

Section –III**TECHNICAL SPECIFICATION FOR EMPANELMENT OF VENDORS FOR SUPPLY OF 11 KV & 33 KV CT-PT METERING SETS IN JAIPUR DISCOM OF RAJASTHAN, FROM WHOM THE APPLICANT CAN PURCHASE THE SAME FOR ELECTRIC CONNECTION AGAINST TN-2652.****A. TECHNICAL SPECIFICATION OF 11 KV CT-PT METERING SETS****1. SCOPE:**

This specification covers the design, manufacture, assembly, testing and delivery of three phase four wire 11 KV/ 110V oil cooled outdoor type combined CTPT units for feeder metering & Indoor type combined CT-PT unit for consumer metering purpose having 1 No. Three phase potential transformer and 3 Nos. single phase paper impregnated oil immersed current transformers for different phases in common tank equipped with weather proof bushing for outdoor use as per technical data incorporated in this specification.

2. APPLICABLE STANDARDS:

Unless otherwise modified in this specification, 11 KV CTPT Metering Sets shall comply with the following Indian Standard Specification (latest version):

IS:2705-1992	Specification for current transformers.
IS:3156-1992	Specification for voltage transformers.
IS:5621-1980	Specification for Insulators/Bushing
IS:2099-1986	Specification for insulators/ bushing
IS:3347-1986	Specification for Insulators/bushing
IS:335-1983	Specification for new insulating oil
IS : 5561	Specification for terminal connectors.

Equipments conforming to any other international standard(s) which ensure(s) equal or better quality than the standard(s) mentioned above will also be acceptable and in such case(s) the copy of standards (English version) adopted should be provided.

3. 11 KV CTPT Metering Sets:

A) 11 KV Single Phase Current Transformer (3 Nos. for R Y & B phases).

The 11 KV current Transformer shall be paper impregnate oil immersed type, single phase 50 HZ conforming to IS:2705/1992 with latest amendment in all respect except where ever modified in this specification.

The 11 KV current Transformer shall have the following technical characteristics/ parameters.

Sr. No.	Particulars	Parameters
i)	Normal system voltage (KV rms)	11
ii)	Highest system voltage (KV rms)	12
iii)	Frequency	50 Hz
iv)	Impulse withstand voltage	95 KV (Peak)
v)	i) One minute power frequency dry withstand voltage (on assembled CT-PT set) a) primary (KV r.m.s.) b) secondary (KV r.m.s.) ii) One minute frequency wet withstand voltage (KV Peak) (On assembled CT-PT)	28 3 Root 2x28 rms
vi)	Transformation ratio (CT Ratio) a) For Consumer Metering b) For Feeder Metering	100/5 A, 50/5 A, 15/5 A & 5/5 A 200/5 A
vii)	Rated output (VA burden)	10 VA
viii)	Class of accuracy	0.5S
ix)	Rated continuous thermal current	1.2 times of rated primary current
x)	Short time thermal current rating	6.4 KA for one second for CT ratio 5/5 A & 15/5 A, 18 KA for one second for CT Ratio 50/5 A & 100/5 A 18 KA for 3 seconds for CT ratio 200/5 A
xi)	Rated dynamic current	2.5 times of short time thermal current rating.
xii)	Number of cores	One
xii)	Instrument security factor	Not exceeding 5
xiii)	Max. ratio error	As per IS:2705/1992
xiv)	Max. phase angle error	As per IS:2705/1992
xv)	Max. temp. rise over max. ambient temp. of 50 deg. C at rated continuous thermal current at rated frequency and with rated burden.	As per IS:2705/1992

B) 11 KV Voltage Transformer:

11 KV voltage Transformer will be used along with CTs of description stated above. This shall be paper impregnate oil immersed type conforming in all respect to the Indian Standards specification IS:3156/1992 with latest amendment except where modified in this specification.

The 11 KV voltage transformer shall have the following ratings/ technical parameters:

Sr.No	Particulars	Parameters
i)	Nominal system voltage (KV rms)	11
ii)	Highest system voltage (KV rms)	12
iii)	Nos. of phases	Three
iv)	Impulse withstand voltage (KVP) (on assembled CTPT set)	95
v)	a) One minute power frequency dry withstand voltage (on assembled CT-PT set) i) primary (KV r.m.s.) ii) secondary (KV r.m.s.) b) One minute frequency wet withstand voltage (KV Peak) (On assembled CT-PT set)	28 3 Root 2x28 rms
vi)	Frequency	50 Hz
vii)	Transformation ratio (PT Ratio)	11 KV/ 110V
viii)	Rated output (VA burden)	30 VA per phase
ix)	Class of accuracy	0.5 (As per IS:3156/1992)
x)	Winding connection	Star/Star with HT neutral earthed.
xi)	Rated voltage factor and time	1.2 continuous and 1.9 for 30 seconds.
xii)	Temp. rise over max. ambient temp.	Within limits of IS:3156/1992
xiii)	Max. Phase angle error	Within limits of IS:3156/1992
xiv)	Ratio error (Max.)	Within limits of IS:3156/1992

4. GENERAL TECHNICAL DESCRIPTION OF 11 KV CT-PT METERING SETS:

- i) The CT PT Metering set shall comply to the latest standards mentioned in the specification and guaranteed technical particulars.
- ii) High voltage winding of 11 KV instrument transformers shall have paper insulation impregnated with oil under vacuum. The paper used for insulation shall be of high insulation grade. The process of impregnation shall be detailed out in the tender.
- iii) The core material of CT-PT sets shall be of high grade, non-ageing, electrical silicon steel having low hysteresis loss and high permeability to ensure accuracy at both normal and over current/ voltage.
- iv) The instrument transformers shall be contained in a fully weather proof, outdoor type, platform mounting and also suitable for pole mounting type tank with 6 Nos. of 12 KV class weather proof bushing for incoming and outgoing connections.
- v) The thickness of MS sheet used for fabrication of tank shall be minimum 3.15 MM for sides and bottom and 5 MM for top cover.
- vi) The external surfaces of tanks of CT-PT sets shall be painted with one coat of primer and two coats of synthetic enamel paint of shade No.631 of IS:5. The internal surfaces of the tank shall be painted with two coats of a suitable heat resistant oil insoluble paint.
- vii) The metering sets shall be supplied with first filling of insulating oil conforming to IS:335 (with latest amendment).
- viii) The bushings used in the CT-PT sets shall conform to IS:2099, IS:5621 and IS:3347 (latest amendments). These shall be suitable for operation in heavily polluted atmosphere with creepage distance of 25 MM/KV.
- ix) The minimum clearance between phases and phase to earth as specified in the relevant ISS should be maintained.
- x) The paper impregnated oil immersed type instrument transformers shall be complete with all fittings and accessories mentioned at Clause No. 5 of this specification.

