SUPPLY CHAIN MANAGEMENT

THIRUVANANTHAPURAM

SPECIFICATION

11 KV CTPT OUTDOOR UNIT FOR BORDER METERING

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(ii) Amendments and History

Sec. #	*Rev. #*	*Date*	*History of Change*

1. Purpose

Purpose of this document is to document updates & history, upkeep and publish the specifications related to **11 KV CTPT OUTDOOR UNIT FOR BORDER METERING** in a professional manner.

2. Scope

The Scope of this document is to inform and alert all relevant stakeholders including KSEBL, Public, KSERC etc regarding the current specifications and historical changes adopted in specifications of **11_KV CTPT OUTDOOR UNIT FOR BORDER METERING** used in field by KSEBL.

3. Responsibility

Executive Engineer (D), Office of Chief Engineer, Supply Chain Management shall compile and take necessary steps to publish the specification in KSEBL website and shall inform relevant stakeholders regarding updates and revisions.

4. Procedure For Revision

Modifications if any, in the technical Specification will be incorporated as **Revisions** . Any changes in values, minor corrections in pages, incorporation of small details etc. will be considered as Minor Modification. **The Revisions due to minor modifications will be assigned as Rev No. 0.1, 0.2 etc .**

A complete updation of the technical specification will be considered as Major modification. **The Revisions due to major modifications will be assigned as Rev No. 1.0, 2.0 etc .**

All the details regarding the revisions (both minor and major) will be incorporated in "**(ii)-Amendments and history "** above.

The concerned officers, in consultation with the Technical Committee will review and suggest changes required and the revision suggestion will be approved by **Chief Engineer- SCM.** Those who notice any discrepancy or have any suggestion regarding revision , may bring the matter to the attention of Chief Engineer -SCM in writing or through e-mail id: **cescm@kseb.in**

CONTENTS

TECHNICAL SPECIFICATION FOR 11 KV CTPT OUTDOOR UNIT FOR BORDER METERING

1.0) SCOPE:- This specification covers the design, manufacture, assembly, testing and supply of 11KV oil filled, copper wound metering equipment (combined CT-PT unit) for metering purpose comprising of one number three phase oil cooled Potential Transformer and three numbers single phase oil immersed Current Transformer to suit the requirement of 11 KV three phase four wire system of metering.

2.0) STANDARD:- Except where modified by this specification the CTs. and PTs. of the Metering sets shall comply with the requirements of following standards of latest issue.

IS: 2705-1992 - Specification for Current Transformers

IS: 3156-1992 - Specification for Potential Transformers

IS: 3347-1986 - Specification for Insulator/ Bushing

IS: 2099-1986 - Specification for Insulator/ Bushing

IS: 5621-1980 - Specification for hollow bushings.

IS: 335-1986 - Specification for new insulating oil

IS : 5 - Painting

IS: 10601 - Primary Terminals

IS: 5561 - Specification for Terminal Connector

3.0) SERVICE CONDITIONS:- The metering equipment to be supplied against this specification shall be suitable for satisfactory continuous operation under the following tropical conditions:

3.1) **Environmental Conditions:-**

Maximum temperature of air in shade : 40^{o}C

Minimum temperature of air in shade : 15^{o}C

Maximum Relative Humidity : 100%

Average days of thunder storm day per annum : 50

Average Number of raining days per annum : 90

Average Annual rainfall : 3000mm

Maximum Wind load : 130kgt/m^2

Altitude not exceeding : 0-1000Meter above MSL

4.0) PRINCIPAL PARAMETERS:- 11KV combined CT/PT Metering Equipment units shall be suitable for 50 Hz frequency & for service under the system conditions having frequency fluctuations of +/- 5% and voltage

fluctuation of + 10% to -30%. The 11 KV oil immersed combined CT/PT (metering equipment) units shall be hermetically sealed and suitable for service under the system conditions as per following specific parameters:

Sl.No.	Particulars	Parameters
1)	Type of installation	Outdoor
2)	System frequency	50 Hz ±5%
3)	Normal System Voltage	11KV
4)	Highest System Voltage for substantially long period	12KV
5)	System voltage fluctuations	+10% to -30%.
6)	System earthing	Solidly grounded

5.0) ESSENTIAL COMPONENTS:- Each CT PT metering Unit shall comprise of the following.

