

SCHEDULE-III
TECHNICAL SPECIFICATION FOR OUTDOOR TYPE 33 KV CTs AGAINST
TENDER SPECIFICATION TN-2510.

3.0 SCOPE:

This specification covers the design, manufacture, assembly testing at manufacturer's works before despatch, supply and delivery of Single Phase 50 Hz oil immersed, self cooled, hermetically sealed, outdoor type 33 KV Current Transformers for installation at various Grid Sub-stations of Jaipur Discom. Consideration may be given to alternatives which the suppliers consider advisable by reason of his own manufacturing requirements & experience provided descriptive matter/ tests certificates are submitted pointing out the recommended device or arrangement equal to or superior to that required by this specification and if the purchaser is convinced of the quality and/or superiority of the equipment. These equipment shall be suitable for installation in system with neutral effectively grounded.

3.01 SCHEDULE OF REQUIREMENT:

The requirement of 33 KV CTs shall be as under:-

S. No.	Item	Ratio	Quantity in (Nos.)
1.	33 KV Current Transformers	400-200-100/5-5A	60

The bidder should quote prices of above CTs with terminal connector suitable for panther conductor.

3.02 STANDARDS:

The design, manufacture & testing of various equipments, covered by this specification shall comply with the latest issue of following and other applicable standards except the value wherever specified shall be considered relevant:-

IS:2705	Specification for Current Transformers
IS:2099	Specification for Bushing
IS:5621	Specification for hollow porcelain bushing.
IS:5561	Specification for electric power connectors.
IS:335	Specification for new insulating oil.
IS:4201	Application guide for Current Transformer.
IEC:60044-1 & 2	Instrument Transformers

Equipments conforming to other International and IEC Standards which ensure equal or higher quality than the standard(s) mentioned

above would also be acceptable. In case the tenderer wishes to offer equipment conforming to other standard, they shall furnish English translation of the relevant standards

3.03 CLIMATIC CONDITIONS:

The climatic conditions under which the equipment will be required to operate satisfactorily are as under:-

- i) The equipment offered by you shall conform in all respects to the relevant Indian standards specifications except where stated otherwise in the order. Special care shall be taken in the design & manufacture of equipment to take into account the tropical conditions such as high temperature excessive humidity, dust & salt laden atmosphere at detailed below:-

- a) Maximum temperature of air in shade : 50 deg.C
- b) Minimum temperature of air in shade : (-) 5 deg.C
- c) Maximum relative humidity : 95 %
- d) Minimum relative humidity : 10 %
- e) Height above mean sea level : upto 1000 meters
- f) Dust storms are likely to occur
the period from March to July
- g) Average number of thunder storms : 40
days/annum.
- h) Average number of tropical monsoon : 4 months
conditions per annum.
- i) Average rain fall : 10-100 cms. depending upon
area.

ii) TROPICAL TREATMENT:

All the equipment shall be suitably designed and treated for normal life and satisfactory operation under the hot and humidity Tropical Climatic Conditions specified under clause No. 3.03 above and shall be dust and vermin proof. All the parts and surface which are subject to corrosion shall be made of such material and shall be provided with such protective finish as would protect the equipment installed from any injurious effect of excessive humidity.

You shall supply all such minor accessories required for the completion of the supply which have either not been specifically mentioned in this specification or your tender offer.

3.04 TECHNICAL REQUIREMENTS FOR 33 KV CURRENT TRANSFORMERS:

- i) The Current Transformers shall be of Single Phase oil immersed self cooled hermetically sealed & outdoor type suitable for the service conditions indicated complete in all respects conforming to latest issue

of IS mentioned at clause 3.02 and modern practice of design & manufacture. The thickness of tank sheet shall be minimum of 3 mm.