- xi) The 11 KV CT-PT sets shall be hermetically sealed type (should not communicate with atmospheric air) in construction without any oil conservator. The quality and work-man-ship shall be of high standard.
- xii) CT-PT sets shall be used for 3 phase 4 wire KWH metering. As such 11 KV CT PT sets shall have 3 Nos. CTs.
- xiii) The 11 KV CT PT sets shall have one No. of Three Phase Potential Transformer. The primary winding of single phase PT shall be connected in star formation in the tank with common external neutral.
- xiv) The neutral of primary PT winding shall be floating. The neutral of PT Secondary winding shall be earthed.**
- xv) The secondary winding neutral of PT and secondary terminals of CTs and PTs shall be brought out in one single secondary terminal box through 3 KV bushings. The terminals shall be marked as per ISS and supporting marking plate with earth terminal shall be provided. The secondary terminal box compartment shall be divided in two portions - One portion containing secondary of all CTs and the other portion shall contain all secondary PT connections with neutral and one body earthed. The whole compartment shall be covered by one bolted cover with sealing arrangement. At least two bolts at diagonally opposite corners of secondary terminal box shall be suitable for sealing arrangement. All other bolted covers and inspection windows covers, where provided shall also have sealing bolts for sealing purpose. Suitably shorting links shall be provided for individual CT shorting and PT secondary neutral.
- xvi) The secondary terminal box shall have cable gland/ flange suitable to receive two Nos. control cable of size 6 core X 4 sq.mm. and 4 core x 2.5 sq. mm at the bottom of the secondary box for metering connections to secondary winding of 11 KV CT-PT circuits respectively.
- xvii) The 11 KV CT PT Set shall have 3 Nos. incoming and 3 Nos. outgoing outdoor type bushing. The 11 KV CT-PT Sets shall have 6 Nos. bimetallic terminal connectors suitable for Dog Conductor for ratio 200/5 Amp. These should be type tested from CPRI/ NABL accredited Labs. These test reports should not be older than **7 years** for Short Circuit Test. The dimension & drawing shall be furnished along with tender duly signed and sealed by testing authority. Inspecting officer shall verify the original type test reports at the time of inspection for terminal connectors & bushings.
- xviii) No oil drain plug at the bottom of the CT-PT Sets be provided.

- xix) Embossing/ punching with minimum height of 10mm of Sr. No. & ratio be done on the tank of the CT-PT Sets.
- xx) Manufacturer's name in short should be embossed/ punched.
- xxi) CT Ratio should be painted on tank body so that it should be visible clearly.
- xxii) The under base of CT-PT Sets of 11 KV shall be provided with 2 Nos. 75x40x6mm channels to make them suitable for fixing to a plate form or plinth. These channels shall be provided through continuous welding with tank of the CT-PT Sets.
- xxiii) For 200/5 A Amp CT-PT set, HV Metal parts (Primary terminal) shall be of 20 mm dia and made of copper. The primary terminal shall be along the entire length of bushing. However brass may be used for consumer metering CT-PT sets for which HV Metal parts (Primary terminal) shall be of 16 mm dia.
- xxiv) The equipment shall be suitable to withstand for loading conditions when supply for one phase is disconnected from primary side.
- xxv) Bushing rod of 20 mm dia made of copper shall be used for 11KV CT-PT Sets for 200/5 Amp. ratio.
- xxvi) 2 Nos., 5/8" dia, 3" length earthing bolts with 2 nuts, 2 flat & 2 Nos. Spring washers shall be provided with each CT-PT Set.
- xxvii) Spring loaded pressure release device shall be provided on each 11KV CT-PT Set for releasing of accumulated gases.
- xxviii) The CT-PT Set (for outdoor installation) top shall be taper / slanting with minimum slant of 10 mm.
- xxix) The following sealing arrangement for providing seals on each 33 KV CT-PT set shall be made by the manufacturer.
 - i) 4 Nos. holes of 2.5 mm dia on each bushing clamp bolts of 6 nos. HT bushings for providing two polycarbonate seals at diagonally opposite bolts of each bushing clamp in M&P lab after successful testing as required.
 - ii) 4 Nos. holes of 2.5 mm dia on the bolts provided at four corners of top cover for providing two polycarbonate seals at diagonally opposite corner of CT-PT set by the inspecting officer after successful testing and providing polycarbonate seals in M&P lab after successful testing as required.

- iii) 4 nos. sealing holes on the name plate (R&D plate so that our inspecting officer may provide numbered seal on one side of the plate covering top & bottom holes whereas on the remaining two holes of other side, the one numbered seal will be provided by MT Lab after successful testing.

5. FITTING AND ACCESSORIES:

The outdoor platform/ pole mounting type metering equipments shall be complete with tank, fittings and accessories as detailed below:

- 1 No. Electrically welded sheet steel tank/ enclosure for accommodating above instrument transformers with suitable bolted cover.
- 6 Nos. Outdoor single terminal porcelain/ **Cycloaliphatic** bushing of reputed make without arcing horns. 3 Nos. for incoming and 3 Nos. for outgoing.
- 1 No. Secondary terminal box. The terminal box opening door/cover shall have suitable sealing arrangement. The necessary gland/ socket shall be in the scope of supply.
- 1 No. Oil filling hole with cap/plug.
- 1 No. Toughened prismatic oil level indicator with min. oil level marking.
- 2 No. Lifting lugs for lifting the complete CT-PT unit.
- 2 Nos. Earthing terminals.
- 1 Set Under base channels with suitable fixing holes for mounting on platform/poles.
- 1 Set Detachable collar assembly.
- 1 No. Rating and diagram plate.
- 6 Nos. Bimetallic Terminal Connectors. [For each 11 KV CT-PT Set of ratio 200/5 Amp.]