5.1) **STEEL TANK**:-

a) The oil filled container incorporating the voltage transformers and current transformers should be fitted with incoming and outgoing primary terminals and secondary terminal box. The secondary terminal box shall be arranged on sides. The general arrangement drawing with 3 bushing on the incoming side and 3 bushings on the outgoing side shall be submitted along with tender. The over all tank should be rectangular cubicle.

b) The tank shall be built with a plate of 5 mm thick top and 3.15 mm sides and bottom and. All fittings shall be capable of withstanding without leakage or distortion at the standard test pressure. All joints of the tank and fittings shall be hot oil tight and no leakage should occur during service. Both side of the joint should have continuous welding.

c) It shall be provided with an oil gauge (prismatic). The oil gauge glass shall be fixed to the side wall of the main tank (preferably round in shape). The tank shall be provided with necessary lifting lugs.

d) The external surface of the tank of CT-PT unit shall be painted with one coat of thermosetting powder paint or one coat of zinc chromate primer followed by two coats of synthetic enamel/polyurethane base paint. These paints can be either air drying or staving. For inside surface, heat resistant paint (hot oil proof) shall be used. The colour of the finishing coats shall be dark admiral gray conforming to N0.632 of IS-5 of 2007.

e) The secondary terminal box cover, tank cover and other vertical joints where gaskets are used **shall be suitably bent at least 25 mm bent**. This is to safeguard against seepage of water into tank in case of damaged gasket. The secondary terminal box cover is provided with necessary sealing arrangement with sealing bolts at all corners and bolts should be at least 8 mm diameter GI bolts spaced maximum 70 mm apart.

f) The 6 mm gaskets of high quality shall be dovetailed/without joints to prevent moisture entry. In case of dovetailed joint, they shall not be more than two joints.

g) It should be fitted with two nos. base channel 75 x 40 x 5 mm size across the width of the tank for mounting on double pole structure.

h) The internal surface of the tank shall be given a coating of Zinc chrome which shall not cause any chemical reactions with the Insulating oil, deteriorate the insulating properties of oil. Suitable arrangement shall be provided with the metering equipment to facilitate expansion and contraction of oil due to changes in temperature. The extra oil space is to be provided by giving proper shape of the top cover with central portion projected outside and side sloping. The top cover is bolted with the tank with minimum 6 mm thick cork sheet bonded with resistant nitrile / neoprene gasket of best quality.

i) The tank body shall be welded with 2 No Lifting lugs of adequate strength at suitable diagonal locations for balanced lifting of the tank. In all the four corners 6 mm holes one each at the corner of tank flange and on top cover flange are to be provided so as to match each other. The same shall be sealed by bolts with sealing holes, sealing wire and tablet after testing the equipment by KSEB Ltd

representatives. All the welded joints in the tank should be leak proof and pressure tested at 1 Kg./cm^2 for 30 minutes.

J) Deleted.

k Spring loaded pressure release device shall be provided on CT-PT unit for releasing of accumulated gases

l) The tank shall be reinforced by welded angle of size 25 x 25 x 3mm on the entire outside wall on the edge of the tank to form two equal compartments. One face of reinforcement angle should be continuous welded with the tank surface such that other side of the angle forms inverted "L".

m) The connection between the CT and PT inside the metering equipment shall have adequate clearance and reinforced insulation to avoid flashover between the two, inside the unit.

