SECTION-3

3.1.0 Scope of Works

3.1.1. **The scope of works covers "Supply, Erection, Testing & Commissioning of Terminal Equipment at 132 KV Kamakhya GIS of AEGCL"**

The major scopes of work are as follows: -

a) Design, manufacture, testing, supply, delivery of equipment (as per BoQ) to AEGCL site.

b) Erection, testing & commissioning of 132KV CVT & 132KV CT along with associated works (as per BoQ) at AEGCL site

c) Arrangements of any permits required for transportation and movement of supplied materials. However, AEGCL shall assist as far as practicable in the process.

3.1.2. The Bill of Quantities for indicative purposes is furnished in Price Schedules of Section-2 (Vol-I) of this bidding document. The BOQ is as per BOQ Schedules attached in the online e-tender document.

3.1.3. The quantities in the above Annexure are provisional in nature and for bid comparison purpose only. Quantities may vary to the extent of (+) 20 % to (-) 20% in terms of Contract Price.

3.1.4. **The bidder on its own responsibility must visit and examine the Site of Works and its surroundings and obtain information that may be necessary for preparing the bid.** Any permits or licenses that may be required to execute the works should also be obtained by the contractor.

3.1.5. **The items mentioned in these Annexures shall only be used while quoting the bid prices. Any other items not specifically mentioned in the specification but which are required for installation, testing, commissioning and satisfactory operation of the cable as per Indian Standards/IE Rules/IE Act and concerned authority regulations are deemed to be included in the scope of the specification and no deviation in this regard shall be accepted**

No modifications/additions/ deletions shall be made by the bidder to the items and quantities given in these schedules.

3.2.0 Contractor to Inform Himself Fully

3.2.1. The contractor should ensure that he has examined the Specifications and Schedules as brought out in this Section as well as other Sections of The Bidding document and has satisfied himself as to all the conditions and circumstances affecting the contract price and fixed his price according to his own views on these matters and acknowledge that no additional allowances except as otherwise provided therein will be levied.

3.2.2. The Employer shall not be responsible for any misunderstanding or incorrect information obtained by the contractor other than information given to the contractor in writing by the Employer.

3.3.0 Service Conditions

3.3.1. The plant and materials supplied shall be suitable for operation under the following climatic and other conditions:

a) Peak ambient day temperature in still air : 45°C

b) Minimum night temperatures : 0°C

c) Reference ambient day temperature : 45°C

d) Relative Humidity a) Maximum	: 100 %
b) Minimum	: 10 %
e) Altitude	: Below 1000 M above MSL
f) Maximum wind pressure	: As per IS: 802 latest code.
g) Seismic Intensity	: ZONE-V as per IS 1893.

3.4.0 Conformity with Indian Electricity Rules & Other Local Regulations

3.4.1. The Contractor shall note that all substation works shall comply with the latest provisions of Indian Electricity Rules and with any other regulations. Local authorities concerned in the administration of the rules and regulation relating to such works shall be consulted, if necessary, about the rules and regulations that may be
applicable.

3.4.2. The Contractor shall also comply with the Minimum Wages Act 1948 and the payment of Wages Act (both. of
the Government of India and State of Assam) and the rules made there under in respect of any employee or
workman employed or engaged by him or his Sub-Contractor.

3.4.3. All registration and statutory inspection fees, if any, in respect of his work pursuant to this Contract shall be to
the account of the Contractor.

3.5.0 Contractor's Requirement

3.5.1. The Contractor should be in possession of a up to-date valid Labour License, ESIC registration, EPFO certificate, Electrical Contractor Licence and Electrical Supervisory Licence issued by the Chief Electrical Inspector, Govt. of Assam, as per the provision of Law. Attested copy of each of the aforementioned Licence must be handed over to the Owner for his record prior to handing/taking over of sites.

3.5.2. **All the works shall also be inspected by the Chief Electrical Inspector, Govt. of Assam or his authorize representatives. It is the responsibility of the Contractor to obtain pre-requisite commissioning clearance of any equipment from the said Inspectorate. The Contractor will pay necessary fees to the Inspectorate, which it may levy. Concerned supervising authority of AEGCL will provide all necessary assistance in this regard.**

3.6.0 Standards

3.6.1. The equipment covered under this bidding document 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.

3.6.2. In case of any conflict between the standards and this specification, this specification shall govern.

3.6.3. Equipment conforming to other international or authoritative Standards which ensure equivalent or better performance than that specified under Clause 3.6.0 above shall also be accepted. In that case relevant extracts of the same shall be forwarded with the bid.

3.7.0 Engineering Data

3.7.1. The furnishing of engineering data by the Contractor shall be in. accordance with the Bidding Document. Thereview of these data by the Employer will cover only general conformance of the data to the specifications and not a thorough review of all dimensions, quantities and details of the materials, or items indicated or the accuracy of the information submitted. This review by the Employer shall not be considered by the Contractor, as limiting any of his responsibilities and liabilities for mistakes and deviations from the requirements, specified under these specifications.

3.7.2. All engineering data submitted by the Contractor after review by the Employer shall or part of the contract document.

3.8.0 Drawings and Documents for Approval

3.8.1. All necessary drawings and documents required for completion of the project is to be submitted by the contractor for approval. The drawings provided with bid (if any) are for indicative purpose only and fresh drawings are to be prepared by the contractor as per actual site condition after survey. The drawings and documents are to be approved by AEGCL before procurement or commencement of work.

3.8.2 All drawings submitted by the Contractor including those submitted at the time of Bid shall be with sufficient detail to indicate the type, size, arrangement, dimensions, material description, Bill of Materials, weight of each
component break-up for packing and shipment, fixing arrangement required, the dimensions required for installation and any other information specifically requested in these specifications.

3.8.3. Each drawing submitted by the Contractor shall be clearly marked with the name of the Employer, the specification title, the specification number and the name of the Project. All titles, noting, markings and writings on the drawing shall be in English. All the dimensions should be to the scale and in S.I. units.

