

TECHNICAL SPECIFICATION FOR 132KV CURRENT TRANSFORMERS (AIS)

1. SCOPE OF CONTRACT

- 1.1. Design, manufacture, testing, supply, delivery of equipment (as per BoQ) to AEGCL site.
- 1.2. Arrangements of any permits required for transportation and movement of supplied materials. However, AEGCL shall assist as far as practicable in the process.

This Section of the Specification covers general requirements for design, engineering, manufacture, assembly and testing at manufacturer's works of 132 kV outdoor Current and Potential Transformers.

2. STANDARDS

- 2.1. The equipment covered by this specification shall, unless otherwise stated be designed, constructed and tested in accordance with the latest revisions of relevant Indian Standards and shall conform to the regulations of local statutory authorities.
- 2.2. In case of any conflict between the Standards and this specification, this specification shall govern.
- 2.3. The current transformer shall comply also with the latest issue of the following Indian standard.

(i)	IS: 2705(Part-I)	Current transformers: General requirement.
(ii)	IS: 2705(Part-II)	Current transformers: Measuring Current transformers
(iii)	IS: 2705(Part-III)	Current transformers: Protective Current transformers
(iv)	IS: 2705(Part-IV)	Current transformers: Protective Current transformers for special purpose application.

3. GENERAL REQUIREMENTS

- 3.1. The cores of the instrument transformers shall be of high grade, non-aging CRC steel of low hysteresis loss and high permeability.
- 3.2. Current transformers shall be of Live Tank design.
- 3.3. The instrument transformers shall be truly hermetically sealed to completely prevent the oil inside the tank coming into contact with the outside temperature. To take care of oil volume variation the tenderer is requested to quote the current transformers with stainless steel diaphragm (bellow).
- 3.4. The instrument transformers shall be completely filled with oil.
- 3.5. A complete leak proof secondary terminal arrangement shall be provided with each instrument transformers, secondary terminal shall be brought into weather, dust and vermin proof terminal box. Secondary terminal boxes shall be provided with facilities for easy earthing, shorting, insulating and testing of secondary circuits. The terminal boxes shall be suitable for connection of control cable gland. IP rating of terminal box shall be IP 55. Spare terminals shall be provided. The exterior of the secondary terminal box shall be hot dipped galvanized.
- 3.6. All instrument transformers shall be of single-phase unit.

- 3.7. The instrument transformers shall be so designed to withstand the effects of temperature, wind load, short circuit conditions and other adverse conditions.
- 3.8. All similar parts, particularly removable ones, shall be interchangeable with one another.
- 3.9. All cable ferrules, lugs, tags, etc. required for identification and cabling shall be supplied complete for speedy erection and commissioning as per approved schematics.
- 3.10. The instrument transformers shall be designed to ensure that condensation of moisture is controlled by proper selection of organic insulating materials having low moisture absorbing characteristics.
- 3.11. All steel work shall be degreased, pickled and phosphated and then applied with two coats of Zinc Chromate primer and two coats of finishing synthetic enamel paint.

4. INSULATING OIL

- 4.1. The quantity of insulating oil for instrument transformers and complete specification of oil shall be stated in the tender. The insulating oil shall conform to the requirement of latest edition of IS: 335

5. COMMON MARSHALLING BOXES (shall be supplied by CT manufacturer)

- 5.1. The outdoor type common marshalling boxes shall conform to the latest edition of IS 5039 and other general requirements specified hereunder.
- 5.2. The common marshalling boxes shall be suitable for mounting on the steel mounting structures of the instrument transformers.
- 5.3. One common marshalling box shall be supplied with each set of instrument transformers. The marshalling box shall be made of sheet steel and weather-proof. The thickness of sheet steel used shall be not less than 3.0 mm. It is intended to bring all the secondary terminals to the common marshalling. The marshalling box shall be of hot dipped galvanized steel.
- 5.4. The enclosures of the common marshalling boxes shall provide a degree of protection of not less than IP 55 (As per IS 2147).
- 5.5. The common marshalling boxes shall be provided with double hinged front doors with pad locking arrangement. All doors and removable covers and plates shall be sealed all around with neoprene gaskets or better arrangement.
- 5.6. Each marshalling box shall be fitted with terminal blocks made out of moulded non-inflammable plastic materials and having adequate number of terminals with binding screws washers etc. Secondary terminals of the instrument transformers shall be connected to the respective common marshalling boxes. All out going terminals of each instrument transformer shall terminate on the terminal blocks of the common marshalling boxes. The terminal blocks shall be arranged to provide maximum accessibility to all conductor terminals.
- 5.7. Each terminal shall be suitably marked with identification numbers. Not more than two wires shall be connected to any one terminal. At least 20 % spare terminals shall be provided over and above the required number.
- 5.8. All terminal strips shall be of isolating type terminals and they will be of minimum 10 A continuous current rating.
- 5.9. All cable entries shall be from bottom. Suitable removable gland plate shall be provided on the box for this purpose. Necessary number of cable glands shall be supplied fitted on to this gland plate. Cable glands shall be screw on type and made of brass.
- 5.10. Each common marshalling box shall be provided with two numbers of earthing terminals of galvanised bolt and nut type.

