

ESP-001-
2A Rev.00



PROJECT ENGINEERING & SYSTEMS DIVISION

Std. / Doc. Number

PY55291

Rev. No. 00

Sheet 1 of 14

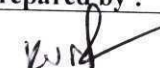
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TECHNICAL SPECIFICATION FOR OUTDOOR TYPE 11kV CT,PT METERING CUBICLE

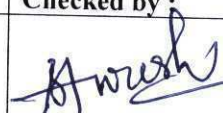
PROJECT: STP Raipur
CUSTOMER: M/s RDA, Raipur

Revisions:
Refer to record of revisions

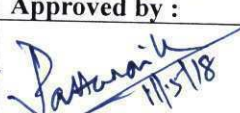
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11.05.18

ESP-001 - 2A Rev.00		PROJECT ENGINEERING & SYSTEMS DIVISION (TECHNICAL SPECIFICATION FOR 11kV METERING CUBICLE)		Std. / Doc. Number	
				PY55291	
				Rev. No.	00
				Sheet 2 of 14	

PURCHASE SPECIFICATION FOR OUTDOOR TYPE 11kV CT/PT METERING CUBICLE

CONTENTS

1.	INTRODUCTION.....	3
2.	SCOPE OF SUPPLY AND SERVICES.....	3
3.	BOQ OF ITEMS.....	3
4.	STANDARDS.....	4
5.	GENERAL REQUIREMENTS.....	5
6.	TECHNICAL REQUIREMENTS.....	5
7.	INSPECTION & TESTING.....	8
8.	DOCUMENTATION.....	9
9.	PACKING AND DESPATCH.....	10
10.	DEVIATION SCHEDULE (TECHNICAL).....	11
11.	CHECK LIST.....	12
12.	VENDOR LIST FOR ELECTRICAL COMPONENTS.....	13
13.	Material code.....	13

ESP-001 - 2A Rev.00		PROJECT ENGINEERING & SYSTEMS DIVISION (TECHNICAL SPECIFICATION FOR 11kV METERING CUBICLE)		Std. / Doc. Number	
				PY55291	
				Rev. No.	00
				Sheet 3 of 14	

1. INTRODUCTION

Bharat Heavy Electricals Limited (BHEL), Project Engineering & systems Division, Hyderabad is setting up 6 no. of STP plants (with different capacities) in the vicinity of Raipur Development Authority – Kamalavihar & IndraPrashtha , Raipur, Chattisgarh for its use. This document provides technical specification for OUTDOOR TYPE 11kV CT, PT METERING Cubicle / Panel.

2. SCOPE OF SUPPLY & SERVICES

Bidder's scope of supply & services shall consist of the following:-

- a) Design, Manufacturing, testing and Supply of Outdoor type 11kV floor mounting Metering cubicle (Tampered proof) & Type tested.

Each Metering Cubicle shall consists of Aluminium/Copper Busbars, 3 nos of 1-phase CTs, 3 nos of 1-phase PTs, 3 nos. HT fuses at incoming side, Cable Boxes suitable for termination of Incoming & Outgoing HT cables, Space provision or cutout for installation of Energy Meter supplied by others, TTB along with control wiring (from CTs & PT to TTB and TTBs to Meter) and other installation accessories inside the cubicle.

- b) Clamps for supporting of HT cables inside the cable boxes.
- c) Metering cubicle along with CTs & PTs shall have provision for sealing as per the requirement of Chattisgarh Electricity Board.
- d) CT & PTs shall be designed, manufactured and tested at works as per Chattisgarh Electricity Board.
- e) Metering panel shall be provided with integral base frame for mounting on cable trench.

3. BOQ OF ITEMS

Sl. No	Item Description	Qty.	Units
i)	11 KV Tampered Proof /Pilfer Resistant Metering Cubicle suitable for outdoor installation comprising of 3 nos. 1-Phase CTs epoxy resin type, 3 nos.1-phase PTs epoxy resin cast PT along with other items as mentioned at Sl. 2.0 above with following CTs & PTs details	1	Sets
	<u>CTs</u> CT ratio:10/5 Class:0.2S Burden:15VA CTs shall confirming to IS : 2705 /1992, latest Revision <u>PTs</u> PT ratio:11kV/110/√3 Class:0.2 Burden:50VA P.T"s in conformity with IS : 3156/1992 & latest revision		



PROJECT ENGINEERING & SYSTEMS DIVISION

(TECHNICAL SPECIFICATION FOR 11kV METERING CUBICLE)

Std. / Doc. Number

PY55291

Rev. No.