3.8.4. **The drawings submitted for approval to the Employer shall be in quadruplicate**. One print of such drawings shall be returned to the Contractor by the Employer marked "approved/approved with corrections". The contractor shall there upon furnish the Employer additional prints as may be required along with one reproducible in original of the drawings after incorporating all corrections.

3.8.5. The Contractor shall perform the work strictly in accordance with these drawings and no deviation shall be permitted without the written approval of the Employer, if so required.

3.8.6. All manufacturing, fabrication and erection work under the scope of Contractor prior to the approval of the drawings shall be at the Contractor's risk. The contractor may make any changes in the design which are necessary to conform to the provisions and intent of the contractor and such changes will again be subject to approval by the Employer.

3.8.7. The approval of the documents and drawings by the Employer shall mean that the Employer is satisfied that:
a) The Contractor has completed the part of the Works covered by the subject document (i.e. confirmation of progress of work).
b) The Works appear to comply with requirements of Specifications.
In no case the approval by the Employer of any document does imply compliance with neither all technical requirements nor the absence of errors in such documents. If errors are discovered any time during the validity of the contract, then the Contractor shall be responsible of their consequences.

3.8.8. All drawings shall be prepared using AutoCAD software version 2000 or later only. Drawings, which are not compatible to AutoCAD software version 2000 or later, shall not be acceptable. After final approval all the drawings shall be submitted to the Employer in readable CD's

3.8.9. The following is the general list of the documents and drawings that are to be approved by the Employer:

a) Work Schedule (Master Network) Plan with linkages prepared on latest version of Microsoft Projects.

b) General Layout of Switchyard: Plan and Sections.

c) Detail design calculations and drawings for Control Room Panels.

d) Earthing layout and details.

e) Cable Trench Layout and details.

f) Foundation layouts and details of main and auxiliary structures

g) Detail design calculations and drawings for structures, equipment supports and foundations

h) Cable Schedule, as applicable

i) For equipment and items in the scope of supply:

(i) General arrangement drawing with full dimensions.

(ii) Electrical schematic diagram, where applicable.

(iii) Wiring diagram, where applicable.

3.8.10. All Designs/Drawings/Calculations/Data submitted by the contractor, from time to time shall become the property of the Employer and Employer has the right to use or replicate such designs for future contracts / works without the permission of the Contractor. The Employer has all rights to use/ offer above designs/drawings/data sheets to any other authority without prior Permission of the Contractor.

3.9.0 Final Drawings and Documents

3.9.1. The successful Contractor shall require to provide following drawings and documents for each bay constructed in printed form:

(a) All approved drawings (AS BUILD) of equipment and works related to a particular bay in three (3) copies.

(b) Instruction manuals of all equipment related to a particular bay in three (3) copies.

These instruction manuals shall generally consist of-

(i) Operation Manuals,

(ii) Maintenance Manuals and

(iii) Spare Parts Bulletins.

(c) Copies of routine test reports (in triplicate) of relevant equipment.

(d) Final Guaranteed and Other technical particulars of relevant equipment.

3.9.2. In addition to the above the Contractor shall provide five (5) sets of all the drawings and documents to Employer in printed form for his reference and record.

3.10.0 Application System Software

3.10.1. Contractor shall provide copies of licensed copies of application software / configuration & system software in the form of CD (in duplicate) for all IEDs, meters, SAS etc.

3.11.0 Quality Assurance, Inspection & Testing

3.11.1. To ensure that the supply and services under the scope of this Contract whether manufactured or performed within the Contractor's works or at his Sub Contractor's premises or at site or at any other place of work are in,

accordance with the specifications, the Contractor shall adopt suitable quality assurance programme to control

such activities at all points necessary. Such programme shall be outlined by the Contractor and shall be finally

accepted by the Employer after discussions before the award of Contract. A quality assurance programme of
the Contractor shall generally cover but not limited to the following:

a) His organization structure for the management and implementation of the proposed quality assurance programme
b) Documentation control System.
c) Qualification data for Contractor's key personnel.
d) The procedure for purchases of materials, parts components and selection of sub-Contractors services including vendor analysis, source inspection, incoming raw material inspection, verification of material purchases etc.
e) System for shop manufacturing including process controls and fabrication and assembly controls.
f) Control of non-conforming items and system for corrective action.
g) Control of calibration and testing of measuring and testing equipment.
h) Inspection and test procedure for manufacture.
i) System for indication and appraisal of inspection status.
j) System for quality audits.
k) System for authorizing release of manufactured product to the Employer.
l) System for maintenance of records.
m) System for handling storage and delivery and
n) A quality plan detailing out the specific quality control procedure adopted for controlling the quality characteristics relevant to each item of supply.

The Quality plan shall be mutually discussed and approved by the Employer after incorporating necessary corrections by the Contractor as may be required.

3.11.2. **Quality Assurance Documents**

The Contractor shall be required to submit all the Quality Assurance Documents as stipulated in the Quality Plan at the time of Employers inspection of equipment/material.
The Employer or his duly authorized representatives reserves the right to carry out Quality Audit and quality surveillance of the systems and procedures of the Contractors/his vendors Quality Management and Control Activities.

3.12.0 Employer's Supervision

3.12.1. To eliminate delays and avoid disputes and litigation it is agreed between the parties to the Contract that all
matters and questions shall be resolved in accordance with the provisions of this document.

3.12.2. The manufacturing of the product shall be carried out in accordance with the specifications. The scope of the
duties of the Employer, pursuant to the contract, will include but not be limited to the following.
a. Interpretation of all the terms and conditions of these Documents and Specifications.
b. Review and interpretation of all the Contractors drawings, engineering data etc.
c. Witness or authorize his representative to witness tests at the manufacturer's works or at site, or at any place where work is performed under the contract.
d. Inspect, accept or reject any equipment, material and work under the Contract, in accordance withthe Specifications.
e. Issue certificate of acceptance and/or progressive payment and final payment certificate.

f. Review and suggest modification and improvement in completion schedules from time to time, and
g. Supervise the Quality Assurance Programme implementation at all stages of the works.

