

**DRAFT TECHNICAL SPECIFICATION
FOR
SUPPLY, ERECTION, COMMISSIONING AND TESTING OF
11 KV OUTDOOR HT METERING CUBICLE (HTMC) WITH
LBS/VCB
And Resin Cast Current Transformers and Potential
Transformers.**

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1.0 GENERAL:

- 1.1. All equipment and material shall be designed, manufactured and tested in accordance with the latest applicable IEC/IS standards.
- 1.2. Equipment and material conforming to any other standard, which ensures equal or better quality, may be accepted. In such case copies of English version of the standard adopted shall be submitted.
- 1.3. The electrical installation shall meet the requirement of Indian Electricity Rules- 1956/CEA safety Regulation 2010 as amended up to date; relevant IS code of practice and Indian Electricity Act-1910/IE Act-2003 In addition other rules and regulations applicable to the work shall be followed. In case any discrepancy, the most stringent and restrictive one shall be binding.
- 1.4. The high-tension switchgear offered shall in general comply with the latest issues including amendments of the following standards but not restricted to them.

2.0 SPECIAL INSTRUCTION TO BIDDER:

Bidders are requested to read the following instructions carefully before submitting your Bid.

- 2.1. All the drawings, i.e. elevation, side views, plan, cross-sectional view, etc., in AutoCAD format and manuals in PDF format, for the offered item shall be submitted. Also, the hard copies as per specification shall be submitted.
- 2.2. The bidder shall submit a Quality Assurance Plan for the manufacturing process and a Field Quality plan with the Technical Bid.
- 2.3. The bidder shall have to submit all the required Type Test reports for the offered items. However, in the event of partial submission or reports older than the specified limit, bidder shall require to submit their written consent/ confirmation for the submission of Type Test report/s within the commencement period in case of awarding the order, without affecting the delivery schedule In absence of this confirmation, the evaluation shall be carried out accordingly as non-submission of Type Test reports.
- 2.4. The Bidder must fill up all the points of GTP for offered item/s. Instead of indicating "refer Drawing or as per IS/IEC" the exact value/s must be filled in.
- 2.5. All the other points other than GTP, which are asked to confirm in technical specifications must be submitted separately with the bid.

- 2.6. Please note that the evaluation will be carried out on the strength of the content of the bid only. No further correspondence will be made.
- 2.7. The Bidder shall bring out all the technical deviation/s only at the specified annexure.
- 2.8. The Bidder should indicate manufacturing capacity by submitting the latest updated Certificate of a Chartered Engineer (CE).
- 2.9. The Tenderer/supplier shall bind himself to abide by these considerations to the entire satisfaction of the purchaser and will be required to adjust such details at no extra cost to the purchaser over and above the tendered rates and prices.
- 2.10. Tolerances on all the dimensions shall be in accordance with provisions made in the relevant Indian/IEC standards amended up to date and in these specifications. Otherwise the same will be governed by good engineering practice in conformity with required quality of the product.
- 2.11. It shall also encompass all necessary project management, data engineering, acceptance testing, documentation, and guarantee services.
- 2.12. In the event of an order, the bidder is required to impart primary training free of cost considering manufacture, assembly, erection, safety aspects, operation, all kinds of interlocks, and maintenance for the offered item at his works to the person/s identified by the DISCOMs. In the training session, the bidder shall confirm that he has to impart all the aspects of design, operations, the objective of the individual components, possible defects, and corrections, logical design for the operation of the HTMC, etc.

3.0 SCOPE:

- 3.1. This specification covers the design, fabrication, assembling, testing, and supply of metal enclosure consisting of HT switchgear either LBS with HRC Fuses OR Vacuum Circuit Breaker (VCB) as per the contract demand of existing/prospective HT consumer of the respective DISCOM., auxiliary components, wiring, and supply on a destination basis as decided by DISCOM, and performance testing of 11 KV self-equipped metering cubicle. Trivector meter & 03 nos of 11 kV Resin Cast current transformers and 03 nos of Potential/Voltage Transformers shall not be in the scope of supply. The complete metering cubicle shall be suitable for outdoor application.
- 3.2. The 11KV HTMC with VCB/LBS shall fully meet the technical, climatic, isoceraunic, and system conditions given in this specification, for outdoor installation.
- 3.3. The Switchgear panel should be complete in all respects with insulators, interrupting chamber, operating mechanisms, control cabinet, interlocks, auxiliary switches indicating devices, supporting structures, and allied accessories briefly listed in the schedule of requirements.

- 3.4. The 11 KV HTMC offered shall be compact, maintenance-free, easy to install and operate, reliable, safe, and supplied with all accessories and parts required for their effective and trouble-free operation. Such parts will be deemed to be within the scope of the supply irrespective of whether they are specifically indicated in the commercial order or not.
- 3.5. The bidder shall furnish in his offer a list of recommended spares with unit rates for each set of equipment that may be necessary for satisfactory operation and maintenance of circuit breakers and Isolators. The purchaser reserves the right to selection of items and quantities of these spares to be ordered. The cost of such spares shall not be considered for tender evaluation.
- 3.6. The bidder shall submit a list and unit rates of all the special tools, equipment, and instruments required for erection, testing, commissioning, and maintenance of the equipment. The purchaser shall decide the quantity of tools to be ordered. Prices of these tools shall not be considered for tender evaluation. However, the list of necessary tools/equipment which will be supplied free of cost with each Ring Main Unit may be furnished separately.

4.0 SERVICE CONDITIONS

- 4.1. **SYSTEM PARTICULARS/DISTRIBUTION NETWORK PARAMETERS:** 11KV switchgear equipment and accessories shall comply with the following system conditions:

Sr. no	Particulars		Specification
1	Nominal system voltage (KV-rms)		11
2	Highest system voltage (KV-rms)		12
3	System earthing		Effectively Earthed
4	Number of phases		3
5	Rated Frequency (Hz)		50±3%
6	Fault Level(KA)		21 for 3 sec.
7	Basic Insulation level	1.2 x 50 microseconds impulse with stand voltage (in KV peak)	75
		One minute power frequency withstand voltage (KV RMS)	28

4.2. **ATMOSPHERIC PARTICULARS:-** The climatic conditions at site under which the equipment should be operated satisfactorily for its working life; are as follows:

Sr no	Particulars	Values
1	Maximum ambient temperature of the air in shade (°C)	50
2	Minimum ambient temperature of the air in shade (°C)	5
3	Maximum daily average ambient temperature (°C)	40
4	Minimum yearly average ambient temperature (°C)	30
5	Maximum relative humidity (%)	95
	Altitude above M.S.L. (maximum)	1000 Mtr
6	Average number of thunder-storm days per annum	15
	Average number of rainy days/year	120
7	Average annual rainfall (mm)	925
8	Maximum wind pressure (Kg/m ²)	200
9	Earthquake acceleration (g)	0.08 x 2 g.