n) Adequate electrostatic & electromagnetic shielding should be provided to eliminate the effect of electro magnetic induction / electrostatic charge between the C.T and the P.T secondary windings. The minimum electrical clearance between phases and phase to earth as specified in the IS shall be maintained.

o) The windings of instrument Transformers shall be oil-cooled type. The **paper** used for insulation shall be of high insulation grade. The Insulating materials for winding between HV and LV & between interlayer of the winding and for end turn shall be as per relevant I.S. However, end turns have to be provided with reinforced insulation and lead connecting the bushing shall be provided with extra insulation.

p) The tank top cover shall have a slope of sufficient angle to avoid stagnation of rain water.

q) The following details of equipment shall be engraved on tank with at least 10 mm letters.

1. Make
2. Ratio
3. Class of accuracy
4. Serial No:
5. Month & year of manufacturing.

r) The top cover of the metering set is to be linked through copper strip loop at side with main tank (this is for earthing purpose of top cover). 3 numbers bushing on incoming & outgoing terminals with MA, MB & MC (for incoming) and LA, LB & LC (for outgoing) marking are to be provided. The secondary terminals are to be marked with 1S1-1S2-1S3, 2S1-2S2-2S3 & 3S1-3S2-3S3 with CT ratio for CT terminals and a, b, c & n for PT terminals.

s) EARTHING: Two earthing terminals shall be provided with adequate size protected against corrosion, metallically clean and identifiable by means of the sign marked in a legible and indelible manner on or adjacent to the terminals.

t) All bolts should be provided with 2 flat washers and a spring washer with a nut.

5.2) **CURRENT TRANSFORMER**:- Three nos. copper wound C.T. of specified ratio are to be properly fitted within the tank of the metering equipment on 'R' phase, 'Y' phase and 'B' phase. The C.T. secondary winding will have suitable insulation cover. The primary winding shall be of adequate cross-section to carry continuously the rated current plus 20% overload.

5.2.1. The conductor in the secondary winding of the CT shall not be less than 14 SWG/3.24 sq.mm.

5.2.2. Normal current density shall not be more than 1.5 Amps/ sq.mm. in primary winding of the CT.

5.2.3. The primary winding shall be of adequate cross-section to carry continuously the rated current plus 20% overload and should have short time current rating.

5.2.4. Provision for changing the ratio of the CTs. by tappings on the secondary windings shall be made outside the tank so as to be easily accessible.

5.2.5. The 11 KV Current Transformers shall have the following technical characteristics/parameters: -

1	Nominal system voltage (kV rms)	11
2	Highest system voltage 9kV rms)	12
3	Frequency	50 Hz
4	Transformation ratio (CT Ratio)	400-200/5 A
5	Rated output (VA Burden)	10 VA
6	System neutral earthing	Effectively earthed
7	Class of accuracy	0.5S
8	Rated continuous thermal current	1.2 times of rated primary current
9	Short time thermal current rating	25 kA for 1 second
9a	Rated dynamic withstand current (kAp)	62.5 kA
10	Rated dynamic current rating	2.5 times of short time thermal current rating
11	Instrument security factor	<5
12	All other characteristics and test parameter	As per IS: 2705/1972 (latest version)
13	Maximum temperature rise over ambient temp of 50 deg C at rated continuous thermal current at rated frequency, rated bush	55 deg C
14	Rated insulation level	
A	1.2/50 microsecond impulse withstand voltage (kVpeak)	75
B	One minute power dry frequency withstand voltage (kV rms) on primary winding on assembled CT PT unit	28
15	One minute power dry frequency withstand voltage kV rms) on secondary winding on assembled CTPT unit	3
16	Overvoltage interturn test	As per clause 7.5 of IS: 2705, Part I
17	Creepage distance total – mm	300
18	Type of insulation	Class A (in oil)
19	Installation	Outdoor