3.12.3. **Inspection and Inspection Certificate**

3.12.4. The Employer, his duly authorized representative and/or outside inspection agency acting on behalf of the Employer shall have, at all reasonable times, access to the premises and works of the Contractor and their sub-contractor(s)/sub-vendors and shall have the right, at the reasonable times, to inspect and examine the materials and workmanship of the product during its manufacture.

3.12.5. All routine and acceptance tests whether at the premises or work of, the Contractor or of any Sub Contractor, the Contractor except where otherwise specified shall carry out such tests free of charge. Items such as labour, materials, electricity, fuel, water, stores apparatus and instruments as may be reasonably demanded by the Employer/inspector or his authorized representative to carry out effectively such tests in accordance with the Contract shall be provided by the Contractor free of charge.

3.12.6. If desired by the Employer, the Contractor shall also carry out type tests as per applicable Standards for which Employer shall bear the expenses except in cases where such tests have to be carried out in pursuance to **Clause 3.13.3**. The Contractor is required to quote unit rates of type test charges in a separate Schedule (if such schedule is provided in the Bidding Document) in pursuance to this Clause. However, these type test charges shall not be taken into account in comparing Price Bid.

3.12.7. The inspection by Employer and issue of Inspection Certificate thereon shall in no way limit the liabilities and
responsibilities of the Contractor in respect of the agreed Quality Assurance Programme forming a part of the
Contract.

3.12.8. **Tests**

The type, acceptance and routine tests and tests during manufacture to be carried-out on the material and equipment shall mean as follows:

i) Type Tests shall mean those tests, which are to be carried out to prove the process of manufacture and general conformity of the material to this Specification. These tests shall be carried out on samples prior to commencement of commercial production against the order. The Bidder shall indicate his schedule for carrying out these tests.
ii) Acceptance Tests shall mean those tests, which are to be carried out on samples taken from each lot offered for pre-dispatch inspection, for the purposes of acceptance of that lot.
iii) Routine Tests shall mean those tests, which are to be carried out on the material to check requirements, which are likely to vary during production.
iv) Tests during Manufacture shall mean those tests, which are to be carried out during the process of manufacture and end inspection by the Contractor to ensure the desired quality of the end product to be supplied by him.
v) The norms and procedure of sampling for these tests will be as per the Quality Assurance Programme to be mutually agreed to by the Contractor and the Employer.

3.12.9. The standards and norms to which these tests will be carried out are specified in subsequent Sections of this
Specification. Where a particular test is a specific requirement of this Specification, the norms and

procedure
of the test shall be as specified or as mutually agreed to between the Contractor and the Employer in the Quality Assurance Programme.

3.12.10. For all type and acceptance tests, the acceptance values shall be the values specified in this Specification or
guaranteed by the Bidder or applicable Standards, as applicable.

3.13.0 Type Test Reports

3.13.1. Materials, which have never been tested for critical performance, shall not be accepted. In such cases, a promise or agreement by a bidder to have the equipment tested after award of a contract is not acceptable.

3.13.2. All Bids must be accompanied by the Type Test Certificates of materials offered (refer Clause 3.13.5below). Such type test certificates shall be acceptable only if: -
(a) Tests are conducted in an independent **testing laboratory with NABL accreditation**, or
(b) Tests are conducted in manufacturer's own laboratory.
In this case (i) the laboratory must have **NABL accreditation**; and
(ii) tests have been witnessed by technically qualified representatives of earlier clients or purchaser.

3.13.3. **Test reports to be acceptable must be related directly to the equipment offered i.e. it is fully identical in design, rating and construction with the equipment for which the type test certificates have been submitted. Test reports for higher class (by capacity/voltage etc.) of equipment are acceptable with commitment to perform the type tests free of any charge on the particular equipment after the award of contract.**

3.13.4. **The Validity of type test report shall be as per CEA's "Guideline for Validity period of Type Tests conducted on Major Electrical Equipment in power transmission system", file No CEA-PS-14-80/1/2019-PSETD Division- Part (2) dated 17th September, 2021.**

3.14.0 Guaranteed Technical Particulars

3.14.1. The Guaranteed Technical Particulars of the various items shall be furnished by the Bidders with the Technical Bid in the prescribed Schedules attached in Volume-2 of the bidding document. The Bidder shall also furnish any other information's as in their opinion is needed to give full description and details to judge the item(s) offered by them.

3.14.2. The data furnished in Guaranteed Technical Particulars should be the minimum or maximum value (as per the requirement of the specification) required. A Bidder may guarantee a value more stringent than the specification requirement. However, for testing purpose or from performance point of view, the material shall
be considered performed successfully if it achieves the minimum/maximum value required as per the technical specification. No preference what so ever shall be given to the bidder offering better/more stringent values than those required as per specification except where stated otherwise.

3.15.0 Construction Tools, Equipment Etc.

3.15.1. The Contractor shall provide all the construction equipment, tools, tackle and scaffoldings required for construction, erection, testing and commissioning of the works covered under the Contract. He shall submit a

list of all such materials to the Employer before the commencement of work at site. These tools and tackle shall not be removed from the site without the written permission of the Employer.

3.16.0 Materials Handling and Storage

3.16.1. All the supplies under the Contract as well as Employer supplied items (if any) arriving at site shall be promptly received, unloaded and transported and stored in the stores by the Contractor.

3.16.2. Contractor shall be responsible for examining all the shipment and notify the Employer immediately of any damage, shortage, discrepancy etc. for the purpose of Employer's information only. The Contractor shall submit to the Employer every week a report detailing all the receipts during the week. However, the Contractor shall be solely responsible for any shortages or damages in transit, handling and/or in storage and erection at site. Any demurrage, and other such charges claimed by the transporters, railways etc., shall
be to the account of the Contractor.