- 5.11. All steel, inside and outside work shall be degreased, pickled and phosphated and then applied with two coats of Zinc Chromate primer and two coats of finishing synthetic enamel paint. The colour of finishing paint shall be as follows: -

- i) Inside: Glossy White
- ii) Outside: Light Grey (Shade No. 697 of IS: 5)

6. BUSHINGS AND INSULATORS

- 6.1. Bushings and Insulators shall be of Porcelain, Solid core type. Porcelain used for the manufacture of bushings and insulators shall be homogeneous, free from defects, cavities and other flaws or imperfections that might affect the mechanical or dielectric quality and shall be thoroughly vitrified, tough and impervious to moisture.
- 6.2. Glazing of the porcelain shall be of uniform brown colour, free from blisters, burns and other similar defects. Bushings shall be designed to have sufficient mechanical strength and rigidity for the conditions under which they will be used. All bushings of identical ratings shall be interchangeable.
- 6.3. Puncture strength of bushings shall be greater than the dry flashover value. When operating at normal voltage, there shall be no electric discharge between the conductors and bushing which would cause corrosion or injury to conductors, insulators or supports by the formation of substances produced by chemical action. No radio interference shall be caused by the bushings when operating at the normal rated voltage.
- 6.4. The design of bushing shall be such that the complete bushing is a self-contained unit and no audible discharge shall be detected at a voltage up to a working voltage (Phase Voltage) plus 10%. The minimum creepage distance for severely polluted atmosphere shall be 31 mm/KV.
- 6.5. Sharp contours in conducting parts should be avoided for breakdown of insulation. **The insulators shall be capable to withstand the seismic acceleration of 0.5 g in horizontal direction and 0.6g in vertical direction.**
- 6.6. Bushings shall satisfactorily withstand the insulation level specified in data sheet.
- 6.7. Rain shed/drain cover/dome shall be present in CT.
- 6.8. Bellow level indicator shall be present in CT.
- 6.9. **Nitrite butyl rubber/Neoprene gaskets shall be used.**

7. TESTS

7.1. Routine/Acceptance Tests (all units)

All routine tests shall be carried out in accordance with relevant Standards. All routine/acceptance tests shall be witnessed by the Employer/his authorised representative.

- 7.2. **Type Tests:** The bidder shall furnish type test certificates and results for the all tests as per relevant Standards along with the bid for current and potential transformers of identical design. Type test certificates so furnished shall not be older than 5 (five) years as on date of Bid opening.

QAP: QAP shall be submitted.

23.7.3 At factory/works tests the Tan Delta shall not exceed 0.3% (at $U_m/\sqrt{3}$). The same shall not exceed 0.7% at the end of warranty period. If tan delta value of CTs exceed prescribed limit of 0.7% within warranty period, it will be considered as failure within warranty period (Tan delta & capacitance test of CTs shall be measured at 10KV at site). The bidder has to replenish failed CTs within guarantee period without any cost implication to AEGCL.

8. NAME PLATES

- 8.1. All equipment shall have non-corrosive name plates fix at a suitable position indelibly mark with full particular there on in accordance with the standard adapted. Thickness (1mm), purchase order, project name, serial no etc. shall be present in the Name plate.

9. MOUNTING STRUCTURES

- 9.1. All the equipment covered under this specification shall be suitable for mounting on steel structures. Supply of mounting structures is also in the scope of this tender.
- 9.2. Each equipment shall be furnished complete with base plates, clamps, and washers etc. and other hardware ready for mounting on steel structures.

10. SAFETY EARTHING

- 10.1. The non-current carrying metallic parts and equipment shall be connected to station earthing grid. For these two terminals suitable for 65mm X 12mm GS strip shall be provided on each equipment.