6. BUSHING:

The bushing shall conform to IS:5621-1980 and IS:2099-1986 and its subsequent amendment, if any, the bushing shall be of standard make. The make and catalogue No. of bushing shall be clearly stated in the guaranteed technical particulars. The type tests certificates of bushings not older than **seven years** shall also be furnished along with tender. The dimensions of 12 KV class bushings and their related parts shall conform to the relevant Indian Standards as detailed below:

Voltage class	Indian Standard	
12 KV bushing	For porcelain parts IS:3347 (Part-III) Sec.I-1972 or the latest version thereof	For metal parts IS:3347 (Part-III) Sec.II-1967).

The minimum electrical clearance of 255 mm between phases shall be obtained with the bushings mounted and phase to earth clearance should be maintained as specified in relevant IS/ Indian Electricity rules.

On the bushings clamp bolt of CT-PT Sets two holes on two bolts of size 2.5mm (total 12 holes on 12 bolts) at diagonally opposite sides be provided to enable metering wing to seal these bolts after successful testing in Meter Labs.

7. GUARANTEED TECHNICAL PARTICULARS, DRAWINGS AND QUALITY ASSURANCE PLAN:

Guaranteed Technical Particulars in the proforma enclosed with this specification shall be furnished along with the detailed general arrangement dimensional drawings mounting arrangements, connection diagrams and quality assurance plan etc. at the time of inspection offer.

8. INSTRUCTION MANUALS:

One set of operation and maintenance instruction manuals along with the requisite sets of drawings shall be sent along with the delivery of 11 KV CT PT unit to the consignee.

9. INSPECTION, TESTING AND CHECKING:

- i) Routine tests as per relevant standard along with accuracy test of CT as per IS:2705 (Pt-II)-1992 and that of PT IS:3156 (Pt.II)-1992 shall be carried out on each equipment covered by this specification in the presence of inspecting officer nominated by respective SE(M&P). All test reports shall be submitted and got approved from the respective S.E.(M&P) before despatch of the equipment.
- ii) The supplier shall simulate single phase condition in their laboratory for testing one 11 KV CT-PT set of any ratio from each lot offered for inspection under such condition for 24 hours. The errors of PT shall be measured before and after application of single phasing condition for at least 24 hours and results shall be within permissible limits of specified accuracy class. This test shall be done as acceptance test.
- iii) One CT-PT set of each ratio in each offered lot should be subjected to temperature rise test .The test shall be carried out simultaneously application of

rated current (1.2 lb) and rated voltage (12 KV) and also ISF test, at firm's works free of cost.

- iv) During routine/ acceptance test, errors for CTs shall be conducted at 1 %, 5%, 20%, 100% and 120% of rated current and in case of PT at 80%, 100% and 120% of rated voltage.
- v) Algebraic summation of errors of standard CTs/PTs to the errors observed on CTs/PTs under test should be made to get final errors on specified percentage current/ voltage/ burden. If class of accuracy of standard CT-PT is less than 10 times of the accuracy of CT-PT set under test.
- vi) Leak test :- One CT-PT set of each rating in each offered lot should be subjected to 'Leak Test' through Nitrogen gas for a pressure of 10 PSI (Pound sq. inch) for half an hour and pressure shall not drop more than 2 PSI. There should be no leakage observed at any part of CT-PT set.
- vii) One CT-PT set of each rating in each offered lot shall be opened for verifying the diameter and cross sectional area of primary coil conductors including verification of GTP.
- viii) One sample of oil shall be selected for each ratio and shall be tested for a) Break down voltage b) Tan delta at 90 Deg.C.

The oil supplied with CT PT set shall be of EHV grade Transformer oil suitable for insulation and coding of the electric transformers of extra high voltage and shall conform to IS 335 (with latest amendments)

If CT-PT set fails in any of the above tests/verification at works, entire lot shall be rejected.

During the inspection at firm's works, inspecting officer / agency shall provide polycarbonate seals on each CT-PT set as under -

- i) One polycarbonate seal on one side of the plate covering top & bottom holes.
- ii) Two polycarbonate seal at diagonally opposite corner of top cover of CT-PT set.

Further, it shall be ensured that all meters and instruments used during inspection/ testing are calibrated from NABL approved test house and date of calibration should not be older than one year at the date of presenting the same to the inspecting officer.

10. COMPLETENESS OF EQUIPMENT:

Any fittings, accessories or apparatus which may not have been specifically mentioned in the specification for 11 KV CT-PT metering sets covered under the scope of this enquiry-, but which are usual or necessary in the equipment of similar type shall be deemed to be included in the contract and shall be supplied by the contractor without

extra charges. All plants and equipment shall be complete in all respect whether such details are mentioned in the specification or not.

11. NAME PLATE AND MARKING:

- a) The equipment shall have a non detachable type name plate which should be clearly visible and effectively secured against removal having markings as per requirement of IS. In addition, Sr.No., Ratio and date of despatch shall have to be engraved on bushing side of tank with letters of suitable depth & 25 mm height filled with red colour.
- b) The- main and load are to be stencilled on top cover on main and load side respectively.
- c) Two additional identification plates of size 4'x4' duly welded on both sides smaller vertical faces of the tank of CT-PT set with the following details engraved may be provided:
 - i) Sr. No.
 - ii) Ratio
 - iii) Make
 - iv) TN No.

GUARANTEED AND OTHER TECHNICAL PARTICULARS FOR 11KV CT-PT SETS

(I) FOR 11 KV SINGLE PHASE CURRENT TRANSFORMERS

PARTICULARS				
NAME & ADDRESS OF MANUFACTURER.				
MANUFACTURER'S TYPE & DESIGNATION.				
NOMINAL SYSTEM VOLTAGE (KV rms)				
HIGHEST SYSTEM VOLTAGE (KV rms)				
INSULATION LEVEL :				
a) IMPULSE WITHSTAND VOLTAGE(KV PEAK)				
b) ONE MINUTE POWER FREQUENCY DRY WITHSTAND VOLTAGE (KV r.m.s)				
(i) PRIMARY(KV rms)				
(ii) SECONDARY (KV rms)				
a) ONE MINUTE POWER FREQUENCY WET WITHSTAND VOLTAGE (KV Peak)				
RATED FREQUENCY (Hz)				
TRANSFORMATION RATIO.				
RATED OUTPUT (VA BUDEN)				
CLASS OF ACCURACY.				
SHORT TIME THERMAL CURRENT FOR THREE SECOND.(KA rms)				
RATED DYNAMIC CURRENT (KA PEAK)				
RATED CONT. THERMAL CURRENT (KA rms)				
MAX. INSTRUMENT SECURITY FACTOR.				
DETAIL OF WINDINGS.				
PARTICULARS	CT RATIO	No. of Turns	Cross sectional Area of each Turn in Sq.mm (Aprox.)	Total weight of winding in Kg. per Unit
i) PRIMARY	200/5 A 100/5 A 50/5 A 15/5 A 5/5 A			
ii) SECONDARY	200/5 A 100/5 A 50/5 A 15/5 A 5/5 A			