3.16.3. The Contractor shall maintain an accurate and exhaustive record-detailing out the list of all items received by
him for the purpose of erection and keep such record open for the inspection of the Employer.

3.16.4. All items shall be handled very carefully to prevent any damage or loss. The materials stored shall be properly protected to prevent damage. The materials from the store shall be moved to the actual location at
the appropriate time so as to avoid damage of such materials at Site.

3.16.5. All the materials stored in the open or dusty location must be covered with suitable weather-proof and flameproof covering material wherever applicable.

3.16.6. The Contractor shall be responsible for making suitable indoor storage facilities, to store all items/materials, which require indoor storage.

3.16.7. The Contractor shall have total responsibility for all equipment and materials in his custody, stored, loose, semi-assembled and/or erected by him at site. The contractor shall make suitable security arrangements including employment of security personnel to ensure the protection of all materials, equipment and works from theft, fire, pilferage and any other damages and loss.

3.17.0 Contractor's Materials brought on to Site

3.17.1. The Contractor shall bring to Site all equipment, components, parts, materials, including construction equipment, tools and tackles for the purpose of the work under intimation to the Engineer. All such goods shall, from the time of their being brought vest in the Employer, but may be used for the purpose of the Works only and shall not on any account be removed or taken away by the Contractor without the written permission of the Engineer. The Contractor shall nevertheless be solely liable and responsible for any loss or destruction thereof and damage thereto.

3.17.2. The Employers shall have a lien on such goods for any sum or sums, which may at any time, be due or owing to him by the Contractor, under in respect of or by reasons of the Contract. After giving a fifteen (15) days' notice in writing of his intention to do so, the Employer shall be at liberty to sell and dispose of any such goods, in such manner, as he shall think fit including public auction or private treaty.

3.17.3. After the completion of the Works, the Contractor shall remove from the Site under the direction of the Employer's site representative, the materials such as construction equipment, erection tools and tackles, scaffolding etc. with the written permission of the Employer's site representative. If the Contractor fails to remove such materials within fifteen (15) days of issue of a notice by the Employer's site representative, the Employer's site representative shall have the liberty to dispose of such materials as detailed under clause **3.17.2** above and credit the proceeds thereto to the account of the Contractor.

3.18.0 Commissioning Spares

3.18.1. It will be the responsibility of the Contractor to provide all commissioning spares required for initial operation till the Employer declares the equipment as ready for commissioning. All commissioning spares shall be deemed to be included in the scope of the Contract at no extra cost to the Employer.

3.18.2. These spares shall be received and stored by the Contractor at least 1 month prior to the schedule date of commencement of commissioning of the respective equipment and utilized as and when required. The unutilized spares and replaced parts, if any, at the end of successful completion of performance and guarantee test shall be the property of the Contractor and he will be allowed to take these parts back at his own cost with the permission of Employer's Representative.

3.19.0 Consignee Details

3.19.1 The Contractor shall supply the equipment and execute the works at **132KV Kamakhya GIS, AEGCL.**

3.20 TECHNICAL SPECIFICATION FOR 33 KV, 132KV, 220KV & 400 KV CVT

1. SCOPE:

1.1. This specification provides for the design, manufacture, assembly inspection and testing at the manufacturer's works, packing and delivery at site, erection, testing and commissioning of outdoor mounted type, single phase, oil filled, self-cooled, single unit type Capacitive Voltage Transformers for,132KV, 220kV & 400 KV system to be used for voltage indication, supply of potential to energy meters, relays for feeder protection in Grid Sub- stations of AEGCL, ASSAM. In addition to the above functions the 400 KV, 220kV, 132KV CVT shall be suitable for carrier coupling.

1.2. Bidders are required to quote for 0.2 accuracy class [metering winding] for 132KV, 220kV, 400kV CVTs in the following manner.

(a) Guaranteed Technical Particulars.

(b) Technical literatures, brochures and drawings as per this specification.

(c) Type Test reports.

(d) List of orders, executed and Users' certificates with offer, failing submission of the above particulars with the offer, the tender may not be considered for evaluation.

2. Following is the list of documents constituting this Specification:

(i) Technical Specification (TS).

(ii) Technical requirements.

3. STANDARDS:

13.3.1 The CVTs shall conform in all respects to high standards of Engineering, design, workmanship and latest revisions of relevant standards at the time of offer and the Purchaser shall have the power to reject any work or material which in his judgement is not in full accordance therewith.

13.3.2. Except to the extent modified in the specifications, the CVTs shall conform to the latest editions and the amendments of the standards listed hereunder:

Sl. No.	Standard Ref. No.	Title
01	IEC-44(4)	Instrument Transformer – measurement of PDS.
02	IEC-60	High voltage testing techniques.
03	IEC-171	Insulation co-ordination.
04	IEC-186	Voltage Transformers.
05	IEC-186(A)	Voltage Transformers (first supp. to IEC-186)
06	IEC-270	Partial discharge measurement.
07	IS-335	Insulating oil for transformers and switchgears.
08	IEC-8263	Method for RIV Test on high voltage insulators.
09	IS-2071	Method of high voltage testing.
10	IS-2099	High Voltage porcelain bushings.
11	IS-2147	Degree of protection provided by enclosures for low voltage switchgear and control.
12	IS-2165	Insulation co-ordination for equipments of 100KV and above.
13	IS-3156 (Part-I to IV).	Voltage transformers.
14	IS-3347	Dimensions of porcelain transformer bushings.
15	IS-4146	Application guide for voltage transformers.
16	IS-5547	Application guide for Capacitor Voltage Transformers.
17	IS-9348	Coupling Capacitor & Capacitor Devices.

13.3.3 All the above along with the amendments thereof shall be read and interpreted together. However, in case of a contradiction between the Technical Specification and any other volume, the provisions of this Technical Specification will prevail.

13.3.4. The voltage transformers with the requirements of other authoritative standards, which ensure equal or better quality than the standards, mentioned above shall also be acceptable. Where the equipments, offered by the supplier conform to other standards, salient points of difference between the standards shall be brought out in the offer. 4 (four) copies of the reference standards in English language shall be furnished along with the offer.