11. TERMINAL CONNECTORS (Shall be under manufacturer scope)

- 11.1. The equipment shall be supplied with required number of terminal connectors of approved type suitable for ACSR. The type of terminal connector, size of connector, material, and type of installation shall be approved by the Employer, as per installation requirement while approving the equipment drawings. No part of a clamp shall be less than 12mm. thick.

12. PRE-COMMISSIONING TESTS

- 12.1. Contractor shall carry out following tests as pre-commissioning tests. Contractor shall also perform any additional test based on specialties of the items as per the field instructions of the equipment Supplier or Employer without any extra cost to the Employer. The Contractor shall arrange all instruments required for conducting these tests along with calibration certificates and shall furnish the list of instruments to the Employer for approval.

(a) Current Transformers

- (i) Insulation Resistance Test for primary and secondary.
- (ii) Polarity test.
- (iii) Ratio identification test - checking of all ratios on all cores by primary injection of current.
- (iv) Dielectric test of oil (wherever applicable).
- (v) Magnetising characteristics test.
- (vi) Tan delta and capacitance measurement
- (vii) Secondary winding resistance measurement
- (viii) Contact resistance measurement (wherever possible/accessible).

13. TECHNICAL DATA SHEET FOR CURRENT

- 13.1. For 145 kV CT the instrument security factor at all ratios shall be less than five (5) for metering core. If any auxiliary CTs/reactor are used in the current transformers then all parameters specified shall have to be met treating auxiliary CTs as an integral part of the current transformer. The auxiliary CTs/reactor shall preferably be inbuilt construction of the CTs. In case these are to be mounted separately these shall be mounted in the central marshalling box suitably wired up to the terminal blocks.
- 13.2. **TYPE AND RATING:**
All instrument transformer shall be outdoor type, single phase, oil immersed, self-cooled suitable for mounting on steel structure. The instrument transformer shall have the following ratings and particulars.

SL No.	A. Item	Ratings and Particulars	
I	II	III	
A	Nominal system voltage	132 kV	
B	Highest system voltage, kV	145	
C	Rated frequency, HZ	50	
D	System earthing	Solidly earth	
E	Insulation level		
a)	Impulse withstand voltage: kVp	650	
b)	One-minute p.f. Withstand voltage, kV (r.m.s.)		
		275	
F	Short time current for 3 seconds, kA	40	
G	Minimum creepage distance, mm	4495	
H	Temperature rise	As per ISS	
I	FEEDER C.T.		
	(i) No. of Cores	4	4
	(ii) Transformation ratio		
		300-600/1-1-1-1	800-1000/1-1-1-1
	(iii) Rated out put		
	(a) Core-1	30 VA	30 VA
	(b) Core-2	30 VA	30 VA
	(c) Core-3	-	-
	(d) Core-4	-	-
	(e) Core-5	NA	NA
	(iv) Accuracy class		
	(a) Core-1	0.2S	0.2 S
	(b) Core-2	5P	5P
	(c) Core-3	PX	PX
	(d) Core-4	PX	PX
	(e) Core-5	NA	NA
	(v) Accuracy limit factor		
	(a) Core-1	-	
	(b) Core-2	20	20
	(c) Core-3	-	
	(d) Core-4	-.	
	(e) Core-5	NA	NA
	(vi) Instrument security factor		
	(a) Core-1	<5	<5

	(b) Core-2	-	-
	(c) Core-3	-	-
	(d) Core-4	-	-
	(e) Core-5	NA	NA
	(vii) Minimum Knee point voltage, Volts		
	(a) Core-1	-	
	(b) Core-2	-	
	(c) Core-3	≥1200 (at 600A)	≥1600 (at 1000A)
	(d) Core-4	≥1200 (at 600A)	≥1600 (at 1000A)
	(e) Core-5	NA	NA
	(viii) Maximum secondary resistance, ohm		
	(a) Core-1	-	
	(b) Core-2	-	
	(c) Core-3	3(at 600A)	3(at 1000 A)
	(d) Core-4	3(at 600A)	3(at 1000 A)
	(e) Core-5	NA	NA
	(ix) Maximum exciting current, at V _k /4 mA		
	(a) Core-1	-	
	(b) Core-2	-	
	(c) Core-3	10 (at 600A)	10 (at 1000A)
	(d) Core-4	10 (at 600A)	10 (at 1000A)
	(e) Core-5	NA	NA

Note:

- (i) It is intended to use different ratios of the same CT at the same time for various protections and metering cores. The CTS should therefore be suitable for the above purpose by secondary tapings only. The ratio change by secondary taps is acceptable as long as the required CT specifications are achieved at all ratios.
- (ii) The knee point voltage specified above shall be at higher ratio/ taps.