

## TECHNICAL SPECIFICATION FOR 11 KV PILFER PROOF METERING CUBICLE (INDOOR TYPE)

### **1.0 GENERAL:**

This specification covers the design, manufacture testing and supply of 11 KV indoor type metering cubicle made of M.S. sheet.

- 1.1 The metering cubicle shall be totally enclosed, dust and vermin proof having two separate compartments HT & LT covered with two separate hinged doors. The 11 KV metering cubicle shall comply with the requirement of Indian Electricity Rules 1956.
- 1.2 The metering cubicle shall be supplied with three Nos. 11KV Single phase C.T's and one no. 11KV three phase P.T., with connecting strips, support to 11KV cable, C.T.'s and P.T. with necessary clamping arrangement, Bus bar etc.
- 1.3 All the equipments shall comply with the requirements of the relevant I.S. specifications.
- 1.4 List of raw material to be along with the name of suppliers should be submitted with the tender.

### **2.0 CONSTRUCTION:**

- 2.1 The 11KV metering cubicle shall be fabricated with M.S. sheet having thickness not less than 2.0mm. The dimension of the cubicle shall be approximately 1800mm (Height) x 700mm (Length) x 700mm (Depth). These dimensions may vary slightly as per design of the manufacturer taking into care the minimum clearances of 120mm between two phases as well as between phase to earth. In case minimum clearances are not possible these dimensions can be increased on higher side.
- 2.2 All the edges and joints shall be made and welded in such a way so that no access inside the cubicle shall be possible through them and shall thus provide strength to robust mechanical construction both for transportation and installation for its use.
- 2.3 The metering cubicle shall be totally enclosed one and shall be provided with two nos. hinged doors made of M.S. sheet of thickness not less than 2.0 mm and shall rest on the collars along the four sides of the cubicle so that the doors remain flushed with the body of the cubicle.
  - 2.3.1 The hinges of the doors shall be concealed type (welded from inside) so as to eliminate any chance of de-hinging without causing any damage to the cubicle.
  - 2.3.2 Two nos. doors shall be provided with synthetic /semi – synthetic gasket to make it dust & vermin proof.
  - 2.3.3 Each door shall be provided with a handle, separate locking and two sealing arrangements each.
- 2.4 The metering cubicle shall rest upon two Nos. M.S. Channel support of approximate size 75 mm X 40 mm X 4 mm welded at bottom along its breadth.

- 2.4.1 Each of these supporting channels shall have suitable arrangement for foundation bolts at two places there by making hole of 12 mm dia for the foundation bolts which shall be tightened by means of nuts provided inside the cubicle.
- 2.4.2 The metering cubicle shall be provided with M.S. Earthing strip of size 50 mm X 5 mm welded at the two opposite base angles provided with welded bolt of 6mm dia welded from inside the cubicle. The earthing strip can be connected by tightening a bolt from outside the metering cubicle at two opposite ends.
- 2.5 The surface of the metering cubic shall be cleaned suitably and made smooth and shall be provided with two coats of grey colour epoxy painting of standard make on the outside and two coats of white colour epoxy painting of standard make in the inside the cubicle as well as that of doors.
- 2.6 The metering cubicle shall have two separate compartments, separated by M.S. sheet of 2.0 mm thickness as given below: -

**2.6.1. a) UPPER (L.T.) COMPARTMENT:**

The upper compartment of the metering cubicle shall be called L.T. compartment and shall have approximate minimum height of 550 mm.

The compartment shall house a trivector meter and also a check energy meter (both not in scope of supply), along with its associated wiring.

- 2.6.1.1 For fixing of Trivector meter and check energy meter in this compartment two Nos. slotted channel of 25 mm X 25 mm X 2 mm size shall be welded vertically at two opposite ends and similarly two Nos. slotted channel of the same size shall be placed horizontally so that horizontal channel can be bolted at desired heights for installing the meter inside the cubicle.
- 2.6.1.2 There shall be one window (approx. size 300 X 200 mm) fitted with transparent toughened glass (fixed with araldite) and protected by providing wire mesh (approx. square 25 mm) over it on the door of the upper compartment. The glass shall be fitted within channel from inside of window. The window should not be open able. The height of window shall be such so as to have the meter reading at or below eye level.
- 2.6.1.3 The L.T. Compartment shall essentially contain the following: -  
Hanger of slotted Channels for mounting main meter (L&T, Secure, Datapro, Duke, Accurate make etc.) and check meter for having flexibility for mounting of meter vertically and horizontally, (Meter not in scope of this supply).
- 2.6.1.4 The provision for fixing terminal end of MRI cord, connecting electronic TVM optical port shall be made in the form of a pocket on the main cover of meter chamber, with seal able sheet cover of size 75 x 50mm.