00

Sheet 4 of 14

ii)	11 KV Tampered Proof /Pilfer Resistant Metering Cubicle suitable for outdoor installation comprising of 3 nos. 1-Phase CTs epoxy resin type, 3 nos.1-phase PTs epoxy resin cast PT along with other items as mentioned at Sl. 2.0 above with following CTs & PTs details		1	Sets
	<u>CTs</u> CT ratio:15/5 Class:0.2S Burden:15VA CTs shall confirming to IS : 2705 /1992, latest Revision	<u>PTs</u> PT ratio:11kV/110/√3 Class:0.2 Burden:50VA P.T"s in conformity with IS : 3156/1992 & latest revision		
iii)	11 KV Tampered Proof /Pilfer Resistant Metering Cubicle suitable for outdoor installation comprising of 3 nos. 1-Phase CTs epoxy resin type, 3 nos.1-phase PTs epoxy resin cast PT along with other items as mentioned at Sl. 2.0 above with following CTs & PTs details		4	Sets
	<u>CTs</u> CT ratio:20/5 Class:0.2S Burden:15VA ISF ≤ 5 CTs shall confirming to IS : 2705 /1992, latest Revision	<u>PTs</u> PT ratio:11kV/110/√3 Class:0.2 Burden:50VA P.T"s in conformity with IS : 3156/1992 & latest revision		

4. STANDARDS

- a) The equipment covered by this specification shall be in line with the requirement of relevant IS/IEC as mentioned below & their latest editions. The latest edition shall be prior to the date of purchaser's enquiry:

IS – 2071	Method Of High Voltage Testing
IS – 2705	Current Transformers
IS – 3156	Voltage Transformers
IS – 11322	Partial Discharge Measurement
IS – 12063	Classification of degree of protection provided by enclosures of Electrical Equipment.
IS – 3427	HT switchgear and control gear
IEC 529 / IS 2147	Dust proof and weather proof enclosure
IS 5	Colors for ready mixed paints enamels

- b) The equipment shall also confirm to the provisions of Indian Electricity Rules and other statutory regulations currently in force in the country.

**PROJECT ENGINEERING & SYSTEMS DIVISION**
(TECHNICAL SPECIFICATION FOR 11kV METERING CUBICLE)

Std. / Doc. Number

PY55291

Rev. No.

00

Sheet 5 of 14

5. GENERAL REQUIREMENTS

- a) Bidders are advised to contact BHEL for essential technical queries in writing within one week of issue of Enquiry. Offers with incomplete information will not be considered for evaluation, and are likely to be rejected outright without any further interaction with the Bidder.
- b) Unsolicited requests from bidders for alterations to their already submitted offer will not be entertained. These would not be taken cognizance, and offers will be evaluated without taking into account such requests/correspondence.
- c) Any technical features [over & above BHEL enquiry specification requirements] proposed by Bidder will not be given preference for the purpose of evaluation.
- d) Documents to be submitted as a part of the technical bid have been cited at Cl. 8 of this document.
- e) The Price bid must be submitted in the Price Schedule format furnished along with this specification.

6. TECHNICAL REQUIREMENTS:**6.1 11 kV Metering CTs**

- i) The metering CTs shall be suitable for 11 KV, 50Hz, 3wire system. Each CT shall be suitable for single phase. The CT shall be single core, single ratio, epoxy resin cast, copper wound primary type, conforming to IS 2705 amended upto date.
- ii) CT Primary P1 & P2 terminals to be made in such a way that static voltage do not appear w.r.t the Cubicle body.
- iii) The secondary terminals of the CTs shall be robust design so as to provide effective and firm termination. The secondary winding resistance of CTs shall be as low as possible. Proper access to each set of CTs shall be provided for repair / maintenance. The CT rating plate and the terminals must be accessible after the Power cables have been installed. The current transformer particulars as specified in relevant IS/IEC shall be given on an accessible plate mounted external to the current transformer.
- iv) The polarity of the primary and secondary windings of each current transformer shall clearly be indicated.

6.2 11 KV Metering PTs

- i) The PT shall be dry type epoxy resin cast, copper wound suitable for 1 phase, 11 KV, 50 HZ, system. 11KV single phase epoxy resin cast PTs per cubicles IS: 3156 (part-I&II) amended upto date. The PT shall be type tested in accordance with IS:3156 (part-I&II) with latest amendments.
- ii) The voltage transformers shall conform to IEC 61869-1&3 / IS: 3156. Voltage transformers shall be of the electromagnetic type. The earth end of the high voltage winding and the ends of the secondary winding shall be brought out in the terminal box. The voltage transformers shall be provided with 4 pole miniature circuit breakers with auxiliary contacts on the secondary side.