GURANTEED RATIO ERROR (MAX.)	
GURANTEED PHASE ANGLE ERROR (MAX.)	
MAX. TEMP. RISE OF THE WINDING OVER AN AMBIENT TEMP. OF 50 DEG. C AT RATED CONTINUOUS THERMAL CURRENT, AT RATED FREQUENCY & WITH RATED BURDEN.	
i) INSULATION CLASS	
ii) INSULATION MATERIAL USED.	
CORE DETAILS:	
i) MATERIAL	
ii) WEIGHT OF CORE	
TYPE OF INSULATING OIL WHETHER AS PER IS-335 AND LATEST AMENDMENT.	
WHETHER SHORT CIRCULATING ARRANGMENT FOR CTs.	
BUSHING DETAIL	
a) MAKE	
b) CATALOGUE NO.	
c) TOTAL CREEPAGE DISTANCE (mm)	
d) IS TO WHICH BUSHING CONFORMS.	
e) ARCING DISTANCE (mm)	
f) MAX. CREEPAGE FACTOR.	
g) Type of Bushing (porcelain / Cycloaliphatic)	
WHETHER CURRENT TRANSFORMER USED ARE OF RESIN CAST OIL IMMERSED TYPE OR OTHERWISE.	
IS TO WHICH CT CONFORMS.	
MAKE OF TERMINAL CONNECTOR	

(II) FOR SINGLE PHASE POTENTIAL TRANSFORMERS

NAME & ADDRESS OF MANUFACTURER.	
MANUFACTURER'S TYPE & DESIGNATION.	
NOMINAL SYSTEM VOLTAGE (KV rms)	
HIGHEST SYSTEM VOLTAGE (KV rms)	
INSULATION LEVEL :	
a) IMPULSE WITHSTAND VOLTAGE(KV PEAK)	

b) ONE MINUTE POWER FREQUENCY WITHSTAND VOLTAGE (KV PEAK)			
RATED FREQUENCY (Hz)			
RATED TRANSFORMATION RATIO.			
RATED OUTPUT (VA BUDEN PER PHASE)			
CLASS OF ACCURACY.			
RATED VOLTAGE FACTOR AND TIME.			
WINDING CONNECTIONS			
a) PRIMARY			
b) SECONDARY			
DETAIL OF WINDINGS.			
PARTICULARS PT RATIO	NO.OF TURNS	CROSS SECTIONAL AREA OF EACH TURN IN SQ.MM.	TOTAL WEIGHT OF WDG. In Kg. (approx.)
i) PRIMARY WINDING (COPPER) 11 KV			
ii) SECONDARY WINDING (COPPER) 110 V			
GURANTEED RATIO ERROR (MAX.)			
GURANTEED PHASE ANGLE ERROR (MAX.)			
GURANTEED MAX. TEMP. RISE OF THE WINDING OVER AN AMBIENT TEMP. OF 50 DEG. C AT RATED CONTINUOUS THERMAL CURRENT, AT RATED FREQUENCY & WITH RATED BURDEN.			
BUSHING DETAIL			
a) MAKE			
b) CATALOGUE NO.			
c) TOTAL CREEPAGE DISTANCE (mm)			
b) IS TO WHICH BUSHING CONFORMS.			
e) ARCING DISTANCE (mm)			
f) MAX. CREEPAGE FACTOR.			
g) Type of Bushing (porcelain / Cycloaliphatic)			
i) INSULATION CLASS			
ii) INSULATION MATERIAL USED.			
CORE DETAILS:			
i) MATERIAL			
ii) WEIGHT OF CORE			
WHETHER ANY FUSE HAVE BEEN PROVIDED IN SECONDARY SIDE OF PT ?			

WHETHER NEUTRAL OF PT FOR HT SIDE IS ISOLATED/FLOATED ?	
III OTHER PARTICULARS FOR 11 KV COMPLETELY ASSEMBLED CT-PT SETS.	
PARTICULARS	
OVERALL DIMENSIONS OF CT-PT SET.	
MOUNTING DETAILS.	
i) TOTAL MASS OF COMPLETELY ASSEMBLED CT-PT SET WITH OIL.	
ii) MASS OF IST FILLING INSULATION OIL.	
iii) VOLUME OF OIL (LITRES)	
i) MATERIAL OF TANK/ENCLASURE SHEET.	
ii) THICKNESS OF THE TANK SHEET.(mm)	
a) BOTTOM.	
b) TOP COVER	
c) SIDES	
MAKE/MANUFACTURER'S NAME FOR INSULATING OIL TO BE USED IN CT-PT SETS.	
WHETHER ALL THE FITTINGS AND ACCESSORIES AS PER CLAUSE 3.06 OF SPECIFICATION PROVIDED ?	
WHETHER CT-PT SETS ARE SUITABLE FOR SATISFACTORY OPERATION OUNDER ABNORMAL SYSTEM CONDITION VIZ., SINGLE PHASING SUPPLY ARRANGEMENT BY LOOPING SUPPLY PHASE WITH OTHER LINE PHASE ?	
MIN. ELECTRICAL CLEARANCE BETWEEN PHASES. WITH BUSHINGS MOUNTED (MM)	
MIN. ELECTRICAL CLEARANCE BETWEEN PHASES. TO EARTH WITH BUSHING MOUNTED (MM) ?	
WHETHER OIL CONSERVATOR PROVIDED ON CT-PT SET ?	
ARRANGEMENT PROVIDED TO TAKE CARE OF EXPANSION AND CONTRACTION IN OIL.	
WHETHER PRESSURE RELIEF DEVICE PROVIDED ?	
TEST RESULTS OF OIL AS PER IS : 335	

BREAK DOWN VOLTAGE	
TAN DELTA AT 90 DEG. C	
COLOUR OF OIL (SHALL BE COLOURLESS)	

Part -B**B. TECHNICAL SPECIFICATION OF 33 KV CT-PT METERING SETS****1. SCOPE:**

This specification covers the design, manufacture, assembly, testing and delivery of three phase four wire 33 KV/110V oil cooled outdoor type combined CTPT units for metering purpose having one No. three phase potential transformers and 3 Nos. single phase paper impregnated oil immersed current transformers for different phases in common tank equipped with weather proof bushing for outdoor use as per technical data incorporated in this specification.