**2.6.2.0 LOWER (HT) COMPARTMENT:**

The lower compartment of metering cubicle shall be called HT compartment and shall have approximate height of 1250 mm.

- 2.6.2.1 This compartment shall house 3 Nos. 11 KV Single Phase CT's, for R, Y & B phases and One No. 11 KV Three Phase PT, 11 KV Cable termination kit connecting strips

between 11 KV CT's, PT's and suitable clamping arrangements for two Nos. 11 KV XLPE Cables (one each for Incoming and outgoing side). Provision of suitable space and arrangement of proper orientation of cable termination shall be made so that there is no problem in fixing the incoming and outgoing 11KV cables. The CT's and PT should be mounted in such a manner that there is a minimum 90 mm clearance between phase to phase and phase to earth on HT live parts.

- 2.6.2.2 The compartment shall be provided with one no. hinged door, which shall rest on the collar of the M.C. such that it becomes completely dust-proof & vermin proof. The door shall be provided with a separate one No. locking and two nos. sealing arrangement. Suitable provision shall also be made at three places for welding of the doors with the cubicle by providing M.S. Flat of size 2cmX6cm on door and cubicle each.
- 2.6.2.3 The compartment should be provided with 2 Nos. cable entries with detachable plate of size 100 mm X 100 mm at the bottom, suitable for 11 KV XLPE cable of maximum size 70 Sq. mm.
- 2.6.2.4 Suitable provision shall be made to clamp H.T. cable box inside the compartment with proper clamping arrangement.
- 2.6.2.5 The H.T. Compartment shall essentially contain the following: -
- 11 KV Current Transformer, (single Phase) : 3 Nos.  
for R, Y & B Phases:
  - 11 KV / 110 V Potential Transformer (3 Phase) : 1 No.
  - Epoxy resin cast 11KV insulators. : 1 Set
  - 'Cu' Bus bar to connect CTs. (CT Terminals) : 1 Set
  - Flexible copper flat strip or 8 SWG copper wire : 1 Set  
to connect the CT/Bus bar and P.T.
  - L.T. wiring for the secondary of the P.T. and : 1 Set  
CT circuits.
  - Suitable provision of silicagel to absorb moisture inside the cubicle should be made.
- 2.7 A plate of suitable size shall be provided on the outside of the cubicle, which shall have the following information to be engraved on the plate:

**PASCHIMANCHAL VIDYUT VITRAN NIGAM LIMITED**

Name of the consumer	:	
Service Connection No.	:	
Sanctioned Load	:	
Date of release of connection	:	
Type of load cont./Non cont.	:	
Meter No. & make	:	
Line CTR/PTR	:	
Meter CTR/PTR	:	
Class of accuracy of CTs	:	
Class of accuracy of PTs	:	
CT/PT MF	:	
Dial factor for energy/for demand	:	
Overall MF for energy/for demand	:	
Date of last checking	:	

In addition to the above CT and PT ratios and their class of accuracy shall be painted / engraved on the front side of the panel by the supplier. The information regarding the suitability of the Cubicles for loads as given below shall also be indicated by paint / engraving in bold letter.

Suitable for load from \_\_\_\_\_ to \_\_\_\_\_ MVA as per following CT ratio limits:

5/5, 10/5, 20/5, 30/5, 50/5, 60/5	:	from 0.056 MVA to less than 1.0 MVA
75/5, 80/5, 100/5 A	:	from 1.0 MVA to less than 2.0 MVA
125/5, 150/5 A, 200/5A	:	from 2.0 MVA to 4.0 MVA

Apart from other informations, following information shall essentially be provided on name plate of 11 KV metering cubicles.