NOTE:

1. The equipment offered shall be suitable for continuous operation at the full rated capacity under the above conditions.
2. The HT Consumers are located at various places and atmospheric conditions of highly polluted industrial area or areas of corrosive in nature near coastal, the equipment offered shall be suitable, for a heavily polluted atmosphere without rusting of enclosure and its parts.

5.0 APPLICABLE STANDARDS:

Unless otherwise specified elsewhere in this Specification, the HTMC, Switchboard (Switchgear), Load break switch/VCB, Instrument Transformers, and other associated accessories shall conform to the latest revisions and amendments thereof to the following standards.

Sr No	Applicable IEC/IS	Description
1	IEC 62271- 200:2008/ IS 12729 :2004	General requirement for Metal Enclosed Switchgear
2	IEC 62271 – 102:2018/ IS 9921-2	Alternating the Current disconnecter (LoadBreak isolators) and earthing switch
3	IEC 62271-1:2017	Common specifications for high voltage alternating current switchgear and control gear
4	IS:9385-1:1979/ IEC 60282-1:2009	High Voltage Fuses
5	IEC 62271-100:2008/ IS 13118 : 1991	Specification for alternating current breakers
6	IEC 61869-2:2012/IS – 16227 (Part I & II)	Current Transformers
7	IS – 16227 (Part I & III)	Potential Transformers
8	IS 8686:1977/IEC 60255	Specifications of Static protective relay
9	IEC 62271-103:2011/IS 9920 : 2002 (Part 1,3,4)	High voltage switches & Control gear
10	IEC 60273:1990/ IS : 2099	Dimension of Indoor & Outdoor post insulators with voltage > 1000 V
11	IS/IEC 60529	Classification of degrees of protection provided by enclosures of electrical equipment
12	CEA regulation 2010	For Safety
All Indian Electricity Rules/ Bills amended up to date applicable for clearances, safety and operation of the equipment		

NOTE: In the event of offered equipment conforming to Standards other than the above, The salient points of comparison between the Standard(s) adopted and the relevant IS/IEC shall be indicated in the technical offer to bring out clearly how the chosen standard is equal to or better than the ones stipulated in this specification. Copies of the Standard(s) adopted shall be furnished.

6.0 GENERAL REQUIREMENTS OF THE HT METERING CUBICLE (HTMC):

6.1. The HT metering cubicle shall be installed electrically in between the incoming supply point and the distribution transformer of HT consumers' installation as per the prevailing practice of the DISCOM. The general arrangement of the cabinet shall be as per the enclosed schematic drawing and the final drawing approval has to be obtained from the respective DISCOM, after approval of prototype sample, as mentioned at clause 23 of this specifications. As shown in the general arrangement drawing, the complete HT Metering Cubicle (HTMC) shall have two compartments i.e. Switch gear compartment for LBS with suitable rating of HRC fuses OR VCB with protection relay, CTPT compartment and the provision for HT Metering installation. All three compartments shall be suitably designed to house following components.

- Switch gear Compartment: 11 kV Load Break Switch with Earth switch and three nos of HRC fuses of suitable rating OR 11 kV VCB with protection relay
- CTPT Compartment:
 - 3 Nos of 11 kV Resin Cast Current Transformers having CTR from 10/5 Amps to 250/5 Amps.
 - 3 Nos of 11 kV Resin Cast Potential Transformer having PTR 11/ $\sqrt{3}$ kV//110/ $\sqrt{3}$ Volts.
 - high grade aluminium bus-bars totally covered by HT insulating sleeves.
 - There shall be the provision in the CTPT compartment to run the secondary wires from the terminals of CTs & PTs in the CT / PT compartment and which shall be covered by resin cast blocks and the secondary wires shall be brought in the metering compartment through rubber bush and shall be left open with sufficient spare length. 2 core armoured, multi stranded 2.5 mm², Copper cable of sufficient length for the hard wired connections of the secondary terminals of current transformers and potential transformers. The termination of these secondary cables shall be at the standard make Test Terminal Blocks
 - Adequate number of PVC cable glands to receive purchaser's incoming and / or outgoing cables with suitable cable clamping arrangement at incoming & outgoing of cubicle.
- HT TV Meter installation/Compartment

6.2. The HTMC shall be used for outdoor applications only and its design and components shall be sturdy enough to work satisfactorily under all severe climatic and system conditions parameters as mentioned above.

6.3. The switchgear constructions shall be such that the operating personnel shall not be endangered by breaker operation and internal explosions, and the front of the panel shall be specially designed to withstand such abnormal situations. Pressure relief flaps shall be provided for safely venting out gases produced inside the HTMC during the fault conditions. These flaps shall be vented upwards and cannot be opened from outside. These relief flaps shall be of such construction as not to permit ingress of dust/water in harmful quantities under normal working conditions. The enclosure shall be constructed

with a CRCA sheet of at least 2.0mm thickness. It shall have a rigid, smooth, leveled, flawless finish.

- 6.4. Individual explosion vents shall be provided for the breaker, bus bar, and cable chambers on the top of the panel to let out the gases under pressure generated during an unlikely event of a fault inside the panel.
- 6.5. The complete HTMC shall be mounted on the civil plinth as per the detailed drawing attached in Annexure no: of this specification.
- 6.6. The CTPT compartment/Chamber shall be provided with the facilities for sealing the chamber as per the prevailing practice of the DISCOM, padlock arrangement. Both the front and rear doors of the CTPT chamber shall have the provision for toughened glass fitted inspection windows as per the indicative drawing of this specifications.
- 6.7. The HTMC shall have inbuilt electrical components viz. Load break switch(LBS) with HRC fuse OR vacuum circuit breaker(VCB) with protection as per the rating of the HTMC, Bus bar(main & earth), earth switch, cable termination, CTPT unit compartment, metering compartment, auxiliary components, and wiring, etc. These individual components are described below.