PROJECT ENGINEERING & SYSTEMS DIVISION

(TECHNICAL SPECIFICATION FOR 11kV METERING CUBICLE)

Std. / Doc. Number

PY55291

Rev. No.

00

Sheet 6 of 14

- iii) The PTs shall be of uniform insulating. Voltage transformers will have continuous over voltage factor of 1.2 and over voltage factor of 1.9 for 8 hours. VT selected shall be compatible with 11kV system earthing of High resistance grounding.
- iv) Voltage transformers shall be protected on the HV side by high rupturing capacity, short circuit current limiting fuses in accordance with IEC 60282-1. Fuses shall be readily accessible.

6.3 Metering Cubicle:

- i) Metering cubicle along with Bus bars & equipment shall be designed for 21kA for 1 sec (RMS) and 52.5kA (Peak). However, CTs can be designed for minimum 3KA for 1 sec due to design limitation (if any).
- ii) HT cable boxes (both Incoming & outgoing) of Metering Cubicle shall be designed for Incoming and outgoing HT cable entries i.e. HT cable 3Cx400 sq.mm, AL shall be terminated at incoming Cable Box and HT cable 3Cx185sqmm, AL will be connected to outgoing cable box. Sufficient space shall be available to terminate these HT cables in the Cable boxes through HT cable termination Kits. A 11kV Fuse shall be provided at the incomer side of the Panel.
- iii) The metering panel shall be fabricated with 2mm MS plate and panel height of the location of Meter shall be easily visible. The panel should be provided with 4 Nos. lifting hooks.
- iv) The panel shall be suitable for outdoor installation with minimum IP55 degree of protection and shall be dust and vermin proof. The panel shall have two separate compartments. The upper one shall house, energy meter (free issued by BHEL) with associated wiring and shall be termed as "Meter compartment". The upper compartment will be double door type and the arrangement for meter fixing will be in inner portion. The other section i.e. lower compartment shall house the 11 KV, 1 Ph, dry type epoxy resin casted CT (3 Nos.) and 11 KV, 1 Ph, dry type epoxy resin casted PT (3 Nos.) and shall be termed as "HT CT/PT compartment".
- v) A separate and independent vermin proof door shall be provided for each of the upper and lower compartments with provision of locking and sealing arrangement.
- vi) The Metering cubicle shall be totally enclosed and shall be provided with one no. hinged door made of MS sheet which shall rest on the collar along sides of cubicle so that the doors remain flushed with body of the cubicle.
- vii) The door shall be provided with a handle and two no's sealing arrangement. There shall be one fixed (non-openable) window (approximate size 300 x 200mm shall confirmed during detail Engineering) fitted with transparent acrylic glass to enable the meter reader to note down the reading without opening the door of the panel. The glass shall be fitted / tightened with MS Frame from inside of window.
- viii) The metering panel shall be suitable to be mounted on a Trench. The metering panel shall have arrangement to connect it will earth at two independent points. One earthing knob /bolt shall also be provided in the "Meter compartment" for connection to star point of wiring. All the three earthing bolts shall be provided with nuts and washers.
- ix) Clearances between all parts and components of panel should comply with relevant IS standard. One TTB (Test Terminal Block) (AREVA or equivalent make) to be provided



PROJECT ENGINEERING & SYSTEMS DIVISION

(TECHNICAL SPECIFICATION FOR 11kV METERING CUBICLE)

Std. / Doc. Number

PY55291

Rev. No.

00

Sheet 7 of 14

just below the meter for smooth Connection to meter terminals. (Sample GA is attached as annexure-I for reference)

- x) Bus bars shall be of high conductivity electrolytic aluminium or copper supported on insulators made of non-hygroscopic, non-inflammable material with tracking index equal to or more than that defined in standards.
- xi) The bus bars and the supports shall be adequately sized and braced to withstand the specified short-circuit current without permanent deformation.
- xii) Suitable clearance between phases and between live parts and enclosure shall be provided to keep it safe for the operator to approach and even to touch the enclosure in the worst case.
- xiii) Metering Cubicle along with CTs/PTs shall be designed for insulation level of 28kV (RMS) and 75kV (PEAK) Impulse.
- xiv) The Metering panels shall be provided with space heaters to prevent moisture condensation, and maintain cubicle temperature 5°C above the ambient. The space heaters shall be controlled through a double pole MCB and thermostat Space heaters shall be supplied from 240V AC auxiliary bus for space heater.
- xv) The Metering panels shall be suitable for installation on base frame supplied by vendor along with foundation bolts. Amply-dimensioned oblong holes shall be provided at the bottom of all the panels for their installation on the base frame. The panels with base frame shall be suitable for installation on panel supporting frame. The panels shall be suitable for tack welding directly to the frame.
- xvi) The Metering shall have earthing pads for connection with earth grid. Suitable earthing arrangement shall be provided for incoming and outgoing side earthing of panels.
- xvii) All metal parts of the panel and all integral earthing features shall be connected directly to a copper earth bar, which shall be provided running along the full length of the panel
- xviii) All doors and movable parts shall be connected to the earth bus with flexible copper connections. Provision shall be made to connect the earthing bus bar to the plant earthing grid at two ends. All noncurrent-carrying metallic parts of the equipment and components shall be earthed. The earth bus shall be brought to the cable compartment, and earthing bolts shall be provided to earth cable armour. The mating surfaces of all bolted parts shall be zinc passivated to ensure continuity between them.
- xix) The typical SLD is attached in Annexure-I & GA drawing attached in annexure-II for reference.