(i) Name of Manufacturer (ii) Month/Year of Manufacture (iii) Guarantee Period 36 Months/ 42 Months

- 2.10 The metering equipment shall be of compact design and the completeness of the equipment shall be the responsibility of the supplier.
- 2.11 The firm should have eligibility type test of the offered equipment as elaborated in the relevant clause of PQR as per relevant ISS and/or any other specified international standards during the last 5-year period issued from **CPRI/ERDA**. Photocopy of such type test reports/ certificates must be submitted along with tender bid. The type test certificates of prototype manufactured and tested by foreign collaborators of the tenderer at their works shall not be acceptable for indigenously manufactured equipment.
- 2.12 If the firms do have the eligibility type test as per Sl. No. point no. 2.11 above but do not have valid type test report for offered equipments as per current technical specification with revised parameters as prescribed by PVVNL for cross sectional area of conductor, core, current density, the firm shall have to give undertaking to submit valid type test report of offered equipment issued by **CPRI/ERDA only** within maximum period of three months time. Keeping in view of the timely completion of projects supplies shall be accepted, with the provision that 50% payment shall only be released and the balance 50% may be released only after submission of valid type test report.
- 2.13 **INSPECTION:**  
The material shall be offered for inspection to CE(MM)/SE (MM). At least 15 days advance notice about the readiness of the material inspection commensurate with contractual delivery schedule, shall be given by the supplier to CE(MM)/SE (MM) alongwith copies of routine test report & packing list, so as to enable the purchaser to depute his representative (s) for inspection at your works.

### **3.0 ELECTRICAL COMPONENTS:**

The supplier shall be original manufacturer of the epoxy resin cast CT/PT or accredited representative of such manufacturer. The bidder must have facility to cast epoxy resin by hot casting process under vacuum for CTs & PTs at his own works. These CT & PT should have been type tested as mentioned elsewhere in the tender specification as per relevant ISS (latest revision) in a Govt. accredited National Test House such as CPRI, Bangalore / Bhopal/ERDA/NTH etc during the last five years from the date of Tender opening. A brief detail of the various components to be provided in the metering cubicle is given below: -

#### **3.1 CURRENT TRANSFORMERS:**

There shall be three Nos. Single Core single ratio dry type epoxy resin cast type current transformers as per IS: 2705: 1992 of latest revisions thereof as per details mentioned below: -

S.No.	TYPE		Dry type epoxy Resin cast type CTs.
1	Ratios		5/5A,10/5A,15/5A,20/5A,25/5A,30/5A,40/5A,50/5A,60/5A,75/5A,80/5A,100/5A,125/5A,150/5A,200/5A
1.	Nominal system voltage (KV rms.)	:	11
2.	Highest system voltage (KV rms.)	:	12
3.	Frequency	:	50 Hz.
4.	Rated output (V.A burden)	:	10 VA
5.	Current density at rated current(Max)	:	1.5 Amp. Per sq. mm
6.	Current density at STC for 1 second(max)	:	165 Amp. Per sq. mm
7.	Cross sectional area of primary As per current density	:	Should be as per rated current density or as per current density at STC (for 1 second) whichever is higher
8.	Class of accuracy	:	0.5 S
9.	Rated continuous thermal current	:	1.2 times of rated primary current.
10.	Short time thermal current rating	:	5/5 : 3 KA for 0.5 sec. 10/5-20/5 : 3 KA for 1.0 sec. 25/5-40/5 : 7.8KA for 1.0 sec. 50/5-100/5 : 13 KA for 1 sec 100/5-250/5 : 18 KA for 1.0 sec
11.	Rated dynamic current rating	:	2.5 times of short time thermal current rating
12.	Instrument Security factor	:	< 5
13.	All other characteristics and test parameter	:	As per IS: 2705/1992 (latest version)
14	Max temperature rise over ambient temp of 50° at rated continuous thermal current at rated frequency rated bush.	:	45°c

### Material

- |                            |  |
|----------------------------|--|
| (i) Core                   | High-grade non-ageing electrical low loss core of superior CRGO silicon sheet steel.   |
| (ii) Conductor             | Super enameled copper wire   |
| (iii) Insulation           | Resin cast.  |
| (iv) Base                  | MS Hot dip galvanized.   |
| (v) Primary termination    | Tinned Copper strips with sleeves 50x6 mm size as per relevant ISS, with clear polarity making P1&P2. The strips should be suitably so bended as to facilitate smooth jointing with 11KV incoming and outgoing cable lugs. |
| (vi) Secondary Termination | Firm and effective Termination with clearly polarity marking S <sub>1</sub> & S <sub>2</sub>   |

The current transformer should be type tested and routine tested as per IS: 2705:1992 or latest amendment thereof.