13.3.5. **The supplier is to furnish the standards as mentioned above from Sl. 1 to 17 at their own cost, if required by the purchaser.**

4. CLIMATIC AND SERVICE CONDITIONS:

4.1 Earthquake Incidence:

The VTS are to be designed to withstand earthquake of intensity, equivalent to 0.5g in the horizontal and 0.6g in the vertical direction

Where, ‘g’ stands for acceleration due to gravity.

5. INSTALLATION:

The VTS covered under this specification shall be suitable for outdoor installation without any protection from rain, dust, mist and direct rays of the sun.

6. GENERAL TECHNICAL REQUIREMENTS:

6.1. GENERAL TECHNICAL REQUIREMENTS FOR 400KV, 220KV & 132KV CAPACITIVE VOLTAGE TRANSFORMER:

6.1.1. The design of capacitor voltage transformers shall such that its accuracy shall not be affected by the presence of pollution on the external surface of its insulators.

6.1.2. The CVT shall operate satisfactorily in system with high X/R ratio. (Tp=100 ms.).

6.1.3. The CVT transformer tanks along with top metallic shall be galvanized and painted to required shade.

6.1.4. Impregnation details along with tests and checks to ensure successful completion of impregnation cycle shall be furnished for purchaser's approval.

6.1.5. SS Bellows shall be tested in accordance with relevant standards. The details shall be subject to the approval of the purchaser.

6.1.6. The CVT shall be capacitor voltage type with electromagnetic units and shall be suitable for carrier coupling.

6.1.7. All windings of voltage transformer secondaries shall be protected by HRC cartridge type fuses. In addition, fuses shall be provided for the protection and metering windings for fuse monitoring scheme. The secondary terminals of the CVTs shall be terminated to stud type non-disconnecting terminal blocks in the individual phase secondary boxes via the fuse. Fuse ratings shall be clearly mentioned.

6.1.8. CVTs shall be suitable for high frequency (HF) coupling, required for power line carrier communication. The carrier signal must be prevented from flowing into potential transformer (EMU) circuit by meant of a RF choke/reactor, suitable for effectively blocking the carrier signal over the entire carrier frequency range i.e. 40 to 500 KHZ. Details of the arrangement shall be furnished along with the bid. HF terminal of the CVT shall be brought out through a suitable bushing and shall be easily accessible for connection to the coupling devices of the carrier communication equipment, when utilized. The bushing shall be fully protected against rain and vermin so as to avoid the possibility of short circuits to earth. An earthing link with fastener shall be provided for HF terminal.

6.1.9. The electromagnetic unit, comprising compensating reactor, intermediate transformer and protective and damping devices should have a separate terminal box with all secondary terminals, brought out.

6.1.10. The accuracy of the windings (0.2/3P) shall be maintained throughout the entire burden range preferably in the frequency range of 48 HZ to 51.5 HZ on all the three windings without any adjustment during operation. Preference will be given to such bidders who can offer for maintaining the above accuracy class in the frequency range i.e. 48 HZ to 51.5 HZ up to the above specified burden values.

6.1.12. Constructional Features:

6.1.12.1. The 400KV, 220KV & 132KV CVT shall be suitable for mounting on support structure of lattice type structures.

6.1.12.2. Access to secondary terminals shall be possible without any danger of access to high voltage circuit.

6.1.12.3. CVTs shall be hermetically sealed units.

6.1.12.4. **A protective surge Arrester/spark gap shall be provided to prevent break down of insulation by incoming surges and to limit abnormal rise of terminal voltage of shunt capacitor/primary winding, tuning reactor/RF choke etc. due to short circuit in transformer secondaries. Surge arrester shall be provided in the secondary winding also.**

6.1.12.5. The CVT secondary terminals shall brought out into a weatherproof terminal box for ease of access. The terminal box shall have an IP rating of not less than IP 55. The terminal box shall be provided with a removable gland plate at the bottom and shall be suitable for accepting the required numbers of PVC insulated PVC sheathed, 10 core 2.5 mm^2 standard copper conductor cable.

6.1.12.6. All terminals shall be clearly marked to facilitate connection of secondary wiring.

6.1.12.7. Secondary fuses or MCBs shall be provided on or adjacent to each CVT, located such that they are accessible while the primary is live and shall be provided with labels indicating their function and their phase colours CVT secondary circuits shall be complete in themselves and shall be earthed at one point only. A separate earth link shall be provided for each secondary winding and shall be situated at the CVT. Primary earthing links should be provided.

6.1.12.8. Where CVTs are supplied which are or may be connected to different sections of the bus bar, it shall not be possible for the CVT secondary circuits, to be connected in parallel.

6.1.12.9. To prevent ferro resonance, suitable damping devices shall provide for connection to the transformer secondaries.

6.1.12.10. CVTs shall meet the requirements, given in this section of the specification.

6.1.12.11. The creepage and flashover distances of the high voltage insulator shall be suitable for the outdoor service conditions, specified in the schedules.

6.1.12.12. The bidder in the offer is to state the suitable precautions/methods, adopted during design stage of the CVT to avoid the un-desirable effects due to ferro resonance phenomena. The precautions/methods include lower level of working flux density in EMU, greater utilization of the linear portion of the magnetization curve, providing an air gap in the magnetic circuit, connecting a suitable damping resistance permanently across the secondary etc.

6.1.12.13. It should be stated in the bid offer regarding the steps taken in the design stage for elimination/minimization of the influence of the transient response on the behaviour of high-speed relays.

6.1.12.14. It shall be ensured by the bidder in the offer that the connection of carrier, frequency coupling device across the CVT will not affect the designated accuracy class of the CVT windings.