6.4 Sealing:

The metering cubicles shall be Pilfer Resistant & completely lockable and sealable with at least one locking and two sealing arrangements of the door of each compartment as per Chhattisgarh Electricity Board. Apart from sealing Arrangement of both compartments, mounting bolts of CTs and PT shall have the provisions for sealing arrangement so that removal of CTs & PTs from the installed positions in the panel (for tampering/replacement) by the unauthorized person is not possible without breaking/ tampering the sealing arrangement. The hinge arrangement, sealing of CTs and



PROJECT ENGINEERING & SYSTEMS DIVISION

(TECHNICAL SPECIFICATION FOR 11kV METERING CUBICLE)

Std. / Doc. Number

PY55291

Rev. No.

00

Sheet 8 of 14

sealing of PTs shall be diagonally arranged in the base of each CTs & PTs. CT/PT Chamber to have louvers with screen at the top for heat dissipation.

6.5 Painting:

All surfaces to be painted including interior and exteriors of tanks, mechanisms and enclosures and other metal parts. These shall be shot or sand blasted or chemically treated to remove all rust, scale, grease and other adhering foreign matters. Steel surfaces, exposed to weather shall be given two (2) coats of zinc chromate and two (2) coats of finishing paint light grey No. 631 of IS:5 with glossy finish except for panels which shall have matt finish. The final finished thickness of paint film on steel shall not be less than 100 microns and shall not be more than 150 microns.

7. INSPECTION & TESTING

7.1 All equipment shall be completely assembled, wired, adjusted and tested at the factory as per the relevant IS/IEC standards. The CTs & PTs shall be tested as per Chattisgarh Electricity board norms.

The following tests shall however be carried out as a minimum. All the tests being conducted shall clearly be brought out in the Quality Assurance Plan (QAP) by Bidder. The category of test i.e whether it is a routine test or type test or both, must also be brought out clearly in the QAP with specific mention of relevant standard Number against each test.

i)	BOM verification	:	100%
ii)	Visual check - Dimensional, component verification, polarity verification	:	100% Witness
iii)	Visual check - Electrical wiring: routing, ferruling, tightness	:	100% Witness

7.2 The following the routine tests shall be conducted

CURRENT TRANSFORMERS: (As per IS2705)

- a) Verification of terminal marking and polarity.
- b) High voltage power frequency test on Primary winding
- c) High voltage power frequency test on Secondary winding
- d) Over voltage inter-turn test.
- e) Determination of errors according to the requirement of accuracy class (0.2s)
- f) Partial discharge test in accordance with IS: 11322 / 1985.

7.3 POTENTIAL TRANSFORMERS: (As per IS 3156)

- a) Verification of terminal marking and polarity.
- b) Power frequency dry withstand test on Primary
- c) Power frequency withstand test on secondary
- d) Determination of errors according to the requirement of accuracy class (0.2)
- e) Partial discharge test measurement test in accordance with IS: 11322/ 1985

7.4 Following Type test reports not older than five years as on techno commercial bid opening conducted on similar design CT/PT Metering Cubicle shall be furnished:



PROJECT ENGINEERING & SYSTEMS DIVISION

(TECHNICAL SPECIFICATION FOR 11kV METERING CUBICLE)

Std. / Doc. Number

PY55291

Rev. No.

00

Sheet 9 of 14

- a) For CTs -All the Type test as per IS-2705
- b) For PTs-All the type Test as per IS-3156
- c) FOR Complete Unit the following type test reports shall be furnished:
 - i) Temperature rise test on complete unit at rated current of cubicle.(IS 3427)
 - ii) Power frequency withstand test for 11kV cubicle (IS2071)
 - iii) Impulse Wave Withstand test(IS2071)
 - iv) IP-55 protection test (IS12063/IEC60529)
 - v) Short time withstand current test(as per IS-3427)

In case the type test reports are not available with vendor the same shall be conducted by vendor on cubicle with higher CT ratio at free of cost without any delivery implications.