### 3.2 POTENTIAL TRANSFORMERS:

There shall be one No. Three phase, Potential Transformers. These will be dry type Epoxy resin cast, air-cooled and as per IS: 3156/1992 or latest amendment thereof. The primary and secondary winding of 11 KV PT should be wound on insulating craft paper. **Entire PT assembly i.e. Core and Coil should be encapsulated under vacuum impregnation in Epoxy Resin.** The PTs. shall have a ratio of 11 KV / 110 V and with a rated burden of 25 VA and of accuracy class 0.5. The material of primary and secondary winding should be copper. The cross sectional area of primary should be 0.04 sq. mm(minimum), and the secondary cross sectional area should be 1.6 sq. mm (Minimum).

These will be connected in star-star for phase-to-phase voltage ratio of 11 KV/110 V. There will be no HT fuses in the primary side and secondary side of the potential Transformers. Rated voltage factor of PT should be as per ISS. Potential transformer should be type tested and routine tested as per IS: 3156:1992 or latest version thereof.

- 3.3 The final layer of primary winding of potential transformer should be re-reinforced with extra insulation and then an equipotential /electro static shielding is to be provided.

**3.4 INSULATORS:**

The insulators required for all the bus bar supports shall be epoxy resin cast, indoor type. The hardware used shall be electroplated M.S. The insulators shall be conforming to relevant ISS.

**3.5 PT LINKS:**

The primary of CT's and HT side of PT shall be connected through a flexible copper strip or through an equivalent size of copper wire (8 S.W.G.) such that HT Terminals of PTs are not subjected to any compression or tension forces.

**3.6 L.T. WIRES:**

The LT wiring shall be done with PVC insulated flexible copper wires of cross section not less than 2.5 Sq. mm. of reputed make, conforming to relevant ISS. These will be provided with lugs and ferrules at termination in the LT Compartments, suitable colour, code, PVC insulated flexible Copper wires will be neatly bunched and dressed and without any joints should be used. These wires shall connect secondary of CTs. and PTs. Proper colour code and numbers should be marked on ferrules for individual CT&PT connections. Wiring should remain open i.e. without PVC flexible conduit. There should not be any wiring for neutral PT secondary. Entry point of wires from CT & PT secondary in meter chamber should be just below the meter fixing place i.e. center of metering chamber. Wires from CT & PT secondary should enter in meter chamber from two separate openings.

**4.0 MAKE OF THE COMPONENT:**

List of raw material to be used along with names of the suppliers should be submitted with Part-I of the tender. Make of various components as detailed above and as being given below.

**4.1 HARDWARE:**

Hot-Dip Galvanized of any standard make.

**4.2 PAINT:**

Epoxy – Paint of standard make.

**4.3 EPOXY RESIN :-**

Dr. Beck, Huntsman, Atul.

**5.0 INSPECTION AND TESTING:**

All cubicles shall be inspected and tested at manufacturer works to verify that these are being supplied in accordance with relevant standards. Technical Specification, Guaranteed Technical Particulars and acceptance and routine tests.

Inspection of material offered for inspection shall be carried out by the representatives of Chief Engineer/Superintending Engineer (DQC), PVVNL, Meerut.

While offering for inspection /testing confirmation to the effect that the cubicle have successfully withstood the routing tests (along with test results) is required to be submitted for each lot offered for inspection Superintending Engineer (DQC), PVVNL, Meerut.

All testing equipment used in inspection and testing should be properly calibrated and sealed once a year. Calibration certificate when demanded by the inspecting officer shall be provided / produced for verification purpose. In case of any dispute regarding calibration, instruments shall be sealed and signed by the representative of the supplier and purchaser and will be sent to test house / Govt. Lab / Govt. institution of repute, for calibration at the cost of supplier. The result of such testing shall be binding on the supplier.

Purchaser reserves the right to get the components like CT's / PT's etc. inspected / type tested before dispatch by any independent inspection agency at the cost of purchaser in case the equipment with stand the type test, otherwise the supplier has to bear such cost in addition to any other action deemed appropriate by the purchaser.