- ii) The core shall be of high grade non-aging laminated silicon steel of low hysteresis losses and high permeability to ensure accuracy at both normal & over current.
- iii) The Current Transformers shall be hermetically sealed to eliminate breathing and prevent air and moisture from entering the tank. The method adopted for hermetically sealing shall clearly be stated in detail in the offer. These shall be provided with prismatic oil level gauge and pressure relieving devices capable for releasing abnormal internal pressure where necessary. Arrangement for oil filling/ drain valve/ plug / hole shall be sealed to avoid leakage / pilferage of oil. The arrangement provided shall be indicated in the tender. For load shedding single phasing is adopted in the system. The offered CTs shall be suitable for working under such conditions.
- iv) For 33 KV CTs only live tank type design shall be acceptable
- v) **PRINCIPAL TECHNICAL PARTICULARS OF CURRENT TRANSFORMERS:-**

S. No.	Description	Particulars
1.	Type of CT/Installation	Single Phase Live Tank oil filled hermetically sealed, outdoor type.
2.	Type of mounting	Steel Structure
3	Nominal system voltage	33KV
4	Highest system voltage	36KV
5	Rated Insulation level.	
a.	One minute dry power frequency withstands voltage.	70KV (rms)
b.	1.2/50 micro second Lightning Impulse voltage (KVP)	170 KV peak
6	One minute High voltage power frequency test on	
a.	Primary winding (test voltage)	As per IS:2705/1992 (with latest amendment)
b.	Secondary winging (test voltage)	As per IS:2705/1992 (with latest amendment)
7	Frequency	50Hz.
8	Transformation ratio(s)	(a) 400-200-100/5-5A
9.	Method of earthing of system	Effectively earthed
10.	Rated continuous Thermal current(s) rating(s)	120% of rated primary current (s)
11.	a) Rated short time thermal current.	25 KA (rms) for 1 Sec.

	b) Rated dynamic current (kAP)	62.5	
12.	Temperature rise for rated continuous thermal current over an ambient temp. of 50 Deg. C.	Within limits of IS:2705/1992 with latest amendments.	
13.	Total creepage distance of porcelain housing (Min.)	900 mm	
14.	Max. Creepage factor for hollow porcelain insulator	4.0	
15.	Core utilization for CTs having ratio (a) 400-200-100/5-5 Amp. (b) 240-120-60/5-5 Amp.	CORE-I Metering	CORE-II Back up protection
a.	Rated burden VA	30	40
b.	Class of accuracy	0.5S	5P
c.	Max. instrument security factor	5	-
d.	Accuracy limit factor (max.)	-	15

vi) Necessary magnetization curve for the relevant core(s) shall be furnished.

vii) TEMPERATURE RISE FOR CURRENT TRANSFORMERS :

The limits of temperature rise of the windings, external surface of the core and other parts of the current transformers when carrying a primary current equal to the rated continuous thermal current at the rated frequency and with rated burden shall be governed by the provisions of latest issue of IS:2705 (Pt.I). The corresponding temperature rise for the terminal connectors shall not exceed at rated continuous thermal current of the CT beyond the limits prescribed in IS:5561/1970 or latest issue.

3.05 CORES AND WINDINGS FOR ALL CLASS CURRENT TRANSFORMERS

- i) The current transformers core to be used for metering and instrumentation shall be of the accuracy class as specified. The saturation factor, instrument security factor of this core shall be low enough so as not to cause any damage to measuring instruments in the event of maximum short circuit current. Mu-metal or equivalent material shall be used for this purpose. This factor shall not exceed to 5 on all transformation ratio.
- ii) The current transformers cores to be used for protective relaying shall be of accuracy specified. The cores shall be designed for a maximum accuracy limit factor of 15 or min. knee point voltage specified as the case may be. The magnetization curves for applicable core shall be furnished by the tenderer along with the tender failing which offer is likely to be ignored.
- iii) The rating of the secondary winding shall be as per Clause No. 3.04(v) of this specification. The secondary terminals shall be brought out in a weather proof compartment on one side of current transformer for easy access and shall be provided with short-circuiting arrangements. Required transformation ratio can be achieved in any manner but the current transformers will have to

satisfy the requirement of rated VA burdens, class of accuracy, accuracy limit factor, instrument security factor and short time thermal rating etc. as specified in Clause 3.4 (v) at all transformation ratio.