6.1.12.15. The capacitor divider unit shall comply to IS: 9348/1979.

6.1.12.16. It shall also be complied in the offer through a calculation sheet, proving that the designated accuracy class of the CVT (both metering and protection) are not affected by extreme temperatures, to be encountered in service conditions (Max. ambient temperature 50º C and minimum -0º C).The terminal connectors should be suitable for 'ACSR' Conductor as per site requirement.

6.1.12.17. Separate point should be provided for measurement of capacitance & dielectric dissipation factor.

6.1.12.18. Capacitor Voltage Transformers shall be suitable for high frequency (HF) coupling required for power line carrier communication.

6.1.12.19. The coupling of Capacitor Voltage Transformers shall be suitable for the entire carrier frequency range of 40 KHz to 500 KHz. Necessary arrangements for preventing the HF signal to flow to the other circuits shall be provided.

6.1.12.20. The HF terminal shall be kept earthed when not used for PLCC purpose. Earthing link with fastener to be provided for HF terminal.

6.1.12.21. Capacitor Voltage Transformers shall be suitable for high frequency (HF) coupling required for power line carrier communication.

7. TESTS:

7.1 Type Tests:

The offered 400kV, 220kv, 132KV capacitive voltage transformer should have been subjected to the following type tests in a Government approved Test Laboratory. The bidder shall furnish four sets of type test reports along with the offer. These tests must not have been conducted earlier than five years from the date of opening of the bid. For any change in the design/type already type tested and to the design/type offered against this specification, the purchaser reserves the right to demand repetition of some or all type tests/special tests without any extra cost to AEGCL in the presence of purchaser's representative at the cost of the supplier.

For 400kV, 220kV & 132kV CVT.

Type Tests/Special Tests for 400kV, 220kV, 132kV CVT:

a) Lightning Impulse voltage test on complete CVT unit.

b) Power frequency over-voltage test on complete CVT unit.

c) Partial discharge test.

d) Radio interference voltage test.

e) Corona extinction voltage test.

f) Temperature rise test on complete CVT unit.

g) Ferro resonance test on the complete C.V.T. unit.

h) Transient response tests.

i) Determination of Temperature Co-efficient test.

j) High frequency capacitance and equivalent resistance measurement test (as per IEC-358)

k) Stray capacitance and stray conductance test (as per IEC-358).

l) Accuracy tests.

m) Thermal stability test.

n) Thermal Co-efficient test (as per IEC-358)

o) Fast transient test.

p) Seismic withstand test.

q) IP-55 test on secondary Terminal Box.

r) Magnetization and internal burden tests.

s) Effectiveness of sealing tests.

t) Mechanical Terminal load test on Bushing.

u) Dielectric loss angle test (Tan Delta Test).

N.B: 1. The dielectric type tests should have been carried out on the same CVT.

2. After the CVT was subjected to the dielectric tests, it should have been subjected to all routine tests as per relevant standards.

3. The ratio errors, phase displacements before, during and after the temperature rise test on complete CVT unit should have been determined with stipulated burdens and the same should comply with the designated accuracy class for each winding of the CVT.

7.2 Routine Tests:

The following routine tests shall be conducted on each VT in the presence of Purchaser's representative for which no charges will be payable by AEGCL. No sampling is allowed.

(a) Verification of terminal markings.

(b) Power frequency withstand tests on primary windings/capacitor voltage divider for CVT

(c) Partial discharge measurement for 400kV, 220kV & 132kV CVT.

(d) Power frequency withstand tests on secondary windings/Low voltage terminal of the capacitor divider for 400kV, 220kV & 132kV CVT.

(e) Power frequency withstand tests between sections.

(f) Determination of errors on complete CVT.

(g) Measurement of Insulation resistance.

(h) Oil leakage test.

(i) Measurement of capacitance and dielectric dissipation factor before and after dielectric tests (as per IEC-358)

(j) Power frequency tests on electromagnetic unit for 400kV, 220kV & 132kV CVT.

(k) Any other test as per relevant national & international standards.

N.B.: Determination of errors shall be performed after the other tests. The standard reference VT to be used during testing for determination of ratio error and phase angle error should of 0.05 accuracy class or better as per standard practice, presently adopted by AEGCL.

8. INSPECTION:

13.8.1. The Purchaser shall have access at all times to the works and all other places of manufacture, where the CVTs are being manufactured and the supplier shall provide all facilities for unrestricted inspection of the supplier's works, raw materials, manufacturer of all the accessories and for conducting the necessary tests.

13.8.2. The Supplier shall keep the Purchaser informed in advance of the time of starting and of the progress of manufacture of equipment in its various stages so that arrangement could be made for inspection at the discretion of the Purchaser.

13.8.3. No material shall be dispatched from its manufacture unless the material has been satisfactorily inspected, tested and dispatch clearance issued. However, the Purchaser reserves the right to alter the despatch schedule attached to this Specification.

13.8.4. The acceptance of any quantity of equipment shall in no way relieve the supplier of his responsibility for meeting all the requirements of this Specification and shall not prevent subsequent rejection, if such equipments are found to be defective.

13.8.5. Clear 15 (Fifteen) days' notice shall be given to this office for deputing officer(s) for inspection. The Voltage Transformers shall be despatched only after the inspection is conducted by a representative of AEGCL and release order, issued from this office after approval of Routine Test Certificates. The shop routine test certificates in triplicate for all the Voltage Transformers along with the calibration certificates of all the meters and equipments to be used during testing (as per Annexure-B of the Specification) should be furnished along with the Inspection Offer. The Inspecting Officer will be authorised for inspection of the Voltage Transformers subject to the condition that the routine test certificates and calibration certificates of the testing equipments/meters will be found to be in order.

9. QUALITY ASSURANCE PLAN:

13.9.1. The Bidder shall invariably furnish following informations along with his offer.

(i) Statement giving list of important raw materials, 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 items.

(iii) List of manufacturing facilities available.

(iv) Level of automation achieved and list of areas where manual processing exists.

(v) List of areas in manufacturing process where stage inspections are normally carried out for quality control and details of such tests and inspection.