7.0 LOAD BREAK SWITCH (LBS):

- 7.1. The 11 KV LBS shall comply with the requirements of the latest edition of IEC 62271 – 102:2018/ IS 9921-2 except where specified, in the specification. It shall consist phase-wise HT HRC fuse to protect from overload and short circuits. The rating of the HRC fuse and its characteristics shall require to match with the CTR of the HTMC. The necessary padlocking arrangements and essential mechanical interlocks shall be provided as per the IEC/IS provisions or as required by the DISCOM.
- 7.2. The LBS shall be capable of rapid and smooth interruption of load currents under all conditions, completely suppressing all undesirable phenomena of the power system or may happen during capacitor switching operations. There shall be no re-striking, no abnormal voltage, and no arcing upon switching of the capacitor banks. The details of any devices incorporated to limit or control the rate of rising of re-striking voltage across the LBS contacts shall be stated. The overvoltage caused by the switch while switching inductive or capacitive loads shall not exceed 2.5 times the highest phase to neutral voltage. The actual make and break times of the switch throughout the range of their operating duties shall be stated in the tender and guaranteed.
- 7.3. The LBS shall be robust in construction, to meet all the climatic and incidental occurrences.
- 7.4. The symmetrical load-breaking capacity of the switch shall be 10 MVA, which shall remain constant within the limits of the rated voltages specified in this specification. For voltages lower than the rated voltage, the breaking current shall remain constant.
- 7.5. The temperature rise and maximum temperature on any part of the panel, while in service under continuous full load conditions shall not exceed the permissible limits of temperature rise as specified in the IEC 62271 – 102:2018/ IS 9921.

- 7.6. Gaskets shall be of a material that will not deteriorate under any service conditions. Metallic compression steps shall be provided for the compressible gasket.
- 7.7. Main contacts shall have ample area and contact pressure for carrying the rated current and the short time short circuit current of the switch without excessive temperature rise which may cause pitting or welding. Contacts shall be adjustable to allow for wear and shall be easily replaceable and shall have a minimum of moveable parts.
- 7.8. The switch shall be suitable for rapid closing and opening. The Load Break Switch opening and closing operations shall be done by a manual mechanism. However, the opening of the LBS is an auto mechanism in case of fusing any of the HRC fuses. The mechanism shall be designed to withstand a number of sequential ON and OFF operations of the Load Break Switch.
- 7.9. Working parts of the operating mechanism shall be of corrosion resisting material, bearing which requires grease, shall be equipped with pressure type grease fittings. Bearings pins, bolts, nuts, and other parts shall be adequately pinned or locked to prevent loosening or changing adjustment with repeated operation of Load Break Switch.
- 7.10. Mechanical indicators to show the close/open/earth position of the contacts shall be provided on the front panel of the HTMC at visible height. It is also required that if any HRC fuse is blown off, then LBS must be switched to the "OFF" position immediately and automatically with mechanical interlocks and specific indication to be displayed, Hence the system abnormality can be identified.
- 7.11. All MS parts of Load Break Switch and ferrous parts such as hangers supports, bolts & nuts shall be hot-dip galvanized as per IS:2629 (latest edition) with zinc plating & olive green passivation. The material for spring shall be rust-proof.
- 7.12. The Load Break Switch along with the operating mechanism shall be mounted properly.
- 7.13. The manual operating device to be provided should be at a convenient height so that it can easily be operated.
- 7.14. The Load Break Switch shall comprise three independent poles, fitted with a common operating mechanism.
- 7.15. The Load Break Switch along with its operating mechanism shall be mounted inside the compartment of a weatherproof sheet steel cabinet suitable for outdoor conditions of HTMC.
- 7.16. Each pole of the Load Break Switch shall be mounted on a common chassis and connected together for operation by a common operating mechanism.
- 7.17. The Load break and Earth Switch shall be manually operated however, the arrangement of manual operation should be as per the relevant IS and the minimum force for the manual operation to be considered as per reference given in the relevant IS.
- 7.18. The phase-wise LED indicators shall be provided for the status of "Live incoming and outgoing Cables" through Capacitor Voltage Dividers mounted on the bushings of the cable.

7.19. The LBS shall be having specific Mechanical ON/OFF/EARTH Indication

7.20. The LBS shall be provided with Anti-reflex operating handle

7.21. Cable Testing facility without disconnecting the cable terminations, cable joints and terminal protectors on the bushings.

7.22. Cable terminations Cable boxes suitable for 3C x 185/300 sq mm XLPE Cable with right angle Cable Termination Protectors.

7.23. Interrogated Interlocking System:

The following interlocks as per the relevant provisions of IS/IEC and specific requirements of DISCOMs; between the Load Break Switch and cubicle shall be provided.

- i. The LBS chamber door can only be opened when the Load Break Switch is in 'OFF' and the earth switch is in "ON" condition & vice versa.
- ii. The earthing switch cannot be open when the LBS chamber is open.
- iii. There shall be a strong mechanical interlock between LBS and Earth switch in the form that the LBS cannot be closed when the earth switch is ON and vice versa.
- iv. The important operating instructions in the Local language are to be displayed on the relevant doors of the HTMC.
 - The Load Break Switch must not be operated when the LBS chamber is in OPEN position.
 - Operational instructions for CTPT Replacement
 - Switch off LBS and verify the indicator
 - Earth the LBS with Earth Switch and verify the indicators
 - Open CTPT Door Chamber for replacement
- v. The details and ratings of the arc extinguisher shall be indicated in GTP and on the Nameplate of the cubicle panel.

8.0 VACUUM CIRCUIT BREAKER (VCB):

8.1. The circuit breakers shall comply with the requirements of the latest edition of IS 13118: 1991 or IEC-62271-100 & 200 except where specified, otherwise in the specification.