The minimum knee point voltage and maximum secondary winding resistance shall correspond to the lowest ratio. In case tapings are provided on secondary side of current transformers to get the designed transformation ratios, magnetization curves corresponding to all secondary taps must be submitted with the tender. Secondary windings resistances at such secondary tap shall also be clearly specified. The secondary terminal box shall be provided with necessary glands with removable gland plate for control cables. The secondary terminal box shall conform to IP-55 test.

- iv) Primary winding shall be made out of high conducting copper. The design density for short circuit current as well as conductivity for primary winding shall meet the requirement of IS:2705/1992 or latest issue. However for primary winding current density corresponding to the rated short time current shall not exceed 160 Amps./Sq.mm for copper conductor. Suitably insulated copper wire of electrolytic grade shall be used for secondary winding. The tenderer should furnish details of primary winding e.g. Number of primary turns, cross-section, short time current density and normal continuous rated current density in the primary winding so as to meet the requirement of IS. Winding shall have high mechanical strength for safety against stress.
- v) The shape of external metal parts shall ensure that rainwater runs off and there is no stagnation.
- vi) The requirement of current transformers of all classes regarding their ratio error, minimum knee point voltage, exciting current at knee point voltage, maximum resistance of secondary winding etc. shall have to be coordinated with the requirement of the protective relay and protecting scheme wherever required without any extra cost to the purchaser.
- vii) The CTs shall be of robust design, tested quality and reliable in operation. Only pure high-grade paper would evenly under controlled conditions and impregnated with mineral oil under vacuum shall be used for the main insulation.

3.06 FITTINGS & ACCESSORIES FOR CTs

The CTs shall be provided with the following fittings & accessories:-

- 1) 2 Nos. bimetallic terminal connector with each CT suitable for horizontal & vertical take-off. The thickness of bimetallic strip/sleeve shall be of min. 2mm.
- 2) Oil level gauge.
- 3) Pressure release device if design recommended.
- 4) Expansion Chamber or suitable type of device for absorbing variation in volume of oil due to change in temperature of oil.

- 5) Oil filling/ drain valve/ plug/ hole with sealing arrangement.
- 6) Lifting lugs/ holes.
- 7) Weather proof secondary terminal box fitted with hinged/ bolted door and complete with terminals and short circuit arrangements. The secondary box hinged/ bolted door shall have sealing arrangement.
- 8) Two Nos. earthing terminals.
- 9) Name & Rating plate showing details of connection diagram.

3.07. GENERAL REQUIREMENTS OF 33 KV CTs

3.07.1 INSULATING OIL AND BUSHINGS:

The quantity of insulating oil for first filling of each instrument transformer and complete specification of the oil shall be stated in the tender. The oil shall conform to the requirements of latest issue of IS: 335. The instrument transformers shall be of standards duly filed in with oil. The oil filled bushing shall be of standard make such as W.S. Industries, BHEL/MIL/Birla NGK/CJI/TEKMEK, KOLKATA. The bushing shall be suitable for operation in heavily polluted atmosphere with creep-age distance of minimum 25 mm per KV. The details of make and catalogue no. etc. of bushing shall be clearly stated in the guaranteed technical particulars. Pressure of nitrogen or any other inert gas used above the oil level to permit expansion or contraction of oil along with device to detect any leakage if any shall be stated in the tender.

3.07.2 TERMINAL CONNECTORS:

The Instrument transformers shall be supplied with bimetallic terminal connectors for both ends suitable for ACSR Panther conductor as per requirement and confirming to IS:5561. Each terminal connector shall be suitable for both horizontal and vertical takeoff arrangement.

The instruments transformers shall also be provided with two number earthing terminals of adequate size, protected against corrosion and metallicly clean. Bimetallic strips or sleeves of suitable thickness to prevent bimetallic corrosion shall be provided as a part of the terminal connectors.