2. APPLICABLE STANDARDS:

Unless otherwise modified in this specification, the 33 KV CTPT Metering Sets shall comply with the following Indian Standard Specification (latest version):

IS:2705-1992	Specification for current transformers.
IS:3156-1992	Specification for voltage transformers.
IS:5621-1980	Specification for Insulators/Bushings
IS:2099-1986	Specification for insulators/ bushing
IS:3347-1986	Specification for Insulators/Bushings
IS:335-1983	Specification for new insulating oil
IS :5561	Specification for Insulators/Bushings

Equipments conforming to any other international standard(s) which ensure(s) equal or better quality than the standard(s) mentioned above will also be acceptable and in such case(s) the copy of standards (English version) adopted should be provided.

3. 33 KV CTPT Metering Sets:

A) 33 KV Single Phase Current Transformer (3 Nos. for R, Y & B phases).

The 33 KV current Transformer shall be paper impregnate oil immersed type, single phase 50 HZ confirming to IS:2705/1992 with latest amendment in all respect except where ever modified in this specification.

The 33 KV current Transformer shall have the following technical characteristics/ parameters.

Sr.No	Particulars	Parameters
i)	Normal system voltage (KV rms)	33
ii)	Highest system voltage (KV rms)	36
iii)	Frequency	50 Hz
iv)	Impulse withstand voltage (KVP) (on assembled CTPT set)	170
v)	i) One minute power frequency dry withstand voltage (on assembled CT- PT set) a) primary (KV r.m.s.) b) secondary (KV r.m.s.) ii) One minute frequency wet withstand voltage (KV Peak) (On assembled CT-PT set)	70 3 Root 2x70 Rms
vi)	Transformation ratio (CT Ratio)	200/5 A, 150/5 A, 100/5 A, 50/5 A & 25/5 A
vii)	Rated output (VA burden)	15 VA
viii)	Class of accuracy	0.5S
ix)	Rated continuous thermal current	1.2 times of rated primary current.
x)	Short time thermal current	18 KA for one second for CT ratio 100/5 A, 50/5 A & 25/5 A. 18 KA for 3 seconds for CT ratio 150/5 A & 200/5 A
xi)	Rated dynamic current	2.5 times of short time thermal current rating.
xii)	Number of cores	One
xii)	Instrument security factor	Not exceeding 5
xiii)	Max. ratio error	As per IS:2705/ 1992
xiv)	Max. phase angle error	As per IS:2705/ 1992
xv)	Max. temp. rise over max. ambient temp. of 50 deg. C at rated continuous thermal current at rated frequency and with rated burden.	As per IS:2705/ 1992

B) 33 KV Voltage Transformers:

33 KV voltage Transformers will be used along with CTs of description stated above. These shall be paper impregnate oil immersed type conforming in all respect to

the Indian Standards specification IS:3156/1992 with latest amendment except where modified in this specification.

The 33 KV voltage transformer shall have the following ratings/ technical parameters:

Sr.No	Particulars	Parameters
i)	Nominal system voltage (KV rms)	33
ii)	Highest system voltage (KV rms)	36
iii)	Nos. of phases	three
iv)	Impulse withstand voltage (KVP) (on assembled CTPT set)	170
v)	i) One minute power frequency dry withstand voltage (on assembled CT-PT set) a) primary (KV r.m.s.) b) secondary (KV r.m.s.) b) One minute frequency wet withstand voltage (KV Peak) (On assembled CT-PT set)	70 3 Root 2x70 rms
vi)	Frequency	50 Hz
vii)	Transformation ratio (PT Ratio)	33 KV/ 110V
viii)	Rated output (VA burden)	30 VA per phase
ix)	Class of accuracy	0.5 (As per IS :3156/1992)
x)	Winding connection	Star/Star
xi)	Rated voltage factor and time	1.2 continuous and 1.9 for 30 secs.
xii)	Temp.rise over max. ambient temp.	Within limits of IS :3156/1992
xiii)	Max. Phase angle error	Within limits of IS :3156/1992
xiv)	Ratio error (Max.)	Within limits of IS :3156/1992

4. GENERAL TECHNICAL DESCRIPTION OF 33 KVCT-PT METERING SETS:

- i) The CT PT Metering set shall comply to the latest standards mentioned in the specification and guaranteed technical particulars.

- ii) High voltage winding of 33 KV instrument transformers shall have paper insulation impregnated with oil under vacuum. The paper used for insulation shall be of high insulation grade. The process of impregnation shall be detailed out.
- iii) The core material of CT-PT sets shall be of high grade, non-ageing, electrical silicon steel having low hysteresis loss and high permeability to ensure accuracy at both normal and over current/ voltage.
- iv) The instrument transformers shall be contained in a fully weather proof, outdoor type, platform mounting and also suitable for pole mounting type tank with 6 Nos. of 36 KV class weather proof bushing for incoming and outgoing connections.
- v) The thickness of MS sheet used for fabrication of tank shall be min. 3.15 mm for sides and bottom and 5 mm for top cover.
- vi) The external surfaces of tanks of CT-PT sets shall be painted with one coat of primer and two coats of synthetic enamel paint of shade No.631 of IS:5. The internal surfaces of the tank shall be painted with two coats of a suitable heat resistant oil insoluble paint.
- vii) The metering sets shall be supplied with first filling of insulating oil conforming to IS:335 (including latest amendment).
- viii) The bushings used in the CT-PT sets shall conform to IS:2099, IS:5621 and IS:3347 (latest amendments). These shall be suitable for operation in heavily polluted atmosphere with Creepage distance of 25 MM/KV.
- ix) The minimum clearance between phases and phase to earth as specified in the relevant ISS should be maintained.
- x) The paper impregnated oil immersed type instrument transformers shall be complete with all fittings and accessories.
- xi) The 33 KV CT-PT sets shall be hermetically sealed type (should not communicate with atmospheric air) in construction without any oil conservator. The quality and work-man-ship shall be of high standard.
- xii) CT-PT sets shall be used for 3 phase 4 wire KWH metering,, as such 33 KV CT PT sets shall have 3 Nos. CTs .
- xiii) The 33 KV CT PT sets shall have one No. of Three Phase Potential Transformer. The primary winding of PT shall be connected in star formation in the tank with isolated neutral.