5.3 POTENTIAL TRANSFORMER:- The metering equipment shall contain one No. three phase copper wound potential transformer connected in star with the HV neutral floating. The primary winding has to be designed

for unearthed neutral i.e., for the highest voltage of 12 KV. PT winding should have uniform insulation throughout from live terminal to neutral end, and not the graded insulation. The 11 KV metering unit should be suitably designed for with-standing the unbalanced voltages developed due to single phasing operation during load regulatory measures in 11KV distribution system. It should be capable of withstanding the disturbance of back e.m.f., magnetic characteristic and consequential mechanical inter-play of forces, if any, under such single phasing. **Secondary winding of PT should be three phase star connected with neutral brought out**. On secondary side of PT four terminals shall be marked as a, b, c and n. **PT fuses are to be provided on the secondary side**.

The11KV potential transformers shall have the following technical characteristics/ parameters:

1	Nominal system voltage (kV rms)	11
2	Highest system voltage 9kV rms)	12
3	Frequency	50 Hz
4	Transformation ration of PT	11000/110v
5	Rated output (VA burden)	25 VA per phase
6	Winding connection	Star/Star with floating neutral
7	Number of phases	Three
8	Class of accuracy	0.5
9	All other characteristics and test parameters	As per IS: 3156 (Part II, latest version)
10	Maximum temperature rise over ambient temperature of 50 deg C at rated continuous thermal current at rated frequency, rated bush	55 deg C
11	Installation	Outdoor
12	Rated insulation level	
A	1.2/50 microsecond impulse withstand voltage (kVpeak)	75
B	One minute power frequency dry withstand voltage (kV rms) on primary winding	28
13	One minute power frequency dry withstand voltage (kV rms) on secondary winding	3
14	Rated voltage factor and time	1.2 continuous, 1.5 for 30 seconds

The 11KV metering equipment shall also have the following common technical characteristics/ parameters:

A	Impulse withstand voltage on assembled metering equipment	75 kV peak
B	One minute power frequency dry withstand voltage test on assembled metering equipment	
I	Primary	28 kV
II	Secondary	3 kV

C	One minute power frequency (wet) withstand voltage test on assembled metering equipment	28 kV
D	P. D. Measuring voltage/ permissible voltage	Deleted.

5.4 CORE MATERIAL:- The core material of C.T. & P.T. set shall be of high grade non aging electrical silicon steel (CRGO) of first quality having low hysteresis loss and high permeability to ensure accuracy at both normal and over current / voltage.

TECHNICAL SPECIFICATIONS:-

Material grade	Max guaranteed core loss
M4	0.89 watt/kg at 1.5 Tesla and 50 Hz
Having silicon content of 3% (approx)	
Density of laminations	7.65 g/cc (approx)
Standard	BS 601 (Part-2) 1973

5.5. **BUSHINGS**:- The metering equipment shall be supplied with 6 No 12KV oil communicating porcelain weatherproof bushings with brass studs as per rating of the metering units. The bushing should conform to latest version of IS: 3347-1986(part III)/IS: 5621-1980 and IS: 2099-1986.The Creepage distance must correspond to heavily polluted atmosphere.

The bushings from reputed manufacturers only will be accepted:-

The bushing stems shall be provided with suitable bimetallic connectors so as to connect the jumper without disturbing the bushing stem. The bush rod stem length should be at least 40 mm and 4 nuts with 2 flat washers of brass material should be provided with each bush rod.

1. Type & Make - Out door/ Reputed indigenous make as mentioned above
2. Dry flash over voltage –as per IS
3. Wet flash over voltage – as per IS
4. Dry 60 Sec withstand voltage – as per IS
5. Under oil flash over on puncture withstand test voltage (Power frequency) - as per IS
6. Full wave impulse withstand test voltage –as per IS
7. Creepage distance in polluted air – max