3.07.3 PAINTING:

All ferrous parts of the Instrument Transformers exposed to atmosphere shall be painted externally with one coat of anti rust abide paint (Primer) and two coats of dark admirably grey paint (synthetic enamel paint of light grey shade No. 631 of IS:5). All interior surfaces in contact with oil shall be painted with two coats of heat resistant oil insoluble paint.

3.07.4 TYPE OF MOUNTINGS:

The tenderer may submit their drawing / design for supporting structures of the Instrument transformers offered by bidders.

3.08 DRAWING AND MANUALS:

The following drawings/ technical literature of the equipment covered by this specification shall be furnished along with tenders: -

- i. Outline general arrangement drawings showing all dimensions and weight of each item.
- ii. Drawing showing inside details.
- iii. Diagram of connections and drawing for ratio plate.
- iv. Drawing of bushing insulator to be used mentioning all details.
- v. Drawings depicting magnetization curve for relevant secondary winding of the Instrument Transformers
- vi. Technical and descriptive literature explaining constructional features and details of the equipments.
- vii. Drawing of bimetallic terminal connector indicating all details.
- viii. Name/Rating plate diagram
- ix. Drawing of all fittings and accessories

3.09 INSTRUCTION MANUALS:

The successful tenderer shall have to supply 10 sets of operating and maintenance instruction manuals along with the erection manuals and requisite drawings of the equipments covered by this specification. One set of drawings and a manual shall also be sent along with each consignment to respective consignee.

3.10 NAME / RATING PLATE:

All items of the equipment includes in this specification shall be provided with rating plates as per relevant standards. Rating Plate & terminal marking shall be as per relevant IS. Purchase order / TN reference shall also be given.

3.11 TYPE TEST REPORTS

Certified copies of tests reports from any CPRI/ NABL accredited testing laboratories of all type tests as per relevant latest standard mentioned under section-III clause 3.02 in respect of similar equipment (voltage class wise) included in this specification along with bushing and terminal connector (if offered other than approved make) shall be furnished to adjudge the technical suitability along with the tender. The tenderer shall furnish necessary calculations on the basis of STC test reports furnished above to prove the CTs of offered ratios are capable to withstand the specified short circuit level. The type tests reports shall not be older than **5** years. The type tests details are as under:

- a) Short time current test
- b) Lightning impulse voltage withstand test.
- c) Temperature rise test.

- d) High voltage power frequency (wet) withstand test.
- e) Determination of errors or other characteristics.

In case, a bidder do not posses valid type test reports as per the requirement, an undertaking stating that valid Type Test Certificate from a Govt. /Govt. approved/ Govt. recognized/ NABL accredited/ ILAC accredited laboratory shall be furnished from first lot (without asking any delivery extension) along with Bank Guarantee with the Technical Bid from a Nationalized/Scheduled Bank in prescribed proforma at Schedule-III C or DD/Pay order amounting to Rs. 5.0 Lacs, should be furnished. The initial validity of Bank Guarantee shall be 9 Months with claim period of 3 Months in addition.

3.12 INSPECTION & TESTING

- i) Each equipment covered under this specification shall comply with and shall be subjected to all routine tests prescribed in the relevant Indian Standards specification as mentioned in Clause 3.02 above.
- ii) In the event of order, supplier shall have to get all type test conducted as per requirement of relevant standards on one sample out of first lot comprising minimum 25% of ordered quantity of lowest ratio CT's in presence of inspecting officer without any extra cost, at CPRI/ NABL accredited testing laboratories designated by purchaser for which facilities exists in India unless otherwise it is waived by the purchaser.
- iii) In case Bidder has furnished complete valid Type Test Reports of offered items as per requirement of Specification & ordered quantity is less than 100 Nos, the above condition of Type Test on 1-Sample from first lot comprising minimum 25% of ordered quantity in presence of inspecting officer without any extra cost, at CPRI/ NABL accredited testing laboratories shall not be applicable. In case Bidder has furnished BG in absence of Type Test then Type Test from first lot will be conducted as per Clause No. 3.12(ii).
- iv) In case a bidder who has supplied 33 KV CTs of offered ratio and accuracy to any three Discoms of Rajasthan during last 5 years from the date of opening of a new tender and type tests have been conducted from 1st lot offered for inspection than the condition of Type Test on 1 Sample from 1st Lot comprising minimum 25% of ordered quantity in presence of Nigam's Inspecting Officer without any extra cost at CPRI/NABL accredited Lab as per clause No. 3.12(ii) of Specification shall not be applicable upon them for the ratio for which type test has conducted.
- v) Routine tests as per relevant standard shall be carried out on each equipment covered by this specification in the presence of purchaser's representative if desired by the purchaser. All tests reports shall be submitted and got approved