8.2. VCB Panelboard shall be enclosed, Single Bus Bar, Floor mounted Metal Clad, Indoor type Flush Front, Horizontal Draw out & Horizontal Isolation Vacuum Circuit Breaker suitable having 'M2 Class type Tested mechanism' for installation in 3 Phase, 50Hz, 11KV, 21KA for 3 Sec. effectively Earthed supply system comprising of housing for Breakers, mechanical interlocks, safety shutters, 06 Nos Isolating Plugs and a VCB Trolley with three vacuum interrupters & epoxy supports insulators and self-aligning finger type isolating contacts, Trucks having integral locking-in Device for insertion and withdrawal of VCB complete with necessary interlocks.

8.3. The Circuit Breaker shall have the Manual charged, independent spring closed/spring

tripping, trip-free operating mechanism with manual closing and tripping push button.

- 8.4. Mechanical indication as per relevant IS/IEC viz. Breaker Closed/Open, Spring Charged/Discharged Mechanical Operation Counter, Electrical Release Coil, Breaker operated auxiliary Switch with 6NO+6NC and spare Contacts Manual Hand Operated mechanism.
- 8.5. The manual operation of the circuit breaker shall not have any effect on the trip spring. This should only be discharged under a fault (electrical) trip; the following manual reset operation should recharge the trip spring and reset the circuit breaker mechanism in the main off position.
- 8.6. The circuit breaker shall be fitted with a mechanical flag, which shall operate in the event of a fault (electrical) trip occurring. The “tripped” flag should be an unambiguous color differing from any other flag or mimic.
- 8.7. The circuit breaker shall have an Anti-reflex operating handle. Anti-reflex handles - these must be fitted to ensure that the equipment can only be operated fully in one direction (open or close), before the handle is re-oriented to allow operation in the other direction.
- 8.8. The circuit breaker front door shall be fitted with a “Live Cable” LED Indicators through Capacitor Voltage Dividers mounted on the incoming and outgoing cable bushings, the indicator should be visible from outside without opening the doors.
- 8.9. Circuit Breakers shall be provided with the following accessories.
 - I. Auxiliary Switch with minimum 6 NO + 6 NC auxiliary contacts.
 - II. Tripping Coil
 - III. Mechanical Operation Counter
 - IV. Spring Charging Handle
- 8.10. **Protection and Tripping Arrangement:**-The protection on the circuit breaker shall comprise the following components.
 - I. The phase-wise protection Current Transformer shall be of Epoxy resin cast and shall be used for indoor for each phase of the system, having rating 250/1 Amp and accuracy class 5P10 as per relevant IS 2705-Part III 1992.
 - II. low burden trip coil and a Self-powered non-directional IDMT (Inverse Definite Minimum Time) protection relays (Numeric/Microprocessor-based) 3x over current and earth fault element shall be definite type time relay. The relay should be housed within a pilot cable box accessible.
 - III. Overcurrent Relays shall have an adjustable setting for current from 50% to 200% and Earth Fault from 10% to 40%. These shall be manual reset types.

9.0 EARTHING SWITCH:

- 9.1. The LBS shall be equipped with an inbuilt integrated earth switch.
- 9.2. The earthing switch with a making capacity of 50 KA must be integrated into a comprehensive interrogator interlocking system and must be equipped with an ON snap action drive (The closing action of the earthing switch is of snap-action type).
- 9.3. The Earth switch shall be Rated peak withstand current 21 KA for 3 sec.
- 9.4. The proper mechanical interlocking of the earth switch with LBS shall be provided. Between
- 9.5. LBS 'ON' and Earthing and (b) Between earthing switch and Cubicle opening doors.
- 9.6. Earth switch contacts must be closed with proper pressure to avoid any loose contacts.
- 9.7. Each pole of Earth Switch shall be mounted on a common chassis and connected together for operation by common operating mechanism.
- 9.8. One end of the earth switch shall be connected to bus bar and second end shall be brought out of the cubicle for proper earthing with 2 nos holes suitable for ½" size galvanized bolts. 2" x ½" size 2 nos hot dip galvanized bolts and plain and spring washers shall be provided for earthing connections.

10.0 CUBICLE EARTHING :

- 10.1. All metal parts of the cubicle which do not belong to the main circuit and which can collect electric charge causing dangerous effect shall be connected to the earthing conductor made of copper having a cross-section area not less than 75 sq. mm. Each end of the conductor shall be terminated by M10/equivalent quality and type of terminal for connection to earth system installation. There shall be continuity between the metallic parts of the switchboard and cables so that there is no electric field present in the surrounding air, thereby ensuring the safety of people.
- 10.2. Earth conductor location shall not obstruct access to cable terminations. Minimum two numbers of earth terminals shall be brought out of the cubicle. Inside the cubicle, an aluminium bus bar with size 50X6 mm and length as per the requirement shall be provided.
- 10.3. The following items are to be connected to the main earth conductor by rigid or copper conductors having a minimum cross-section of 75 mm² (a) earthing switches
- 10.4. (b) Cable sheath or screen (c) CTPT unit enclosure (d) capacitors used in voltage control devices, if any.

10.5. The metallic cases of the relays, instruments and other panel mounted Equipments shall be connected to the earth bus by independent copper wires of size shall be made as per the provision of IEC/IS standards. The colour code of earthing wire shall be green. Earthing wires shall be connected on the terminals with suitable clamp connectors and soldering shall not be permitted.

10.6. Two no. of Maintenance free chemical earthing with connecting G.I Strip are to be provided with ref IS: 3043-1987(2006).

11.0 HRC FUSE:

11.1. HRC fuse base having same capacity of Load Break switch shall be provided in the chamber of LBS in series of it.

11.2. All the devices shall be connected in series as under:

11.3. Incoming cable from UTILITY to LBS to HRC fuse to P1 of CTPT unit and P2 of CTPT unit to outgoing to consumer LBS cubicle/overhead structure through a cable.

11.4. The HRC fuses used in the Load break switch-fuse combination shall have a striker pin that ensures tripping of the three-pole load break switch in case of any HRC fuse is blown off.