- xiv) The neutral of primary PT winding shall be floating. The neutral of PT Secondary winding shall be earthed.
- xv) The secondary winding neutral of PT and secondary terminals of CTs and PTs shall be brought out in one single secondary terminal box through 3 KV bushings. The terminals shall be marked as per ISS and supporting marking plate with earth terminal shall be provided. The secondary terminal box compartment shall be divided in two portions - One portion containing secondary of all CTs and the other portion shall contain all secondary PT connections with neutral and one body earthed. The whole compartment shall be covered by one bolted cover with sealing arrangement. At least two bolts at diagonally opposite corners of secondary terminal box shall be suitable for sealing arrangement. All other bolted covers and inspection windows covers, where provided shall also have sealing bolts for sealing purpose. Suitably shorting links shall be provided for individual CT shorting and PT secondary neutral.
- xvi) The secondary terminal box shall have cable gland/ flange suitable to receive two Nos. control cable of size 6 core x 4 sq.mm & 4 core X 2.5 sq. mm at the bottom of the secondary box for metering connections to secondary winding of 33 KV CT-PT circuits respectively.
- xvii) The 33 KV CT PT Set shall have 3 Nos. incoming and 3 Nos. outgoing outdoor type bushing. 33 KV CT-PT Sets shall have 6 Nos. bimetallic terminal connectors suitable for DOG/PANTHER conductor. These should be type tested from CPRI/ NABL accredited Labs and reports should not be older than **7 years** for Short Circuit Test. Inspecting officer shall verify the original type test reports at the time of inspection for terminal connectors & bushings.
- xviii) No oil drain plug at the bottom of the CT-PT Sets be provided.
- xix) Embossing/ punching with minimum height of 10mm of Sr.No., ratio & TN No. be done on the tank of the CT-PT Sets.
- xx) Manufacturer's name in short should be embossed/ punched.
- xxi) CT Ratio should be painted on tank body so that it should be visible clearly.
- xxii) The under base of CT-PT Sets shall be provided with 2 Nos. 100x50x6mm channels as shown in the figures at Annexure-I to make them suitable for fixing to a platform or plinth. These channels shall be provided through continuous welding with tank of the CT-PT Sets.

- xxiii) The HV metal parts (Primary Terminals) shall be of 16 mm dia and made of copper. The primary terminal shall be along the entire length of bushing.
- xxiv) The following sealing arrangement for providing seals on each 33 KV CT-PT set shall be made by the manufacturer.
 - i) 4 Nos. holes of 2.5 mm dia on each bushing clamp bolts of 6 nos. HT bushings for providing two polycarbonate seals at diagonally opposite bolts of each bushing clamp in M&P lab after successful testing as required.
 - ii) 4 Nos. holes of 2.5 mm dia on the bolts provided at four corners of top cover for providing two polycarbonate seals at diagonally opposite corner of CT-PT set by the inspecting officer after successful testing and providing polycarbonate seals in M&P lab after successful testing as required.
 - iii) 4 nos. sealing holes on the name plate (R&D plate so that our inspecting officer may provide numbered seal on one side of the plate covering top & bottom holes whereas on the remaining two holes of other side, the one numbered seal will be provided by MT Lab after successful testing.

5. FITTING AND ACCESSORIES:

The outdoor platform/ pole mounting type CT-PT metering sets shall be complete with tank, fittings, accessories as detailed below :

- 1 No. Electrically welded sheet steel tank/ enclosure for accommodating above instrument transformers with suitable bolted cover.
- 6 Nos. Outdoor single terminal **porcelain / Cycloaliphatic** bushing of reputed make without arcing horns. 3 Nos. for incoming and 3 Nos. for outgoing.
- 1 No. Secondary terminal box. The terminal box opening door/cover shall have suitable sealing arrangement. The necessary gland/ socket shall be in the scope of supply.
- 1 No. Oil filling hole with cap/plug.
- 1 No. Toughened prismatic oil level indicator with min. oil level marking
- 2 No. Lifting lugs for lifting the complete CT-PT unit.
- 2 Nos. Earthing terminals.
- 1 Set Under base channels with suitable fixing holes for mounting on plat-form/poles.
- 1 Set Detachable rollar assembly.

1 No. Rating and diagram plate.

6 Nos. Bimetallic Terminal Connectors suitable for Dog/ Panther conductor.

6. BUSHING:

The bushing shall conform to IS:5621-1980 and IS:2099-1986 and its subsequent amendment, if any, the bushing shall be of standard make. The make and catalogue No. of bushing shall be clearly stated in the guaranteed technical particulars. The dimensions of 33 KV class bushings and their related parts for 33 KV CT-PT sets shall conform to the relevant Indian Standards as detailed below:

Voltage class	Indian Standard	
36 KV bushing	For porcelain parts IS:3347 (Part-V) Sec.I-1973 or the latest version thereof	For metal parts IS:3347 (Part-III) Sec.II-1967).

The minimum electrical clearance of 400 mm for 33KV sets between phases shall be obtained with the bushings mounted and phase to earth clearance should be maintained as specified in relevant IS/ Indian Electricity rules.

7. GUARANTEED TECHNICAL PARTICULARS, DRAWINGS AND QUALITY ASSURANCE PLAN:

Guaranteed Technical Particulars in the proforma enclosed with this specification shall be furnished along with the detailed general arrangement dimensional drawings mounting arrangements, connection diagrams and quality assurance plan etc.