- vi) During every lot offered for inspection, oil sample shall be drawn at random from any one equipment and same shall be tested as per IS: 335 for a) Break down voltage, b) Tan δ at 90⁰ Centigrade.
- vi) One CT in each offered lot shall be opened for verifying the diameter and cross sectional area of primary conductor including verification of GTP.

If CT fails in any of the tests/ verification at the works, the entire lot shall be rejected.
- vii) Dispatch Instructions of inspected material shall be issued only after successful type test reports.

3.13 TESTS AT SITE/ VERIFICATION AT STORES:

The purchaser reserves the right to carry out any site tests as he may decide at his own cost and will claim reimbursement from the supplier, in case the material as a result of such test / tests is not found conforming for the prescribed specification.

Verification:- One CT in each offered lot received in Nigam's stores shall be opened for verifying the diameter and cross sectional area of primary conductor including verification of GTP. If CT fails in above verification at Stores, entire lot shall be rejected and supplier shall lift the rejected lot. In case it found within specified limit, the supplier at his own cost shall reassemble/ replace the physically opened CT at works/ stores.

The payment against supplies shall be released after obtaining successful store verification.

3.14 GUARANTEED TECHNICAL PARTICULARS:

Guaranteed technical particulars for Instrument Transformers is appended at Annexure-I. Tenderer are requested to furnish GTP duly filled along with the tender. Tenders not accompanied by guaranteed technical particulars are liable to be rejected.

3.15 MATERIAL AND WORKMANSHIP:

All materials used in the manufacture of aforesaid equipment shall be of best quality and capable of satisfactory operation under climatic conditions mentioned in Clause 3.03 above. The workmanship shall be of the highest grade and the practice.

3.16 COMPLETENESS OF EQUIPMENTS:

All fittings, accessories or apparatus which may have not been specifically mentioned in this specification but which are usual or necessary for the equipments shall be deemed to have been included in this specification. All equipments shall complete in all respect.

3.17 LATENT DEFECTS, ERRORS AND OMISSIONS:

Any material / equipment or part thereof that developed defects, error or omissions in the apparatus, not disclosed prior to the final acceptance by the purchaser, but occur or are disclosed during the guaranteed period shall be corrected promptly or the apparatus or part there of shall be replaced by the supplier free of charges and all expenses for the transportation handling, installation of such replacement or any other incidental charges shall be borne by the supplier.

3.18 GUARANTEE PERIOD & REPLACEMENT DURING GUARANTEE PERIOD:

Performance guarantee of the equipment shall be for the period of 36 months from the date of receipt in stores. The month & year of expiry of guarantee period shall be marked on the nameplate. Equipment failed within such guarantee period shall have to be replaced free of cost within 45 days of intimation. You shall furnish successful routine test reports of the equipment. If purchaser desires inspection prior to dispatch an inspecting officer shall be nominated for verification for the test reports. Transportation and lifting of defective material & delivery of replaced material shall be borne by the supplier.

3.19 SCHEDULES :

Any deviations from the provisions of Section-I, II and III of this specification shall be clearly listed and brought out separately in schedule VI A & VI B "Technical Deviations from the specification" & "Commercial deviation from the specifications". The deviations mentioned elsewhere in the offer shall not be considered.

All the schedules as per tender specification shall be returned duly filled and completed.