All instruments used in inspection and testing should be properly calibrated and sealed from any Govt. Test House/Reputed Agency certified by NABL and the reports shall not be less than an one year old. Calibration certifications when demanded by inspecting officers shall be provided/ produced for verification purpose.

8 DOCUMENTATION

8.1 Following information has to be necessarily submitted as a part of the Technical Bid. Bidder shall make the offer in detail, with respect to every item of the Purchaser's specifications. Any offer not conforming to this shall be summarily rejected.

Sl	Description
1.	Single line diagram.
2.	General Arrangement & equipment drawings with dimensions of cubicle in Bidder's scope.
3.	Data Sheets as required (i.e. CT datasheets, PT datasheets etc.)
4.	Signed and stamped technical specification,
5.	Technical Deviation list in the deviation schedule format indicated in this document (or) No Deviation Certificate.
6.	Valid Type test certificates not older than 5 years as on date of tendering
7.	Recommended Spares List for 10 years trouble free operation
8.	Unpriced format of the price schedule indicating quoted/not quoted.

8.2 To be submitted after award of contract :

Sl. No	Document	Submission Schedule	Category
1.	All documents as specified at Cl 8.1 above for submission along with offer	Within 1 week from PO	A
2.	GA & schematics and wiring	Within 1 week from PO	A
3.	Foundation drawing	Within 1 week from PO	A
4.	Comprehensive Quality Assurance plan (QAP).	Within 1 week from PO	A
5.	As-manufacture drawing	1 week after inspection	I

ESP-001- 2A Rev.00		PROJECT ENGINEERING & SYSTEMS DIVISION (TECHNICAL SPECIFICATION FOR 11kV METERING CUBICLE)		Std. / Doc. Number	
				PY55291	
				Rev. No.	00
				Sheet 10 of 14	

6.	Operation & Maintenance manual	Within 2weeks from PO.	A
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A: Approval ; I – Information.

Note: 1) BHEL will furnish Comments within 1 week from receipt of the Drawings.

2) Vendor to submit revised drawings/documents within 1 week from BHEL's comments date. However it is vendor's responsibility to provide complete drawings in all respects and minimum cycle time.

8.3 To be submitted after inspection. (Note: submission of these documents are commercially linked)

- a) Approved Engineering documents, complete O& M manual – all in 3 sets (2 sets to be included with item dispatch and balance to BHEL purchase department).
- b) Guarantee and all test certificates for review and acceptance by BHEL and / or BHEL's Customer

9 PACKING AND DESPATCH

The equipment shall be properly packed for transportation by ship/rail or trailer. It shall be wrapped in polythene sheets before being placed in crates/cases to prevent damage to finish. The crates/cases shall have skid bottoms for handling. Special notations such as Item details, Fragile, This side up, Center of gravity, Weight, Owner's particulars, PO no. etc., shall be clearly and indelibly marked on the packages together with other details as per purchase order.

The equipment may be stored outdoors for long periods before installation. The packing shall be completely suitable for outdoor storage in areas with heavy rains and high ambient temperature unless otherwise agreed. Packing list shall be fixed to each consignments/items.

Project Specific Requirement:

All the Panels shall be dispatched at BHEL site at Raipur at 3 different locations within a radius of 10-15 Km. Exact location and quantity shall be informed at the time of issuing dispatch clearance.



PROJECT ENGINEERING & SYSTEMS DIVISION
(TECHNICAL SPECIFICATION FOR 11kV METERING CUBICLE)

Std. / Doc. Number

PY55291

Rev. No.

00

Sheet 11 of 14

10 DEVIATION SCHEDULE (TECHNICAL)

Sl.No.	Cl.No./Page No./Sec No.	Description as specified	Deviation taken	Remarks/ Reason for Deviation

NOTES:

1. Bidder may give a consolidated list of deviations in this form only. Only the deviations listed here in conjunction with the original tender, shall constitute the contract document for the award of the job to the Bidder.
2. Deviation listed elsewhere shall be ignored & will be summarily rejected.
3. If there are no deviations, bidder shall submit signed copy of this format, mentioning “**No Deviations**” & it shall be henceforth implied that Bidder is complying to all the clauses of the bidding document.
4. Attach more sheets in this format, if required.