5.6. **TERMINAL BOX**:- The secondary terminal box is fabricated built in with the tank with same 3.15 mm thick M.S. sheet. The dimensions of the terminal box should be such that adequate space is available for tightening the secondary cable connections on the secondary terminals provided in the box. The secondary terminals in the terminal box shall have proper marking with polarity indications. The box is provided with two nos. brass gland of heavy duty (No.2) on the bottom plate suitable to accommodate 6 core 4 sq mm& 4 core 2.5 sq mm armoured copper cables. The terminal box is provided with approximately 25 mm wide collars/flange for holding its cover plate made of 16 SWG (1.6mm) M.S. Sheet. The 15 mm wide portion of the three sides (except bottom side) of the terminal box cover sheet is to be bent inside by 180° to make ''U' shape groove enabling this sheet slide down over the flange/collars of the terminal box and completely cover all the collars of the terminal box. This will protect the entry of rain water inside the terminal box and will not need nut & bolts for its clamping. However 2 No. 6 mm diameter holes one each in middle of the top and bottom collar/ flange are to be drilled. Similar holes are drilled in the cover plate and its top bend also so that the corresponding holes match and align when cover plate is slide down on the terminal box collars. These holes shall serve the purpose of providing

bolts with sealing provisions for the terminal box by the commissioning staff after making all secondary connections.

5.6.1. The CT's and PT's secondary terminals shall be distinctly shown with markings. The CT's secondary terminals shall be separated from the PT's secondary terminals by means of barrier. The width of the barrier is to be 50% of the total width of the terminal box.

5.6.2. Terminals shall be provided separately for earthing terminal of P.T. and secondary neutral terminal of P.T. inside the secondary terminal box without any internal link and such that they can be connected externally when required. **The terminal box should be placed in the centre of the primary incoming side of the metering set.**

Each metering set should be complete with interconnection and internal secondary wiring.

5.6.3. Direct access of the secondary terminals for secondary connections to be avoided. Extra bakelite board may be provided which should be internally connected for accessing the secondary connection.

5.7. **INSULATING OIL**:- The metering sets shall be supplied with adequate quantity of new insulating oil whose level shall not be below the minimum oil level marking on the oil level gauge. The insulating oil shall conform to IS.335-1983 of the latest issue with amendments upto date.

The test certificate of oil being used shall be provided at the time of inspection. The oil in the Metering Equipment shall be filled under vacuum. Oil drain valve or sampling cock or non return type oil filling valve provided to facilitate factory processing shall be sealed before dispatch of Metering Equipments.

The Metering Equipment shall be hermetically sealed. The volume above the oil level in the tank shall be filled with Nitrogen gas conforming to commercial grade as per IS:1747:72.

INSPECTION AND TESTING OF INSULATING OIL:- To ascertain the quality of insulating oil the manufacturer's test report should be submitted at the time of inspection. Arrangements should also be made for testing the oil, after taking out the samples from the manufactured CTPT sets and tested in the presence of KSEB Ltd representative for the following characteristics given int the specification in an independent laboratory/ KSEB Ltd, R&D Lab at supplier's cost and test report shall be forwarded to KSEBL. The above test will be carried out for every lot offered for the inspection. MDCC will be issued only after receipt of the test report.

The insulating oil shall have the following technical characteristics/ parameters: -

Test Parameter	-	Required Value
a. BDV	-	60 kV @ 2.5 mm gap
b. Acidity	-	0.03 mg of KOH/G

6.0 CLEARANCE:- The minimum clearance between different phase terminals and earthed parts shall not be less than the values specified below in accordance with BS: 162-1961 or the relevant ISS with amendments upto date.