(vi) Special features provided in the equipment to make it maintenance free.

(vii) List of testing equipments, meters and test plant limitation, if any, vis-à-vis the type, acceptance and routine tests, specified in the relevant standards. These limitations shall be very clearly brought out in the offer.

(viii) All the testing equipments, meters etc. should have been calibrated in a Government approved laboratory. The Bidder must submit the list of testing equipments and meters test as per the Technical Specification.

13.9.2. The Supplier shall within 30 days of placement of order submit the following information to the Purchaser.

(i) List of raw materials as well as bought out accessories and the names of the materials as well as bought out accessories and the name of Sub-suppliers selected from those, furnished along with the offer.

(ii) Type test certificates of the raw materials and bought out accessories.

(iii) Quality Assurance Plan (QAP) with hold points for the Purchaser's possible inspection. The QAP and hold points shall be discussed between the Purchaser and the Supplier before the QAP if finalised. Moreover, the QAP shall be in line with "CEA's Guidelines for Model Quality Assurance Plan for major equipment in Power sector".

13.9.3. The Supplier shall submit the routine test certificates of bought out items and raw materials at the time of acceptance testing of the fully assembled equipment.

10. DOCUMENT:

The supplier shall furnish four sets of following drawings/documents along with his offer.

(a) General outline and assembly drawings of the Capacitive

Voltage Transformers.

(b) Sectional views showing:

i) General constructional features.

ii) Materials/gaskets/sealing used.

iii) The insulation of the winding arrangements, method of connection of primary/ secondary winding to the primary/secondary terminals etc.

(c) Schematic drawing.

(d) Rating & diagram plate as per relevant IEC/ISS

(e) Secondary Terminal Box.

(f) Assembly Sectional view of Primary terminal/capacitor voltage divider

(g) Assembly drawing for secondary terminal

(h) The detailed dimensional drawing of Porcelain Housing such as ID, OD, thickness and insulator details such as height, profile of petticoats, angle of inclination and gap between successive petticoats, total creepage distance etc.

(i) Sectional view of pressure release device.

(j) Drawing showing details of Oil level.

(k) All type test reports relating to the tests as specified in Clause-8.1 of the above.

(l) Ratio and phase angle error curves for CVTS

(m) Magnetization characteristic curves such as B-H curves and Sp. Loss vs. Flux density curves for core material, used for EMU unit of CVT.

(n) Sectional view of EMU unit of 220KV&132KV CVT.

(o) Schematic diagram showing the working of CVT in PLCC.

11. TEST REPORTS:

(i) Four copies of type test/special test reports shall be furnished to the Purchaser with the tender offer.

(ii) Copies of acceptance test reports and routine test reports shall be furnished to the Purchaser. One copy will be returned, duly certified by the Purchaser and only thereafter shall the materials be despatched.

(iii) All records of routine test reports shall be maintained by the supplier at his works for periodic inspection by the Purchaser.

(iv) All test reports of tests conducted during manufacture shall be maintained by the supplier. These shall be produced for verification as and when required for by the purchaser.

12. The necessary galvanized flanges, bolts etc. for the base of the Capacitive Voltage Transformers shall be supplied without any extra cost to the purchaser.

13 APPENDIX – I.

TECHNICAL REQUIREMENTS FOR 132kV, 220kV, 400kV CAPACITIVE VOLTAGE TRANSFORMER.

Sl. No.	Particulars	132kV CVT	400kV/220kV CVT
I	II	V	VI
1	Type	Single phase, 50Hz, oil Filled, self-cooled, Hermetically sealed, Outdoor porcelain type.	Single phase, 50Hz, oil Filled, self-cooled, Hermetically sealed, Outdoor porcelain type.
2	Nominal system voltage.	132kV	400 kV/220kV
3	Highest system voltage.	145kV	420kV/245kV
4	Frequency.	50Hz ± 5%	50Hz± 5%
5	System earthing.	Effectively solidly earthed.	Effectively solidly earthed.
6	Number of phases.	3 [single phase]	3 [single phase]
7	(i) Number of secondary windings. (ii) Purpose of windings.	2 [three] Protection & metering.	3 [three] Protection & metering.
8	Rated primary voltage.	132/1.732kV	400/1.732 kV 220/1.732 kV
9	Rated secondary voltage.	Winding-I-110/1.732V Winding-II-110/1.732V	Winding-I-110/1.732V Winding-II-110/1.732V Winding-III-110/1.732V
10	Ratio	132kV/1.732: 110V/1.732	400kV/1.732: 110V/1.732, 110V/1.732 220kV/1.732: 110V/1.732 110V/1.732
11	Rated burden.	Winding-I (M)-100VA Winding-II (P)-100VA	Winding-I (M)-100VA Winding-II (P)-100VA Winding-III(P)-100VA
12	Accuracy class	0.2/3P	0.2/3P/3P
13	Rated voltage factor at rated frequency.	1.2 continuous. 1.5 for 30second.	1.2 continuous. 1.5 for 30second.
14	Temperature rise at 1.2 times the rated primary voltage, rated frequency & rated burdens.	As per IEC- 186	As per IEC-186
15	Temperature rise at 1.5 times the rated primary voltage for 30 seconds, rated frequency	As per IEC- 186.	As per IEC-186.