(Signature of the Vendor)

ESP-001- 2A Rev.00		PROJECT ENGINEERING & SYSTEMS DIVISION (TECHNICAL SPECIFICATION FOR 11kV METERING CUBICLE)		Std. / Doc. Number	
				PY55291	
				Rev. No.	00
				Sheet 12 of 14	

11 CHECK LIST:

(TO BE FILLED BY BIDDER AND SUBMITTED ALONG WITH TECHNICAL OFFER)

Enquiry No. Date :

Name of the Bidder :

Project : STP-RDA, Raipur, Chattisgarh

Specification No :

Item :

Sl. No.	Check point description	Supplier Confirmation (✓)
1.	Technical Data sheet as per specification enclosed.	
2.	Single line diagram enclosed.	
3.	Duly signed Deviation Schedule(Technical) enclosed	
4.	Relevant Type Test Certificates enclosed	
5.	Unpriced Schedule enclosed as per BHEL specification complying to following: 1. Signed & Stamped (In BHEL format). 2. All items are quoted	
6.	Following documents enclosed for information 1. GA drawing	
7.	Catalogues enclosed if any	
8.	Clause wise confirmation to BHEL specification included in technical offer except the deviations listed in deviation schedule (i.e Signed Technical Specification).	

Note: Bidder to submit **this checklist** duly filled & signed along with the Offer. No deviation is acceptable in this regard. Without duly signed & stamped checklist, offer shall not be considered for evaluation.

BIDDER'S STAMP & SIGNATURE



PROJECT ENGINEERING & SYSTEMS DIVISION

(TECHNICAL SPECIFICATION FOR 11kV METERING CUBICLE)

Std. / Doc. Number

PY55291

Rev. No.

00

Sheet 13 of 14

12 Vendor List for Electrical Components

i) The acceptable makes of electrical components are as follows:

ITEM	MAKES
C.T.	Chhattisgarh state electricity board approved (CSPDCL)
P.T.	Chhattisgarh state electricity board approved (CSPDCL)
Metering cubicle	Chhattisgarh state electricity board approved (CSPDCL)
HT FUSE	GE INDIA INDUSTRIAL PVT LTD, INDO ASIAN FUSEGEAR LTD, LARSEN & TOUBRO LTD, SIEMENS LIMITED, COOPER BUSSMAN/FERRAZ, C&S
CABLE GLANDS& LUGS	DOWELLS/ELECTROMAC/JAISON/LOTUS/BRACO/AG ELECTRICALS

- (ii) Contractor/ vendor while ordering shall ensure the availability of spare parts and maintenance support services for the offered equipment at least for 15 years from the date of supply.
- (iii) Contractor/ vendor shall give a notice of at least one year to the end user of equipment and PMC before phasing out the products/spares to enable the end user for placement of order for spares and services.
- (iv) For makes of items not listed in the above vendor list/except items mentioned at note-iv, prior approval from BHEL is mandatory. The makes chosen shall have sufficient PTR, preferably where BHEL approvals were taken earlier.

13 Material Code (For BHEL use) :-

Sl.No	Description	Material Code
01	Pilfer Resistant Out Door Type 11kv Metering Cubicle for CT Ration 10/5A	PY9755291016
02	Pilfer Resistant Out Door Type 11KV Metering Cubicle for CT Ration 15/5A	PY9755291024
03	Pilfer Resistant Out Door Type 11KV Metering Cubicle for CT Ration 20/5A	PY9755291032