Rated voltage	Minimum clearance to earth	Minimum clearance between different phase terminals
11 KV	190 mm	255 mm

7.0 FITTINGS AND ACCESSORIES:- The metering equipment shall have the following:-

a) Riveted 'Rating and connection Diagram plate' shall be fitted besides the terminal box on the same face of the metering equipment. This shall indicate Name of manufacturer, voltage, C.T. Ratio, class of accuracy, burden etc and shall be embossed / engraved on the rating plate.

b) 2 No. base mounting channels duly welded to the bottom of the tank.

c) 1 Nos. oil drain valve with plug located 25 mm above the bottom of the tank on one of the sidewalls of the tank.

d) 2 No. earthing terminals (stud and bolts should be properly galvanized and confirm to latest version of IS: 1363 and IS:1367).

e) 1 no pressure release device.

f) 2 nos. lifting lugs to lift the metering equipment.

g) Deleted.

h) 1 no. oil filling hole with cap on the top cover.

i) 6 nos. bimetallic clamps fitted on the bushing stud suitable forholding ACSR Dog conductor.

j) Serial no. of metering equipment, year of manufacture and CT ratio are to be punched clearly on the side wall of the equipment at location below the terminal box. The same shall be clearly visible from ground after erecting the metering set in the structure.

k) Plain oil level gauge / indicator with minimum oil level marking.

The metering equipment shall be complete in all respect. Any fitting, accessories or apparatus which may not have been specifically mentioned in the specification for 11 KV metering set covered under the scope of this tender, but which are usual or necessary in the equipment of similar type shall be deemed to be supplied by the supplier without extra charges.

8.0) MARKING:- Every metering set shall be provided with a name plate as per relevant IS (IS.2705-1992 and IS.3156-1992).

Besides the above, the following particulars shall be incorporated in the name plate. The name plate shall be non-detachable type & fixed with rivets, not with bolts & nuts.

1. Kerala State Electricity KSEB Ltd
2. P.O. NO. and Date.
3. SCHEME.
4. Quantity of oil in litres.
5. Total weight of the unit in kilograms.

The guarantee period (60 months) shall be embossed in a plate welded opposite side of name plate.

9.0) INTERCHANGEABILITY:- All similar materials and removable parts of similar equipments shall be interchangeable with each other.

10.0) DRAWINGS:- The drawings showing the general arrangements of the metering sets indicating the fittings and other details and also the connection diagrams may be furnished to Chief Engineer (SCM) within a week of receipt of the purchase order, for approval. The KSEB Ltd will not be held responsible for the delay on this account.

There should not be any omission of details in the drawings. The supply should conform to the tender and drawings and any deviation should be got approved before the supply is made.

Whenever suppliers are anticipated to deviate or vary more than + / - 10% from the figures furnished in the approval drawings, the revised drawings with deviation and new dimensions should be submitted well in advance and got approved by the KSEB Ltd before supplies are made.

No extension of delivery will be given on account of delay in getting the approval of revised drawings.

Supplies which do not conform to the approved drawing with all particulars are liable to be rejected.

11.0) MODIFICATION:- The Supplier shall carry out any modification to the metering sets ordered as may be suggested by the KSEB Ltd at no extra cost to the KSEB Ltd.

12.0. TEST CERTIFICATES:-

TYPE TESTS:- The equipment offered shall be fully type tested from CPRI as per the relevant standards. These type test certificates shall be got approved by the purchaser before commencement of supply.

12.1. **TYPE TESTS FOR CTs**:

a)Verification of terminal marking and polarity

b)Short time current Test.

c)Temperature rise test.

d)Lightning Impulse Test.

e)High Voltage Power frequency wet withstand voltage test.

f)Determination of errors or other characteristics according to the requirements of the appropriate designation or accuracy class.

12.2. **TYPE TESTS FOR PTs** :

a) Verification of terminal marking and polarity.

b) High voltage Power frequency wet withstand voltage test.

c) Power frequency dry withstand tests on Primary winding &

Power frequency dry withstand test on Secondary winding.

d) Determination of errors according to the requirements of the appropriate accuracy class.

e) Temperature rise test.

f) Impulse Voltage test.

g) Lightning Impulse test

12.3. **TYPE TESTS FOR BUSHINGS**:-

a) Dry flash over voltage.

b) Wet flash over voltage.

c) Dry 1 Minute withstand voltage.

d) Impulse withstand voltage (1.2/50 Micro Seconds –ve wave)

12.4. For any change in the design/type already type tested and the design/type offered against this bid, the purchaser reserves the right to demand repetition of some or all type tests without any extra cost.