11.5. The 11 KV HRC fuse shall comply with the requirements of the latest edition of IS:9385-1:1979/ IEC 60282-1:2009. The rating of the HRC fuses shall be per the rated primary current of the CTs. i.e. which is from 10/5 Amp to 250/5 Amps.

12.0 CT and PT COMPARTMENT:

12.1. Three nos. of CTs & 3 nos. of PTs shall be mounted in this compartment. Resin cast bushings of suitable size, strength & rating shall be provided on the two sides leading to two cable compartments. PT's are to be fixed on incoming side after that CT's shall be fixed keeping suitable distance as shown in indicative drawing. , required clearance shall be maintained from chamber body to CT and PT live bare terminals. The size of the CTPT chamber shall be such that for future augmentation of CT and PT units for load extension requirement by the consumer can be managed with the same HTMC unit.

12.2. The inside terminals of the resin cast bushings, the primary terminals of CTs and primary terminals of PTs shall be connected to electrolytic grade aluminium bus bar of adequate rating and size considering the current density of the aluminum bus bar shall be 1.0 Amp/mm².

12.3. The secondary wiring of CTs & PTs shall be carried out by 1100 V grade multi-stranded two core 2.5 mm² copper wire. Other end of these wires shall be terminated with the provision of marking with ferrules in the standard make Test Terminal Block (TTB) to be fixed inside the wall near to the metering installation/compartment. At the time of HT metering, concern DISCOM shall extend the 10 core 2.5 mm² copper armoured cable from this TTB to the metering TTB for further termination to HT static meter. Entire wiring of cubicle shall be covered in rectangular box type PVC conduit so as to avoid the scattering of wires.

12.4. The CTs & PTs with base frame attached shall be firmly mounted on 75 x 40 x 5 mm base channel in CT and PT compartment. Additional support if necessary may be provided for mounting CT / PT so as to have the bushing terminals, CT primary terminals & PT primary terminals are at same horizontal level i.e. Busbar level. The distance between Busbar bottom surface to mounting channel upper surface for CT and PT shall be 251 mm.

12.5. Mounting Details :-

- I. Mounting details for fixing the Current Transformer on supporting base channel shall be strictly in accordance with the specified details as follows:
- II. The holes for mounting of CT shall be oval shaped with 12mm diameter.
- III. Base Frame hole mounting centre to centre distance (mm) should be 285 (L) x 140 (W).

12.6. There shall be the provision of inspection window provided with toughen glass on the each door of the CTPT chamber i.e on the front and rare door. The height of the inspection window from the base of the door and the dimensions of the glass inspection window shall be such that all three CTs, PTs, metering cable/s and terminal boxes of the CT and PT shall be clearly visible from outside. The fixing of the glass of the inspection window shall be from inside to make the provision pilfer proof i.e Hardware used for fixing window glass, hinges, and particle board shall be concealed and non-removable from outside.

12.7. Proper illumination arrangement shall be provided inside the CTPT chamber for the periodic inspection of CTPT unit from outside through inspection window. The operation switch for the illumination shall be provided on the outside of the chamber.

12.8. No metal parts of primary and secondary windings of the CTs and PTs shall be accessible. The metal parts shall be heat shrinkable insulated.

12.9. The doors of the CTPT chamber shall be designed with proper sealing and padlocking facilities. There shall be also provision to provide an metal cover over the plastic seals with padlocking arrangement for the protection of the seal.

12.10. Natural ventilation is provided by means of ventilation louvers for air intake in the lower part of the CTPT compartment doors. The air is extracted at the top of the roof. Natural air circulation ensures sufficient cooling of the CTPT compartment. The ventilation louvers are of the labyrinth type.

12.11. Heater is required to provide for maintaining the temperature during monsoon when humidity is high. The auxiliary AC voltage for heater shall be taken from external source.

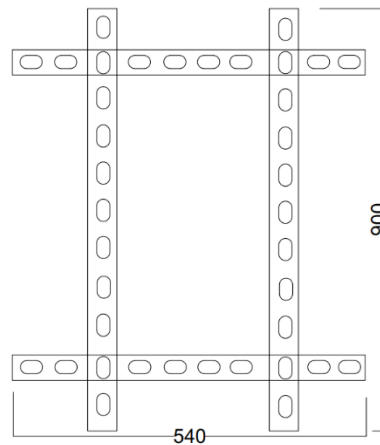
12.12. The CTPT chamber shall be equipped with mechanical/electrical interlock with Earth switch for the safety of the DISCOM operating staff. The interlock shall be such that the CTPT chamber can be opened and have the access to the CTPT only if the earth switched is "ON" and earthed solidly.

12.13. There shall be the optional provision to log the opening and closing operations of the doors of the CTPT chamber and for that appropriate limit switches with one auxiliary contact shall be required to provide on each CTPT door.

- 12.14. The distance between live part of busbar to earth shall be minimum 190 mm.
- 12.15. The busbar centre to centre distance (mm) should be minimum 235/255 mm & busbar centre to earth should be 227.5/255 mm for 11 kV Metering Cubicle.

13.0 ENERGY METER INSTALLATION:

13.1. There shall be the provision for the installation of HT Metering box (which shall be provided by the user DISCOM at the time of commissioning) on the outside side wall of the LBS/VCB Chamber using the M.S strips of minimum thickness of 2.0 mm and having dimensions 900X540 mm and capsule holes shall be provided on the strip as per following reference drawing. The base of the mounting MS strips shall be permanently fixed and welded. The HT Meter, its Test Terminal Block shall be fixed by the user DISCOM inside the HT Metal/SMC metering box. Appropriate size of access hole with the matching gland size shall be provided. The fixing of the MS Strips shall be at the appropriate height so that the meter display shall be at the normal eye level.



13.2. As per prevailing practice of DISCOM, 1.1 KV, 10Core, 2.5 mm² PVC insulated armoured EC grade stranded core copper secondary cable shall be used for metering, which shall be further provided by the user DISCOM. Hence, for the running and fixing of this cable, necessary provisions shall be given in the HTMC enclosure with flexible glands for secondary measuring cable. Cable shall be fixed with glands at both the ends i.e. in the enclosure and HT MMB/SMC.