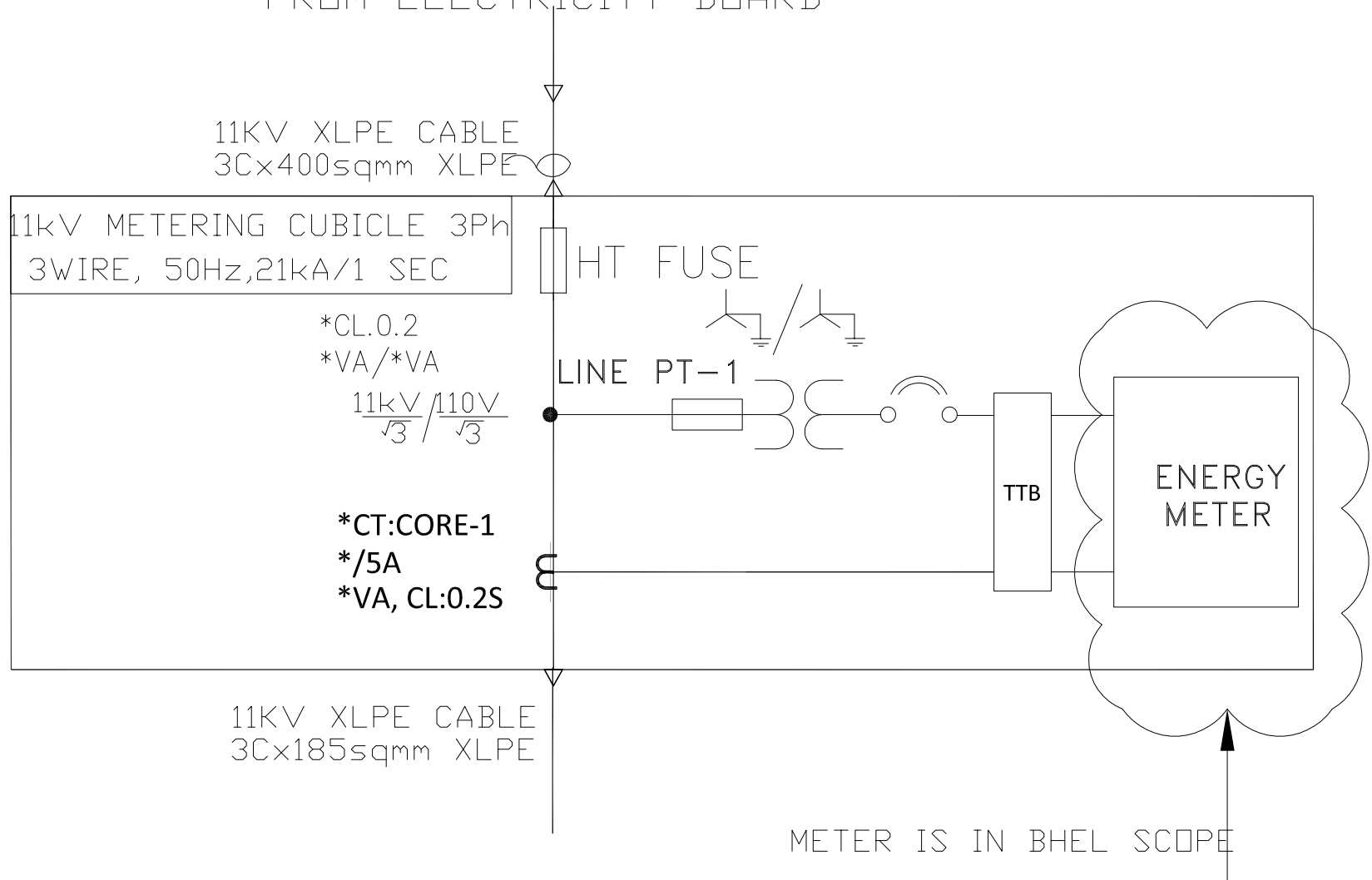
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ANNEXURE-I