8. INSTRUCTION MANUALS:

The successful tenders shall have to supply required number of operation and maintenance instruction manuals along with the requisite sets of approved drawings of the equipments covered under this specification. One set of above manuals and drawings shall also be sent along with the delivery of each 33 KV unit to the consignee.

9. INSPECTION, TESTING AND CHECKING:

- i) Routine tests as per relevant standard along with accuracy test of CT as per IS:2705 (Pt-II)-1992 and that of PT IS:3156 (Pt.II)-1992 shall be carried out on each equipment covered by this specification in the presence of inspecting officer. All test reports shall be submitted and got approved from the SE(M&P) before despatch of the equipment.

- ii) The supplier shall simulate single phase condition in their laboratory for testing one 33 KV CT-PT set of any ratio from each lot offered for inspection under such condition for 24 hours. The errors of PT shall be measured before and after application of single phasing condition for at least 24 hours and results shall be within permissible limits of specified accuracy class. This test shall be done as acceptance test.
- iii) One CT-PT set of each rating in each offered lot should be subjected to temperature rise test .The test shall be carried out simultaneously application of rated current (1.2 lb) and rated voltage (36 KV) and also ISF test, at firm's works free of cost.
- iv) During routine/ acceptance test, errors for CTs shall be conducted at 1%, 5%, 20%, 100% and 120% of rated current and in case of PT at 80%, 100% and 120% of rated voltage.
- v) Algebraic summation of errors of standard CTs/PTs to the errors observed on CTs/PTs under test should be made to get final errors on specified percentage current/ voltage/ burden if class of accuracy of standard CT-PT is less than 10 times of the accuracy of CT-PT set under test.
- vi) Leak test :- One CT-PT set of each rating in each offered lot should be subjected to 'Leak Test' through Nitrogen gas for a pressure of 10 PSI (Pound sq. inch) for half an hour and pressure shall not drop more than 2 PSI. There should be no leakage observed at any part of CT-PT set.
- vii) One CT-PT set of each rating in each offered lot shall be opened for verifying the diameter and cross sectional area of primary coil conductors of CT including verification of GTP.
- viii) One sample of oil shall be taken from each ratio in each lot and shall be tested for a) Break down voltage b) Tan delta at 90 Deg.C.

The oil supplied with CT PT set shall be of EHV grade Transformer oil suitable for insulation and coding of the electric transformers of extra high voltage and shall conform to IS 335 (with latest amendments)

If CT-PT set fails in any of the above tests/verification at works, entire lot shall be rejected.

During the inspection at firm's works, inspecting officer / agency shall provide polycarbonate seals on each CT-PT set as under -

- i) One polycarbonate seal on one side of the plate covering top & bottom holes.
- ii) Two polycarbonate seal at diagonally opposite corner of top cover of CT-PT set.

Further, it shall be ensured that all meters and instruments used during inspection/ testing are calibrated from NABL approved test house and date of calibration should not be older than one year at the date of presenting the same to the inspecting officer.

10. COMPLETENESS OF EQUIPMENT:

Any fittings, accessories or apparatus which may not have been specifically mentioned in the specification for 33 KV metering sets covered under the scope of this enquiry, but which are usual or necessary in the equipment of similar type shall be deemed to be included in the contract and shall be supplied by the contractor without extra charges. All plants and equipment shall be complete in all respect whether such details are mentioned in the specification or not.

11. NAME PLATE AND MARKING:

- a) The equipment shall have a non detachable type name plate which should be clearly visible and effectively secured against removal having markings as per requirement of IS. In addition, Sr. No., Ratio and date of despatch shall have to be engraved on bushing side of tank with letters of suitable depth & 25 mm height filled with red colour.
- b) The main and load are to be stencilled on top cover on main and load side respectively.
- c) A sticker reading as under must be provided in the HV neutral compartment of secondary box.
- d) Two additional identification plates of size 4'x4' duly welded on both sides smaller vertical faces of the tank of CT-PT set with the following details engraved may be provided:
 - i) Sr. No.
 - ii) Ratio
 - iii) Make
 - iv) TN No.

"DO NOT REMOVE EARTH LINK WHEN HV TERMINAL IS LIVE" be given in Red colour.

GUARANTEED AND OTHER TECHNICAL PARTICULARS FOR 33 KV CT-PT SETS**(I) FOR 33 KV SINGLE PHASE CURRENT TRANSFORMERS**

S.No	PARTICULARS		TO BE FURNISHED BY BIDDER		
1	NAME & ADDRESS OF MANUFACTURER.				
2	MANUFACTURER'S TYPE & DESIGN				
3	NOMINAL SYSTEM VOLTAGE (KV rms)				
4	HIGHEST SYSTEM VOLTAGE (KV rms)				
5	INSULATION LEVEL :				
	a) IMPULSE WITHSTAND VOLTAGE (KV PEAK)				
	b) ONE MINUTE POWER FREQUENCY DRY WITHSTAND VOLTAGE (KVrms)				
	(i) PRIMARY(KVrms)				
	(ii) SECONDARY (KVrms)				
	c) ONE MINUTE POWER FREQUENCY WET WITHSTAND VOLTAGE (KVrms)				
6	RATED FREQUENCY (Hz)				
7	TRANSFORMATION RATIO.				
8	RATED OUTPUT (VA BURDEN)				
9	CLASS OF ACCURACY.				
10	SHORT TIME THERMAL CURRENT FOR ONE SECOND (KA rms)				
11	RATED DYNAMIC CURRENT (KApeak)				
12	RATED CONT. THERMAL CURRENT (KA rms)				
13	MAX. INSTRUMENT SECURITY FACTOR.				
14	DETAIL OF WINDINGS.				
	PARTICULARS	CT RATIO	NO.OF TURNS	CROSS SECTIONAL AREA OF EACH TURN IN SQ.MM. (Approx.)	TOTAL WEIGHT OF WDG. IN Kg. PER UNIT
	i) PRIMARY	200/5 A			
		150/5 A			
		100/5 A			