13.3. There shall be the provision for M.S. canopy rain hood of the dimensions of 450 (W)X 300 (D) mm to shelter and protect the HT TVM MMB/SMC Box from direct weather effects and for ease for the operational staff during the working. The hood shall be appropriately welded with the wall of the cubicle unit.

14.0 CUBICLE PANEL

14.1. The panel shall be designed and manufactured as per the indicative drawings of this specifications.. The 11 KV HT Metering panel with its accessories and fittings shall be used for outdoor, plinth mounting, cubicle type switch gears for protection on

the primary side of the CTs and PTs. The panel board shall be so constructed as to form independent 11KV outdoor panel. The panel shall be completely dust and vermin proof. The panels shall remain vermin proof, even when the CT OR PT is taken out for maintenance/replacement. Overall dimensions of the panel shall be furnished along with drawing. The exterior as well as interior of panel shall be painted with two coats of stove enamel paint, with zinc phosphate treatment, after application of single coat of anti-rusting paint. The exterior shall be painted with light gray paint shade 631 of IS: 5. The interior shall be painted with glossy white paint shade. The manufacturer shall have in-house painting facility. The panels shall be provided with MS sheet on all sides. The panel shall be provided with not less than 2 mm thick MS sheet for all sides. Suitable barriers for the bus-bars Load Break Switches shall be provided, Lifting arrangement shall be provided for the panel. Load Break Switch, Bus bar, cable/CTPT chamber shall be individual. The door of LBS/VCB chamber shall have Wire mesh provided behind it, so that the person opening the door shall not have direct access to live parts of the panel.

14.2. Instructions shall be engraved on the switchgear panel, on the LBS/VCB/CTPT compartments describing in simple steps how to carry out standard and safe isolation, operation, racking-in and racking-out switching operations on the circuit breaker and CTPT unit. Similar details should be provided for the operation of the earth switch.

14.3. Single Line diagram of electrical and control wiring shall be provided inside of LBS/VCB and CTPT Compartment.

14.4. Danger plates shall be provided on the H.V sides, mentioning the Corresponding Voltages.

14.5. The drawing and Dimensions of cubicle is for reference only, the manufacturer may design to meet the requirements of tender.

- Depth : 1300 mm to 1900 mm
- Height : 1700 mm to 2100 mm
- Width : 1200 mm to 1500 mm

15.0 BUS– BAR: A set of 3-phase bus-bars of 630 A current rating, having size of preferably 65x 10mm, suitably insulated with HT grade heat shrinkable tube sleeve. The bus-bars shall be made of electrolytic high grade aluminium and shall be rectangular bars of sufficient current rating. PVC sleeves/tap of suitable thickness shall be provided on bus-bars and jumpers except at the joints. The joints shall be separately taped with paraplast compound sleeves or PVC tapping. Suitable shutters shall be provided in addition and separate from interlocks, with padlocking arrangements, so that bus- bars become inaccessible, when the Load Break Switch is open for maintenance. Inter phase barriers shall be of FRP/UL994 material.

16.0 EARTH QUAKE AND WIND DESIGN LOADS: Equipment shall be designed to withstand repeated earth quake accelerations of 0.08 x 2g. And wind loads of 150 kg/m² on the project area (non simultaneous) without damage to component parts and without impairment of operation.

17.0 AUXILIARY POWER SUPPLY: Power supply for auxiliaries shall be arranged from the electrical installation of the concern HT consumer end at 240 V, single phase and 415 V,

three phase, AC 50 Hz. The frequency can vary between 97% and 103% and voltage would vary from 110% to 85% of the normal value for heaters and lighting lamps. Provision of Plug sockets for connection of external auxiliary LT supply shall be made with necessary electrical protection in the HT cubicle.

18.0 CABLE CONNECTION COMPARTMENT:

- 18.1. The cable connection compartment must be successfully tested according to DIN VDE 0670 part 6 or equivalent IEC for behavior in the event of an internal defect. No (insulation material) metal surface of the cable box is allowed to ensure arc proof resistance in the cable connection compartment.
- 18.2. The cable connection compartment cover must be integrated in the comprehensive integrator interlocking system.
- 18.3. The compartment must be dimensioned in such a way that two parallel cables can be accommodated.
- 18.4. The cable compartment door must be detachable/removable type so as to facilitate easy connection of the cable and not to allow any hindrance to the maintenance staff while doing maintenance. No cable cover should be hinged type.
- 18.5. The six nos of Copper Flexible jumper of 32X6 mm of following length shall be provided with each HTMC unit for electrical connections with CTPT unit and incoming and outgoing circuit.
 - i. R & B phase-660 mm
 - ii. Y Phase -490 mm

19.0 OPERATION AND CONTROL:

The HT Metering Cubicle shall be provided with single line diagram and mimic diagram showing integrated position indicator for all switching devices at the front side of the cubicle.

The following performances must be possible while front panel is closed.

- a. Switching
- b. Mechanical position indicator
- c. Mechanical operation
- d. Auxiliary voltage indicator.(External source voltage)

20.0 MOUNTING of HTMC:

Two numbers of base channels along the length having minimum size of 100x50mm shall have to be welded with two numbers of holes suitable for 5/8" dia foundation bolts in each channel at a centre to centre distance 2500 along the length and mm to fix the same with grouted foundation bolts on plinth.

21.0 NAME PLATE

The name plate / rating plate shall be provided and shall also indicate Supply voltage, frequency, no of phases, all required details of Load Break Switch/VCB , panel, earth switch, rated current, rated voltage, auxiliary voltage, HRC fuse rating , protection CT ratio, name of supplier, PO No & date, serial no of HTMC and any other required details as confirmed by the DISCOM. The name plate shall be approved by concern DISCOM.

22.0 TYPE AND ROUTINE TESTS FOR HTMC AND ITS COMPONENTS:-

22.1. **TYPE TEST for HTMC Panel:**-The outdoor switchgear panels shall be of proven design for outdoor installation and should have been type tested as per relevant IS/IEC for the following type tests, carried out in Government approved laboratory, within last seven years prior to date of bid opening. The Type test reports shall be submitted with the offer. In case of non-submission of some of the type test reports with the offer, the bidder shall have to confirm for submission of the same before commencement of supply without affecting delivery schedule.