	& rated burden.		
16	One-minute power frequency dry withstands test voltage for primary winding.	275kV[rms]	650kV[rms]/ 460kV[rms]
17	1-minute power frequency wet withstands test voltage for primary winding.	275kV[rms]	650kV[rms]/ 460kV[rms]
18	1.2/50 micro second impulse withstand test voltage for primary winding	650kV[peak]	1425kV[peak]/ 1050kV[peak]
19 (i) (ii)	One-minute power frequency withstands test voltage for Secondary winding Between LV(HF) terminal & earth terminal	3kV[rms] 10kV[rms] for exposed terminals & 4kV[rms] for terminals, enclosed in a weatherproof box.	3kV[rms] 10kV[rms] for exposed terminals & 4kV[rms] for terminals, enclosed in a weatherproof box.
20	Class of insulation.	'B' or better	'B' or better
21	Material of the conductor of primary and secondary windings.	Copper for EMU	Copper for EMU
22	Fault level of the bus to which PTs will be connected.	40 kA [rms] for 3 second.	63/50kA [rms] for 3 second.
23	Minimum creepage distance.	4495 mm	13020/7595 mm
24	Quality of oil.	EHV Grade As per IS- 335.	EHV Grade As per IS-335.
25	Radio interference voltage at 1.1 times maximum rated voltage at 1.0 MHZ.	500 micro volts.	500 micro volts.
26	Partial discharge level.	Less than 10 Piccocoulombs.	Less than 10 piccocoulombs.
27	Seismic acceleration Horizontal – Vertical –	0.5g. 0.6g.	0.5g. 0.6g.
28	Accuracy class of standard V.T. to be used during testing towards determination of ratio errors and phase angle errors for metering windings.	0.05 or better.	0.05 or better.
29.	Capacitance (Pf)	4400 + 10%, -5%	4400 (for 220kV), 4400/6600 (for 400kV) + 10%, -5%

Note:

(i) For Station service bay equipments rated system voltage shall be 33kV and highest system voltage shall be 72.5kV.

3.21 TECHNICAL SPECIFICATION FOR 132KV CURRENT TRANSFORMERS (AIS)

23.1.0. SCOPE OF CONTRACT

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

23.2.0. STANDARDS

23.2.1. 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.

23.2.2. In case of any conflict between the Standards and this specification, this specification shall govern.

23.2.3. 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.

23.3.0. GENERAL REQUIREMENTS

23.3.1. The cores of the instrument transformers shall be of high grade, non-aging CRC steel of low hysteresis loss and high permeability.

23.3.2. Current transformers shall be of Live Tank design.

23.3.3. 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 are requested to quote the current transformers with stainless steel diaphragm (bellow).

23.3.4. The instrument transformers shall be completely filled with oil.

23.3.5. 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.

23.3.6. All instrument transformers shall be of single-phase unit.

23.3.7. The instrument transformers shall be so designed to withstand the effects of temperature, wind load, short circuit conditions and other adverse conditions.

23.3.8. All similar parts, particularly removable ones, shall be interchangeable with one another.

23.3.9. All cable ferrules, lugs, tags, etc. required for identification and cabling shall be supplied complete for speedy erection and commissioning as per approved schematics.

23.3.10. 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.

23.3.11. 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.

23.3.12. Both primary and secondary winding shall be of Copper. Primary terminal shall be Copper and secondary terminal shall be Brass.

23.4.0. INSULATING OIL

23.4.1. 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

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

23.5.1. The outdoor type common marshalling boxes shall conform to the latest edition of IS 5039 and other general requirements specified hereunder.

23.5.2. The common marshalling boxes shall be suitable for mounting on the steel mounting structures of the instrument transformers.

23.5.3. 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.

23.5.4. The enclosures of the common marshalling boxes shall provide a degree of protection of not less than IP 55 (As per IS 2147).

23.5.5. 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.

23.5.6. 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.

23.5.7. 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.

23.5.8. All terminal strips shall be of isolating type terminals and they will be of minimum 10 A continuous current rating.

23.5.9. 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.

23.5.10. Each common marshalling box shall be provided with two numbers of earthing terminals of galvanised bolt and nut type.

23.5.11. 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)

23.6.0. BUSHINGS AND INSULATORS

23.6.1. 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.

23.6.2. 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.

23.6.3. 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.

23.6.4. 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.

23.6.5. 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.**

23.6.6. Bushings shall satisfactorily withstand the insulation level specified in data sheet.

23.6.7. Rain shed/drain cover/dome shall be present in CT.

23.6.8. Bellow level indicator shall be present in CT.

23.6.9. **Nitrite butyl rubber/Neoprene gaskets shall be used.**

23.7.0. TESTS

23.7.1. **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.

23.7.2. **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 for approval. QAP shall be in line with CEA's Guidelines for Model Quality Assurance Plan for Major equipment in Power sector.

23.7.3 At factory/works tests the Ten Delta shall not exceed 0.3% (at Um/√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.

23.8.0. NAME PLATES

23.8.1. 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.

23.9.0. MOUNTING STRUCTURES

23.9.1. 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.

23.9.2. Each equipment shall be furnished complete with base plates, clamps, and washers etc. and other hardware ready for mounting on steel structures.

23.10.0. SAFETY EARTHING

23.10.1. 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.

23.11.0. TERMINAL CONNECTORS (Shall be under manufacturer scope)

23.11.1. 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.

23.12.0. PRE-COMMISSIONING TESTS

23.12.1. 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).

23.13.0. TECHNICAL DATA SHEET FOR CURRENT

23.13.1. 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.

23.13.2. **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	5	
	(ii) Transformation ratio	600-300/1-1-1	
	(iii) Rated out put		
	(a) Core-1	30 VA	
	(b) Core-2	30 VA	
	(c) Core-3	-	
	(iv) Accuracy class		
	(a) Core-1	0.2S	
	(b) Core-2	5P	
	(c) Core-3	PX	
	(v) Accuracy limit factor		
	(a) Core-1	-	
	(b) Core-2	20	
	(c) Core-3	-	
	(vi) Instrument security factor		
	(a) Core-1	<5	
	(b) Core-2	-	
	(c) Core-3	-	
	(vii) Minimum Knee point voltage, Volts		
	(a) Core-1	-	
	(b) Core-2	-	
	(c) Core-3	≥1200 (at 600 A)	
	(viii) Maximum secondary resistance, ohm		
	(a) Core-1	-	
	(b) Core-2	-	
	(c) Core-3	3 (at 600 A)	
	(ix) Maximum exciting current, at Vk/4 mA		
	(a) Core-1	-	
	(b) Core-2	-	
	(c) Core-3	10 (at 600 A)	

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.