· The supplier shall confirm that they will supply the material exactly for the design for which type tests have been conducted.

· Deleted.

· The routine test certificates for rated combined CT-PT unit as per relevant IS shall be submitted at the time of supply and got approved by this office.

12.5. **ROUTINE TEST:-**Each of completely assembled metering unit shall be subjected to the following routine tests at the manufacturer's works in accordance with the details specified in IS:2705 and IS:3156:-

a. Verification of terminal marking and polarity test of CT and PT of metering unit

b. Power frequency dry withstand test on primary winding of CT and PT of metering unit.

c. Power frequency dry withstand test on secondary winding of CT and PT of metering unit.

d. Over Voltage inter turn test on CT of metering unit.

e. Determination of errors or other characteristics according to requirements and class of accuracy of CT and PT of combined Metering Equipment.

f. Induced voltage test on PT of metering unit.

g. Break down voltage test of transformer oil.

h. Pressure test on tank of metering unit at 0.8 kg./sq.cm.

i. Ratio & phase angle error test of CTs of metering unit.

j. Insulation Resistance test (5 kV insulation tester for HT & 1kv insulation tester for LT)

Required minimum values:

HV - E - 100 M-Ohms

LV – E - 100 M-Ohms

HV – LV - 100 M-Ohms

k. Air pressure test on empty tank of transformer opened for physical verification test (One for every lot offered for pre-despatch inspection).

13.) GUARANTEE:

The manufacturers of the CT-PT unit shall provide a guarantee of 60 months from the date of acceptance by the consignee. In case the CT-PT unit fails within the guarantee period, the purchaser will immediately inform the supplier who will take back the failed unit after joint inspection and replace/repair the unit within 3 months from the date of intimation within roll over guarantee. The outage period ie period from the date of failure till the unit is repaired/replaced shall not be counted for arriving at the guarantee period. Moreover minor repair such as leakage etc reported from the field that can be repaired at site itself shall be rectified by the supplier at site by deputing his representative within 30 days from the date of receipt of such intimation.

13.0(a) **Replacement warranty:**

If the unit is not repaired /replaced during this period, an amount equal to the cost of the unit shall be retained from his succeeding bills/security deposit. Thereafter an amount of 1% of the cost of the unit for each delayed week subject to a maximum of 10% of cost shall be deducted from the retention amount as penalty and balance amount shall be released.

(b) In the event of supplier's inability to adhere to the aforesaid provisions suitable penal action will be taken against the supplier which may inter alia include black listing of the firm for future business with the purchaser for a certain period.

Sd/-

CHIEF ENGINEER (SCM)

GUARANTEED TECHNICAL PARTICULARS.

Sl No	Particulars	Values
I	Name & Address of Manufacturer	
II	Manufacturers Type and Designation	Outdoor oil filled type.
III. 1	For One Number Single Phase Copper wound **Current Transformer**	
2	Nominal System Voltage (KV rms)	11 kV
3	Highest System Voltage(KV rms)	12 Kv
4	Frequency	50 Hz
5	Transformation Ratio (C.T. Ratio)	400-200/5 A
6	Rated Output (V.A.Burden)	10 VA
7	System Neutral Earthing	Effectively earthed
8	Class of Accuracy	0.5s
9	Rated Continuous Thermal Current	1.2 times of rated primary current
10	Short Time Thermal Current Rating	25 kA RMS for 1 sec
11	Rated Dynamic Withstand Current (kAp)	62.5 kApeak
12	Rated Dynamic Current Rating	2.5 times short time current
13	Instrument Security Factor	<5
14	All other Characteristics and Test parameter	As per IS 2705
15	Maximum temperature rise over ambient temperature of 50 C at rated continuous thermal current at rated frequency & with rated burden	As per IS
16	Rated Insulation Level	
	a) 1.2/50 microsecond impulse withstand voltage (KV peak)	75 kVp
	b) One minute power frequency withstand voltage (KVrms) on	
	1) Primary winding (KV rms)	28 kV rms