Sr. No.	Testes to be conducted	Value required
1.	insulation Resistance test	Min. 1000 MΩ with 5KV Tester.
2.	Temperature Rise test	As per IEC 62271-200
3.	Measurement of resistance of main circuit.	As per IEC 62271-200
4.	Short time withstand current	21 KA for 3 Sec
5	Power frequency withstand test at 28 KV rms	As per IEC 62271-100/200
6	Internal Arcing test	As per IEC 62271-200
7	Lightning Impulse With stand test	As per IEC 62271-200
8	Degree of Protection	IP54

22.2. **Routine tests/acceptance test for HTMC:** - As per the latest edition of IS/IEC for complete HTMC panel shall be performed on the each HTMC manufactured to ensure the quality of the supplied material. Following listed routine/acceptance tests to be performed.

Sr. No.	Testes to be conducted
1.	Mechanical Operation test
2.	Test of electrical and mechanical interlocks and indicators
3.	Functional test
4.	Power frequency withstand at 28 KV rms
5.	Temperature rise test on complete cubicle at rated current
6.	Over all dimensions and verification of complete electrical wiring
7.	Measurement of resistance of main circuit.

22.3. The test reports for type tests and routine tests in respect of other equipments used in the manufacturing of HTMC as per the latest edition of the relevant IS/IEC shall be supplied by the bidder.

Sr. No.	Component to be tested	Testes to be conducted	Applicable IS/IEC
1.	Vacuum Circuit Breaker	a) Dielectric test b) Temperature Rise test c) Measurement of resistance of main circuit. d) Short time current and peak withstand current test e) Mechanical endurance test f) Duty cycle test g) Single phase making and breaking test h) Degree of protection (IP5X) i) Humidity test j) Type tests reports for numerical relays and major bought out items as per relevant k) IS/IEC.	As per IS 13118 / IEC 62271-100
2.	Load Break Switch(LBS)/ Isolator	a) Lightning Impulse Voltage withstand test b) Power Frequency Voltage (Wet) withstand test on main circuit. c) Temperature rise test on main isolator d) Short Time Current & peak withstand current test on isolator and earthing switch. e) Short Circuit making performance test of earthing switch. f) Operating and mechanical endurance test on isolator and earthing switch	IEC 60129/ IEC 62271 – 102/ IS 9921
3.	Protective current transformer(CT)	a) Current error and phase displacement b) Composite error	As per IS 2705-part-3:1992

22.4. All tests reports for acceptance / routine rests shall be submitted and got approved

from the purchaser before dispatching the Cubicle.

23.0 INSPECTION: The inspection may be carried out by the purchaser at any stage of manufacture. The successful bidder shall grant free access to the purchaser's representative at a reasonable time when the work is in progress. Inspection and acceptance of any equipment under this specification by the purchaser shall not relieve the supplier of his obligation of furnishing equipment in accordance with the specification and shall not prevent subsequent rejection if the equipment is found to be defective.

24.0 DOCUMENTS AND DRAWINGS:

24.1. The bidder shall furnish two sets of following drawings and documents with dimensions along with their offer.

- I. Complete assembly drawings of the metering cubicle showing plan, elevation and typical sectional views and locations of cable boxes, bus bars, metering compartment and TV meter.
- II. Single line diagrams of electrical and Control wiring
- III. Foundation plan showing location of foundation channels, anchor bolts and anchors, floor plan and openings for cables etc.
- IV. Type test certificates for type testing of bought out items, if already carried out.
- V. Descriptive pamphlets and literature of bought out items including CT characteristic curves etc.

24.2. All drawings and data shall be annotated in English

24.3. Successful tenderer shall be required to furnish four sets of final versions of all the above said drawings and documents within 15 days after Proto type inspection, for purchaser's approval.

24.4. Approval of drawings/work by purchaser shall not relieve supplier of his responsibility and liability for ensuring correctness and correct interpretation of the drawings for meeting the requirement of the latest revision of applicable standards, rules and codes for practices. The equipment shall conform in all respects to high standards of engineering, design, workmanship and latest revisions of relevant standards at the time of ordering and purchaser shall have power to reject any work or materials which, in his judgment, is not in full accordance therewith.

24.5. Instrumentation Manual The successful bidder shall submit three copies of manual of complete instructions for the installations, operation, maintenance and repair and circuit diagrams.

25.0 TRAINING :

The successful bidder shall arrange one/two days training for the DISCOM engineer and maintenance staff considering various aspects of HTMC. The training contains proper understanding of operation and construction of the HTMC, normal trouble shooting, replacement of HRC fuses, safety precautions, interlocks understanding etc.

26.0 PACKING AND DISPATCHING:

26.1. The equipments shall be packed in crates suitable for vertical/horizontal transport, as the case may be, and suitable to withstand handling during transport and outdoor storage during transit. The supplier shall be responsible for any damage to the equipment during transit due to improper and inadequate packing. The easily damageable material shall be carefully packed and marked with appropriate caution symbols. Wherever necessary, proper arrangement for lifting, such as lifting hooks etc. shall be provided. Any material found short inside the packing cases shall be supplied by supplier without any extra cost.

26.2. Name of the consignee each consignment shall be accompanied by a detailed packing list containing the following information.

- I. Details of consignment
- II. Destination
- III. Sign showing upper/lower side of the crate
- IV. Handling and unpacking instructions
- V. Bill of material indicating contents of each package.

