding to be used for synchronizing and relaying (directional relays) shall be of accuracy class specified or appropriate class and its rated burden shall not be less than as specified above.

1.6 **INSULATION :**

- (a) The potential transformers shall withstand 1.2/50 micro second lightning impulse withstand voltage of 150/170 kVp for 22/33 kV PT respectively.
- (b) PTs shall withstand power frequency withstand voltage of 55 / *70KV_{rms}* (dry & wet) of one minute for 22/33 kV PT respectively.

1.7 **TEMPERATURES RISE :**

The potential transformers shall be designed to limit the temperature of windings and other parts as specified in the applicable standards, when corrected or the differences between the temperature prevailing at site and temperatures specified by the standards. The temperature rise at 1.2 times rated primary voltage when applied continuously at rated frequency and at rated burden shall not exceed the limits specified above and the temperature rise at 1.5 times rated primary voltage when applied for 30 seconds starting from previous stable operating condition at rated frequency and rated burden shall not exceed the above temperature limits by more than 10°C.

1.8 INSULATING OIL :

The quantity of insulating oil for first filling of oil in each transformer and the complete specifications of the oil shall be stated in the tender. The price of the oil shall be given separately. The oil shall conform to the requirements of latest edition of Indian standard 335 subject to the requirements of the contractor's specification being fulfilled. The actual oil to be used shall be at the discretion of the purchaser. The insulating oil required for first filling of voltage transformer shall be included in the offer.

1.9 TYPE OF MOUNTING :

The voltage transformers shall be suitable for mounting on steel structures or concrete pedestals. The necessary flanges, bolts etc. for the base of the voltage transformer shall be supplied and these shall be galvanized.

1.10 TERMINAL CONNECTIONS :

Bimetallic terminal connectors suitable for ACSR *Dog or PANTHER or ZEBRA* conductor shall be supplied and they shall be suitable for both vertical and horizontal connections of the transmission lines conductor or station bus-bar. *Requirement of the same shall be decided during detailed engineering.* The terminal connectors shall be suitable for short time current of 25 kA for 3 sec. Suitable terminal earth connector for earthing connections shall also be supplied.

1.11 TESTS :

The type test reports of all type test as stipulated in the list given below of IS: 16227(Part-III) / 2015 not older than seven years and shall be valid up to last date of submission of bid shall be submitted along with the tender. Type tests reports for connectors & bushings confirming latest IS: 5561 and 2099 respective shall be submitted. These shall also be not older than 10 years prior to Bid opening.

Each voltage transformer shall be subjected to routine tests as stipulated in IS: 16227(Part-III) amended up to date

All test reports should be submitted and got approved from the purchaser before dispatch of the equipment.

Type Test Reports to be Submitted for PT

- 1 Temperature Rise Test
- 2 Lightning impulse voltage test on primary terminals

- 3 High voltage power frequency wet withstand test on PT
- 4 Test of Accuracy
- 5 Degree of protection IP55 for secondary terminal box

IMPORTANT NOTE: *In case of non-submission of some of the type test reports, the bidder shall confirm the submission of same before commencement of supply, without affecting delivery schedule, from NABL accredited laboratory, free of cost. In absence of this confirmation, the offer will be evaluated as non submission of type test report.*

If bidder has submitted all valid type / special / additional test reports as per requirement of technical specifications then the same are not required to be repeated. However, those tests which are covered under acceptance/ additional/ routine tests will be required to be carried out during the inspection, which is not a repetition.

Acceptance Tests to be performed on PT in presence of purchaser's representative

1	Power-frequency voltage withstand tests on primary terminals (10% of offered lot)
2	Partial-discharge measurement (10% of offered lot)
3	Power-frequency voltage withstand tests between sections (10% of offered lot)
4	Power-frequency voltage withstand tests on secondary terminals (10% of offered lot)
5	Tests for accuracy (10% of offered lot)
6	Verification of markings (10% of offered lot)
7	Measurement of capacitance and dielectric dissipation factor(100% of offered lot)

Test no. 1 to 6 shall only be performed on 100 % tariff-metering PTs in an NABL accredited/Govt lab

1.12 GUARANTEED AND TECHNICAL PARTICULARS :

Guaranteed and technical particulars as called for in attached Appendix -II shall be furnished along with the tender. Particulars which are subject to guarantee shall be clearly marked.

1.13 COMPLETENESS OF EQUIPMENTS :

Any fittings, accessories or apparatus which may not have been specifically mentioned in these specifications, but which are usual or necessary for the equipment of similar plant shall be deemed to be included in the contract and shall be supplied by the contractor without extra charges. All plant and equipment shall be complete in all details whether such details are mentioned in the specification or not.

SEAL OF THE FIRM

SIGNATURE OF TENDERER

APPENDIX – II**SCHEDULE OF GUARANTEED TECHNICAL PARTICULARS
FOR 22 / 33 kV VOLTAGE TRANSFORMERS****(To be filled in and signed by the Tenderer)**

- | | | | |
|-----|--|--------------|-----------|
| 1. | Type | | |
| 2. | Manufacturer's type designation | | |
| 3. | Nominal rated primary voltage | | Volts |
| 4. | Maximum (continuous) service rated voltage | | Volts |
| 5. | No. of secondary winding | | |
| 6. | Rated secondary voltage | | |
| | | Winding – I | Volts |
| | | Winding – II | Volts |
| 7. | Rated burden | | |
| | | Winding – I | VA |
| | | Winding – II | VA |
| 8. | Accuracy class | | |
| | | Winding – I | |
| | | Winding – II | |
| 9. | Temperature rise at 1.2 time rated voltage with rated burden. | | °C |
| 10. | Rated voltage factor and time | | |
| 11. | Temperature rise for (9 above sec. Clause 1.7) 1.5 times rated primary voltage for 30 Sec. | | °C |
| 12. | One minute power frequency withstand Voltage test (dry) voltage. | | KV (rms.) |

13.	One minute power frequency withstand Voltage test (wet) voltage.	KV (rms.)
14.	1.2 / 50 microsecond impulse wave withstand test voltage.	KV (Peak)
15.	One minute power frequency withstand voltage on secondaries.	KV (rms)
16.	Total minimum creepage distance of bushings	KV
17.	Weight of oil kg.	Kg.
18.	Total weight	Kg.
19.	Overall dimension	Kg.
20.	Mounting details	mm
21.	Other details	

SEAL OF THE FIRM

SIGNATURE OF TENDERER
NOTE:

- (1) Instead of giving reference of drawing No. / IS, Literature etc. actual values / figures must be furnished wherever required otherwise it will be completed to consider that the details in GTP are not furnished & technical Bid will be evaluated accordingly.
- (2) The details against each point of GTP are required to be submitted along with the tender, otherwise tender is liable for rejection.
- (3) List or orders executed for specified rating of CTs & PTs during last five years and performance reports thereof shall be submitted.