3.20 Delivery Schedule

The bidder is required to quote monthly delivery. The delivery of quoted quantity should be completed in 8 months period **in equal installments** including commencement period of 30 days. In case ordered quantity is different than quoted quantity then monthly delivery shall be adjusted proportionately. Tenders in which monthly delivery schedule is not indicated shall be ignored.

3.21 ADDITIONAL ORDER

Repeat orders for additional quantities, upto 50% of original ordered quantities, may be placed by the Nigam, on the same rates, terms and conditions given in the contract.

The delivery and commencement period shall not be linked with the time taken in approval of drawings and arranging type tests etc. Such time shall already be considered in commencement period while quoting delivery.

3.22 QUALITY ASSURANCE PLAN:

The tenderers are required to furnish the quality assurance plan along with their bid, which is to be followed by the supplier during manufacturing of the equipment. The list of raw material used along with their sub suppliers and type test reports of raw material & brought out items be furnished along with the offer.

3.23 PRICE VARIATION:

The prices of Instrument Transformers are on variable basis as per prevailing IEEMA formula w.e.f. 1.6.2005 (mentioned as **Annexure `A`**) with base date **01.01.2019 irrespective of date of tender opening**. Rates quoted with 'FIRM' prices are likely to be ignored.

ANNEXURE-I
GUARANTEED TECHNICAL PARTICULARS FOR 33 KV CURRENT
TRANSFORMERS AGAINST TN-2510

S. No.	Description	Technical particulars	
1a)	Name of Manufacturer with address of works.		
b)	Correspondence Address with email ID.		
2	Manufacturer Type designation		
a.	Nominal system voltage.		
b.	Highest system voltages.		
3	Class of Insulation		
i.	One minute Power Frequency withstand voltage (KVrms)		
ii.	Impulse withstand Voltage (KVP)		
iii.	One Minute High Voltage Power Frequency test		
a.	Primary winding		
b.	Secondary winding		
4.	Frequency.		
5.	Transformation ratio(s).		
6.	Rated Continuous thermal current rating (kA rms)		
7.	Rated Short time thermal current of primary for one second. (kA rms)		
8	Rated Dynamic Current of primary (kA peak)		
9	Temperature rise for rated continuous thermal current over an ambient temperature of 50 Deg. C at rated burden.		
10	Core utilization for CTs having ratio 400-200-100/5-5 A	CORE-I	CORE-II
a.	Rated Primary current (in Amp.)		
b.	Rated Secondary Current (in Amp.		
c.	Rated burden.		
d.	Class of Accuracy.		
e.	Max. Instrument Security Factor.		
f.	Accuracy limit factor.		
g.	Exciting Current.		
h.	Maximum resistance of secondary winding corrected to 75 Deg. C at lowest tap.		
i.	Core Material.		
11.	Winding Details	Primary winding	Secondary Winding
a.	Material of conductor.		
b.	No. of turns.		
c.	Cross sectional area.		
d.	Weight of winding.		
12.	Whether complete type test reports as per relevant IS enclosed.		
13.	Whether magnetization curve enclosed.		
14.	IS to which CT conform		
15.	Total weight of CT		
16.a.	Quantity of oil		
b.	Governing standard for oil		
17.	Overall dimensions.		
18.	Mounting details.		
19.	Bushing details.		

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a.	Confirm to IS:	
b.	Make.	
c.	Catalogue No.	
d.	Total creepage distance (mm)	
e.	Protected creepage distance.	
20.	Make of terminal connector	
21.	Whether pressure release device provided.	
22.	Other Characteristics	
a	Ratio and phases angle curve.	
b.	Ratio correction factor curve.	
23.	Current density in primary windings.	
a	Normal rating, Amps per Sq.mm	
b.	Thermal rating of 3 sec. Amps. per sq.mm.	
c.	Dynamic rating Amps. per sq.mm	
24.	Test results of oil as per IS:335	
a	Break Down Voltage	
b.	Tan delta at 90 Deg.	
c.	Colour of oil (shall be color less)	
25	Any other specific feature.	