27.0 MINIMUM Guaranteed TECHNICAL PARAMETERS OF THE VARIOUS EQUIPMENTS USED IN THE HTMC

I. Load Break Switch (LBS):-

sr no	Particulars		Specifications
1	Type		Indoor fix type
2	Insulating Medium		Air
3	Load Breaking capacity		630 Amp.
4	Rated normal current of LBS		630 Amp.
5	Bus-bar Rating (Amp)		630 Amp.
6	LBS	Minimum Rated short time current (KA RMS)	21
		Rated time (Sec.)	3
7	Method of closing	Normal	Manual
		In case of Emergency	Manual
8	Method of	Normal	Manual

	opening	During Emergency	Auto
9	Size of bus bar		As per requirements so as to match with the ratings of LBS

II. Vacuum Circuit Breaker (VCB):-

Sr no	Particulars	Unit	Values
1	Rated voltage	KV	12
2	Power frequency withstand voltage	KV	28
3	Impulse withstand voltage	KVp	95
4	Rated frequency	Hz	50
5	Type	---	Indoor draw out
6	Rated current (bus bars)	A	630
7	Rated current (cable switch)	A	630
8	Rated current (T-off)	A	630
9	Breaking capacities:		
10	Active load	A	630
11	Rated making capacity (Minimum)	KA	52.5
12	Rated short time current 3 sec. (Minimum)	KA	21
13	Operating Method	----	Manual & Relay tripped
14	Rated Operated Sequence	-----	0-3 min-CO-3 min-CO
15	Opening time(Approx.)	ms	40
16	Closing time (Approx.)	ms	50

SCHEDULE - A

- I. The prospective bidder shall submit with their bid the following GTPs for the individual equipments being the indigenous components of the supplied HTMC
- II. Unless otherwise brought out separately by the bidder, the equipment offered shall be claimed to conform to the specification, scrupulously. The discrepancies between the specification and the catalogues or literature submitted as part of the offer shall not be considered as valid unless specifically brought out

ANNEXURE-A
GUARANTEED TECHNICAL PARTICULARS
(To be filled in and signed by the bidder)

[I] LOAD BREAK SWITCH (LBS)/VACUUM CIRCUIT BREAKER (VCB):

Sr.No.	Particulars/Units	To be specified by Bidder
LOAD BREAK SWITCH (LBS)/VACUUM CIRCUIT BREAKER (VCB):		
1	Maker's name and country of manufacturer	
2	Manufacturer's type designation	
3	Applicable technical standards	
4	Rated voltage (KV)	
5	Service voltage (KV)	
6	Type of LBS/VCB	
6.a	Operation mechanism of LBS/VCB	
7	Ambient temperatures used for design	
	i Maximum (°C)	
	ii Maximum daily average (°C)	
8	Continuous current	
	i Under site condition (Amp)	
	ii Rated (Amp)	
9	Rated short time current(KA rms)	
9.1	Rated time (Sec)	
10	Maximum rise of temperature over ambient for rated current (°C)	
11	Rated operating duty cycle	
12	Interrupting capacity based on duty cycle in clause 28 above	

	i Symmetrical at rated voltage in KA and MVA	
	ii Asymmetrical at rated voltage (KA)	
	iii Symmetrical at service voltage (KA)	
13	Rated re striking voltage	
	i Amplitude factor	
	ii Rate of rise of natural frequency	
	iii Type devices, if any used to limit the rate of rise of restricting voltage	
14	Rated continuous voltage for rated MVA (KV)	
15	Making capacity (KA peak)	
	i At higher rated voltage	
	ii At lower rated voltage	
16	Type of devices, if any used to obtain uniform voltage distribution between breaks	
17	Recovery voltage distribution between breaks in percentage of rated voltage	
	i Switching off capacitor banks	
	ii Switching OFF on an unloaded transformer	
18	Details of main contacts	
	i Material	
	ii Whether contacts are silver plated	
	iii Thickness of silver coating	
	iv Contact pressure (kg/mm ²)	
19	Insulation level of the LBS/VCB	
	i One minute dry withstand voltage (KV rms)	
	ii One minute wet withstand voltage (KV rms)	
	iii Impulse withstand test voltage (KV peak)	

20	Minimum Clearance In Air	
	iii Between phase (live parts) (mm)	
	iv Between live part and earth (mm)	
	v Centre distance between phases (mm) for arc	
21	Extinguisher Standard to which the LBS confirms Details of extinguisher Indicate (make/Type/Rating)	
22	Weight of LBS/VCB (kg)	
23	Method of closing	
	i.Normal:	
	ii.Emergency	
24	Nos. of operations, the LBS is capable of performing at 100% breaking capacity	
25	Relay make and type	
Current Transformer		
1	Make & Type	
2	Reference standard	
3	Voltage/frequency	
4	Current Ratio and Accuracy Class	
5	Class of Insulation	
6	Insulation Level (Peak / rms)	
7	Short time current rating for 1 sec. (KA	
8	Accuracy limit factor	
9	Instrument security factor	
10	Rated Burden	
HRC FUSE		
1	Make & Type	
2	Voltage & Current Rating	
3	Applicable Standard	

HTMC Unit		
1	Overall dimensions of panel	
1.a	Breadth (mm)	
1.b	Width (mm)	
1.c	Length (mm)	
2	Dimension of Each compartment	
2.a	LBS/VCB Compartment	
2.b	CT and PT Compartment	
2.c	Metering compartment	
3	Earthing Conductor & Bus bar size and material	
4	HTMC Enclosure sheet thickness & Paint type	
5	Bus Support Insulator Type & Voltage Class	
5.a	i) Type & Voltage Class ii) Dry withstand Voltage for 1 min. KV rms iii) Wet withstand Voltage for 1 min. KV rms iv) Impulse withstand Voltage KV v) Minimum Creepage distance mm. vi) Calculation of Short Circuit Force withstand capability	
6	Busbars provided with Insulating Sleeve or Insulating Barriers	
7	Approximate Total Weight (Kg)	
8	Describe LBS/VCB Interlocking mechanism	
9	Earth switch normal and Short circuit capacity (Amp)	
10	"Live Cable" LED Indicators Provided?	
11	Dimension of CTPT Inspection window	
12	IP of HTMC unit	
13	Explosion Vent Provided?	
14	Describe	
	Heater	
	vi Make	
	vii Type	
	viii Rating in KW	
	ix Rated Voltage	

15	INDICATING LAMP suitable for 240 V	
	i Make	
	ii Type	
	iii Operating voltage	
	iv Lamp wattages	
SWITCHBOARD WIRING :		
1	Insulation of wire	
2	Size of wire (mm ²)	
3	Grade of wire (Volt)	
4	Whether conductor is of	
	Copper	
	Stranded	
5	Whether wire ends provided with lug type arrangements	
6	Make and voltage grade of terminal blocks used	

Note: Instead of giving reference of drawing nos./IS/literatures etc. actual values/figures must be furnished, where ever required, otherwise the said details in G.T.P. of the Technical Bid,