RDA RAIPUR STP PROJECT

TYPICAL SLD

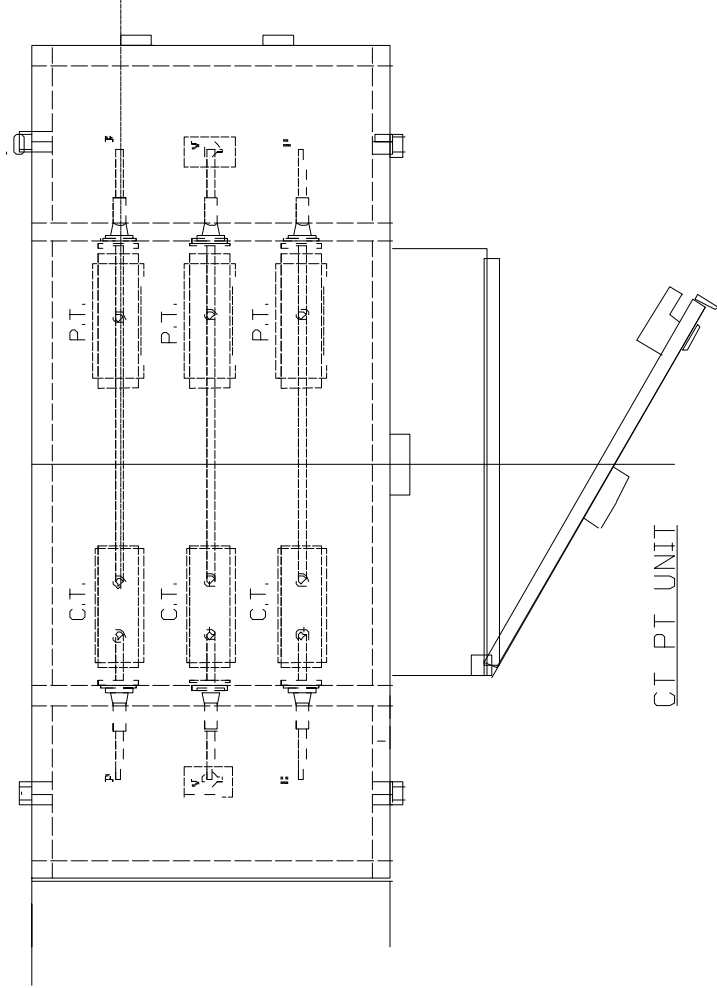
11 KV, 3PH, 50HZ INCOMING POWER SUPPLY
FROM ELECTRICITY BOARD



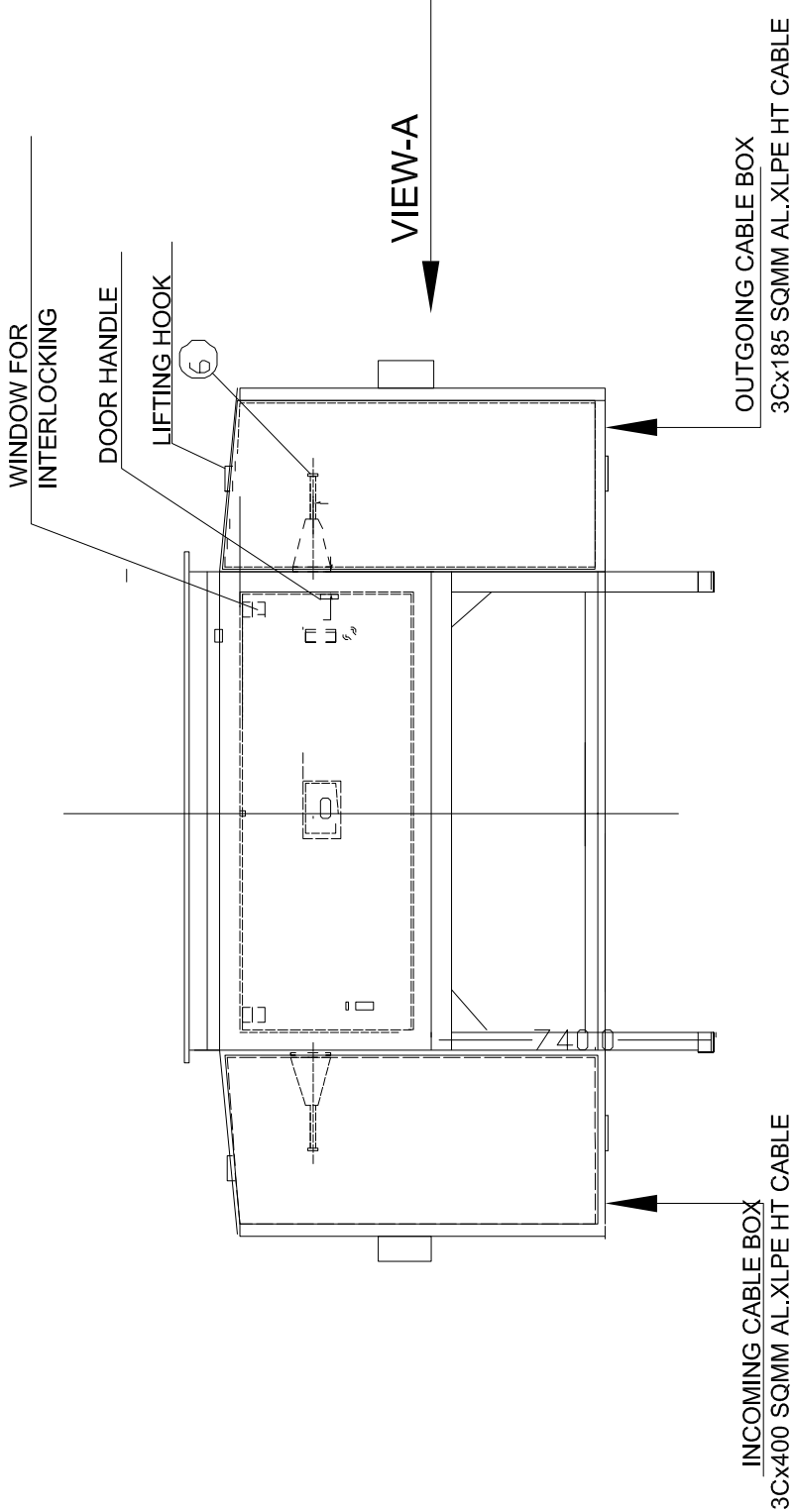
ANNEXURE-II

STP RAIPUR -RDA

TOP VIEW



VIEW-A



FRONT VIEW

TYPICAL GA OF OUTDOOR TYPE CT/PT METERING CUBICLE