	2) Secondary (KV rms)	3 kV rms
	c) One minute power frequency wet withstand voltage on	
	1) Primary (KV rms)	28 kV rms
	2) Secondary (KV rms)	3 kV RMS
17	Over voltage interturn Test	As per IS
18	Creepage distance Total mm	300 mm
18	Class of Insulation	Class A in oil
20	Insulation Material used	Oil impregnated paper (Kraft/Creep paper)
21	Whether Short Circulating Arrangement for CT's	Yes, provided
22	IS to which CT Conforms	2705
IV	For One Number 3 Phase Copper wound **Potential Transformer**	
1	Nominal System Voltage (KV rms)	11 kV rms
2	Highest System Voltage(KV rms)	12 kV rms
3	Transformation Ratio of PT	11000/110 V
4	Frequency	50 Hz
5	Rated Output VA Burden	25 VA per phase
6	Winding Connections	Star/Star with floating neutral
7	No of Phases	Three
8	Class of Accuracy	0.5
9	All other characteristics and test parameters	As per IS 3156
10	Max. temperature rise over ambient temperature of 50 C at rated continuous thermal current at rated frequency and with rated burden	As per IS
11	Installation	Outdoor

12	Rated Insulation Level	
	a) 1.2/50 microsecond impulse withstand voltage (KV peak)	75 kVp
	b) One minute power frequency withstand voltage (Kv rms) on primary winding (KV rms)	28 kV rms
	c) One minute power frequency withstand voltage for secondary winding (KV rms)	3 kV rms
13	Voltage Factor	1.2 continuous & 1.5 for 30 seconds
14	Impulse withstand voltage on assembled metering equipment	75 kVp
15	a) One minute power frequency wet withstand voltage on primary winding (KV rms)	28 kV rms
	b) One minute power frequency wet withstand voltage on secondary winding (KV rms)	3 kV rms
16	Whether any fuse have been provided in the secondary side of PT	Yes, PT fuse of 4A may be provided
17	Whether neutral of PT for HT side is isolated/ floated	Floated
V	CORE MATERIAL	
1	Material Used	CRGO
2	Weight of Core	21.5 KG Total
3	Material Grade	M4 Grade
4	Thickness of stampings	0.27 mm (Approx)
5	Whether Silicon content having 3%	Yes
6	Density of lamination	7.65 g/CC (Approx)
7	Conforming to Standard	As per IS
VI	insulating Oil	As per IS:335
1	Type of Insulating Oil whether as per IS -335 and latest Amendment	As per IS 335

2	Whether Short Circulating Arrangement for CT's	Yes, provided
VII	Bushing Detail	11 kV Roof entry type bushing
1	Make	Adpro/Mahalakshmi or any reputed make
2	Total creepage Distance(mm)	300 mm
3	IS to which Bushing Conforms	IS 2099, IS 3347
4	Arcing Distance(mm)	As per IS
5	Max. Creepage Factor	<4
6	Insulation Class	Class A in oil
7	Insulation material used	Oil Impregnated Paper(Kraft/Creep Paper)
VIII	**Steel Tank**	
1	Material Used	MS
2	Thickness of tank sheet a) Bottom b) Top Cover c) sides	 3.15 mm 5 mm 3.15 mm
3	Painting a) Colour of the paint b) Thickness of painting	 a) Dark Admiral gray as per clause No.632 of IS:5 b) As per IS:5
4	Gasket a) Thickness b) Material	 6 mm Neoprene gaskets can be used instead of Cork sheet

Sd/-

CHIEF ENGINEER (SCM)