One sample of CT of any ratio randomly selected from each offered lot, shall be opened for verifying the diameter & cross sectional area of primary coil conductors including verification of GTP

**Testing Facility:** - The manufacturer must have testing facilities at their works as per clause No. 1.2.3 of "Instruction to Tenderer" to carry out all the routine & acceptance test (including partial discharge test) as mentioned below. List of Testing equipment with photo copy of calibration certificates should be enclosed with Part- I of the tender.

Schematic drawing showing each and every details, dimensions and wiring diagrams shall be submitted necessary for each type of metering cubicle.

## 5.1 Type test:

All the type tests as listed below shall be carried out for the equipment strictly as described as per the relevant ISS(or latest amendment thereafter).

### **Current Transformers (As per IS: 2705 / 1992 or its latest Amendment)**

#### **(A) Type Testing will be done on CT of any one ratio if-**

- (i) The type tested CT has maximum dynamic AT's in confirmation to IS:2705, 1992 Clause no. 9.6.2 (Notes)
- (ii) The shape size construction of all the ratio is same.  
However if shape size & construction varies for different ratio's then all type test shall be repeated accordingly for each shape, size & construction.
  - a) Short-time current test.
  - b) High Voltage power frequency on primary windings.
  - c) High Voltage power frequency on secondary windings.
  - d) Lightning impulse test
  - e) Determination of error according to the requirements of appropriate accuracy class
  - f) Temperature rise test on any one selected sample of each ratio.
  - g) Partial discharge test
  - h) Instruments security factor (ISF) test as per IS:2705. Part-II or any latest amendment.

**Potential Transformers: (As per IS: 3159 / 1992 or its latest amendment. Type test on PT shall be done on any one unit**

- a) Determination of error according to the requirements of accuracy class.
- b) Temperature rise test.
  - (i) At 1.2 times of rated voltage for continuous period.
  - (ii) At 1.9 times of rated voltage for 30 second.

Impulse Voltage Test.

**Complete metering cubicle:** The complete metering cubicle after fitting all CTs and PTs shall be type tested for impulse test by CPRI/ERDA/NTH test lab. The type test report shall be submitted by the bidder.

## **5.2 Routine Tests: -**

The following shall constitute the routine test and acceptance tests.

### **5.2.1 Current Transformers**

- a) Verification of terminal markings and polarity
- b) High Voltage power frequency test on primary windings.
- c) High voltage power frequency test on secondary windings.
- d) Over voltage inter turn test.
- e) Determination of error according to the requirements of appropriate accuracy class.
- f) Partial discharge test in accordance with IS: 11322 / 1985.
- g) Instruments security factor test(IFS) as per IS:2705.

### **5.2.2 Potential Transformers:**

- a) Verification of terminal markings and polarity
- b) Power frequency dry withstand test on primary windings.
- c) Power frequency dry withstand test on secondary windings.
- d) Determination of error according to the requirements of appropriate accuracy class.
- e) Partial discharge test in accordance with IS: 11322 / 1985

## **5.3 Acceptance Test:**

### **5.3.1 Dimensional check of metering cubicle**

5.3.2 High voltage power frequency test on primary winding at 28 KV and secondary winding 3 KV for metering cubicles.

### **5.3.2 Current Transformers**

- a) Verification of terminal markings and polarity
- b) High Voltage power frequency on primary windings.
- c) High Voltage power frequency on secondary windings.
- d) Determination of error according to the requirements of appropriate accuracy class
- e) Temperature rise test on any one selected sample of each ratio.
- f) Partial discharge test
- g) Instruments security factor test(ISF) as per IS:2705, Part-II (7.1.2)

**5.3.3 Potential Transformers**

- a) Verification of terminal markings and polarity
- b) High Voltage power dry withstand test on primary windings.
- c) High voltage power dry withstand test on secondary windings.
- d) Determination of error according to the requirements of appropriate accuracy class.
- e) Temperature rise test on any one selected sample.
  - (i) At 1.2 times of rated voltage for continuous period.
  - (ii) At 1.9 times of rated voltage for 30 second.
- f) Partial discharge test

6.0 In case of any discrepancy between specification and relevant standard, provision contained in this specification shall prevail.