		50/5 A			
		25/5 A			
	ii) SECONDARY	200/5 A			
		150/5 A			
		100/5 A			
		50/5 A			
		25/5 A			
15	GUARANTEED RATIO ERROR (MAX.)				
16	GUARANTEED PHASE ANGLE ERROR (MAX.)				
17	MAX. TEMP. RISE OF THE WINDING OVER AN AMBIENT TEMP. OF 50 DEG. C AT RATED CONTINUOUS THERMAL CURRENT AT RATED FREQUENCY & WITH RATED BURDEN.				
18	i) INSULATION CLASS				
	ii) INSULATION MATERIAL USED.				
19	CORE DETAILS:				
	i) MATERIAL				
	ii) WEIGHT OF CORE				
20	TYPE OF INSULATING OIL WHETHER AS PER IS-335 AND LATEST AMENDMENT.				
21	WHETHER SHORT CIRCULATING ARRANGMENT FOR CTs IS AS PER SPECIFICATION.				
22	BUSHING DETAIL				
	a) MAKE				
	b) CATALOGUE NO.				
	c) TOTAL CREEPAGE DISTANCE (mm)				
	d) IS TO WHICH BUSHING CONFORMS.				
	e) ARCING DISTANCE (mm)				
	f) MAX. CREEPAGE FACTOR.				
	g) Type of Bushing (porcelain / Cycloaliphatic)				
23	WHETHER CURRENT TRANSFORMER USED ARE OF RESIN CAST OIL IMMersed TYPE OR OTHERWISE.				

24	IS TO WHICH CT CONFORMS.	
25	MAKE OF TERMINAL CONNECTORS.	

(II) FOR 33 KV THREE PHASE POTENTIAL TRANSFORMERS

S.No.	PARTICULARS	TO BE FURNISHED BY BIDDER			
		PT Ratio	No. of Turns	Cross-Sectional Area of Each (Sq.mm)	Total Wt. of winding in KG (Approx.)
1	NAME & ADDRESS OF MANUFACTURER.				
2	MANUFACTURER'S TYPE & DESIGN.				
3	NOMINAL SYSTEM VOLTAGE (KV rms)				
4	HIGHEST SYSTEM VOLTAGE (KV rms)				
5	INSULATION LEVEL :				
	a) IMPULSE WITHSTAND VOLTAGE(KV PEAK)				
	b) ONE MINUTE POWER FREQUENCY WITHSTAND VOLTAGE (KV PEAK)				
6	RATED FREQUENCY (Hz)				
7	RATED TRANSFORMATION RATIO.				
8	RATED OUTPUT (VA BURDEN PER PHASE)				
9	CLASS OF ACCURACY.				
10	RATED VOLTAGE FACTOR AND TIME.				
11	WINDING CONNECTIONS				
	a) PRIMARY				
	b) SECONDARY				
12	DETAIL OF WINDINGS.				
	Particulars	PT Ratio	No. of Turns	Cross-Sectional Area of Each (Sq.mm)	Total Wt. of winding in KG (Approx.)
	i) PRIMARY WINDING (COPPER).				
	ii) SECONDARY WINDING (COPPER). 110 V				
13	GURANTEED RATIO ERROR (MAX.)				

14	GURANTEED PHASE ANGLE ERROR (MAX.)	
15	GURANTEED MAX. TEMP. RISE OF THE WINDING OVER AN AMBIENT TEMP. OF 50 DEG. C AT RATED CONTINOUS THERMAL CURRENT, AT RATED FREQUENCY & WITH RATED BURDEN.	
16	BUSHING DETAIL	
	a) MAKE	
	b) CATALOGUE NO.	
	c) TOTAL CREEPAGE DISTANCE (mm)	
	d) IS TO WHICH BUSHING CONFIRMS.	
	e) ARCING DISTANCE (mm)	
	f) MAX. CREEPAGE FACTOR.	
	g) Type of Bushing (porcelain / Cycloaliphatic)	
17	i) INSULATION CLASS	
	ii) INSULATION MATERIAL USED.	
18	CORE DETAILS:	
	i) MATERIAL	
	ii) WEIGHT OF CORE	
19	WHETHER ANY FUSE HAVE BEEN PROVIDED IN SECONDARY SIDE OF PT ?	
20	WHETHER NEUTRAL OF PT FOR HT SIDE IS ISOLATED/FLOATED ?	

(III) OTHER PARTICULARS FOR 33 KV COMPLETELY ASSEMBLED CT-PT SETS.

S. No	PARTICULARS	TO BE FURNISHED BY BIDDER
1	NAME & ADDRESS OF MANUFACTURER.	
2	OVERALL DIMENSIONS OF CT-PT SET.	
3	MOUNTING DETAILS.	
4	i) TOTAL MASS OF COMPLETELY ASSEMBLED CT-PT SET WITH OIL.	
	ii) MASS OF IST FILLING INSULATION OIL.	
	iii) VOLUME OF OIL (LITRES)	
5	i) MATERIAL OF TANK/ENCLASURE SHEET.	
	ii) THICKNESS OF THE TANK SHEET.(mm)	

	a) BOTTOM.	
	b) TOP COVER	
	c) SIDES	
6	MAKE/MANUFACTURER'S NAME FOR INSULATING OIL TO BE USED IN CT-PT SETS.	
7	WHETHER ALL THE FITTINGS AND ACCESSORIES AS PER CLAUSE 3.06 OF SPECIFICATION PROVIDED?	
8	WHETHER SEALING ARRANGEMENT IS AS PER CL.3.05 XXV OF SPECIFICATION	
9	WHETHER CT-PT SETS ARE SUITABLE FOR SATISFACTORY OPERATION UNDER ABNORMAL SYSTEM CONDITION VIZ., SINGLE PHASING SUPPLY ARRANGEMENT BY LOOPING SUPPLY PHASE WITH OTHER LINE PHASE ?	
10	MIN. ELECTRICAL CLEARANCE BETWEEN PHASES. WITH BUSHINGS MOUNTED (MM)	
11	MIN. ELECTRICAL CLEARANCE BETWEEN PHASES. TO EARTH WITH BUSHING MOUNTED (MM)?	
12	WHETHER OIL CONSERVATOR PROVIDED ON CT-PT SET?	
13	ARRANGEMENT PROVIDED TO TAKE CARE OF EXPANSION AND CONTRACTION IN OIL.	
14	WHETHER PRESSURE RELIEF DEVICE PROVIDED?	
15	TEST RESULTS OF OIL AS PER IS : 335	
a)	BREAK DOWN VOLTAGE	
b)	TAN DELTA AT 90 DEG. C	
c)	COLOUR OF OIL (SHALL BE COLOURLESS)	