

MAHARASHTRA STATE ELECTRICITY DISTRIBUTION COMPANY LTD.

TECHNICAL SPECIFICATION FOR
LT SINGLE PHASE STATIC ENERGY METER
SPEC NO:- DIST/MM-IV/001(Dt. 09-08-2006)

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Maharashtra State Electricity Distribution Company Ltd.
Technical Specification for LT Single Phase Static Energy Meters
Specification No. DIST/MM-IV/001(Dt. 09-08-2006)

1.00 SCOPE:

This specification covers the Design, Manufacture, Testing and Supply of ISI marked LTAC Static LCD Energy Meters suitable for measurement of Energy (Kwh) and Demand (KwMD) in Single Phase, Two wire system of LT Consumers.

- 1.01 The original manufacturer of LT AC Static Energy Meters shall only quote against this tender. In case of Foreign Manufacturer, the authorised Agents /Traders/Distributors may also bid provided that they have all the testing facilities in India and meters bear ISI mark.

2.0 Qualifying Requirement:

The bidder/manufacturer having last annual turn over of 50 crore, must have minimum three years experience to manufacture single phase energy meters & have supplied minimum ten Lakhs similar type of static energy meters during this period.

3.00 SERVICE CONDITIONS

The meters to be supplied against this specification shall be suitable for satisfactory continuous operation under the following tropical conditions:

Maximum ambient temperature (°C)	55
Maximum ambient temperature in shade (°C)	45
Maximum temperature of air in shade (°C)	35
Maximum daily average temperature (°C)	40
Maximum yearly weighted average temperature (°C)	32
Relative Humidity (%)	10 to 95
Maximum Annual rainfall (mm)	1450
Maximum wind pressure (Kg/mm ²)	150
Maximum altitude above mean sea level (meters)	1000
Isoceraunic level (days / year)	50
Seismic level (Horizontal acceleration)	0.3g

Climate:- Moderately hot and humid tropical climate

Conducive to rust and fungus growth

4.00 APPLICABLE STANDARD

- 4.01 The Meters shall conform to IS 13779/1999 (amended up to date) and other relevant IS specifications including CBIP Tech-report-88 amended up to date. The specification given in this document supersedes the relevant clauses of IS:13779/1999 (amended up to date) wherever applicable.

> The meter shall bear ISI mark.

> The class of accuracy of the Energy Meter shall be 1.0. The accuracy shall not drift with time.

- 4.02 Current & Voltage Rating

> The current rating shall be (a) 5-30A and (b) 10-60A.

Rated basic current (Ib) for L.T. Energy Meters shall be (a) 5A and (b) 10A respectively.

- > The maximum continuous current (I_{max}) shall be 600% of rated basic current.
Moreover
 - a) The 5-30A meters shall work accurately upto 150% of I_{max} i.e. 45Amps
 - b) The 10-60A meters shall work accurately upto 120% of I_{max} i.e. 72Amps.
- > The Voltage Rating shall be 240 volts. The voltage range shall be (-) 40% to (+) 20% of rated voltage i.e. 144 Volts to 288 Volts.

4.03 Temperature

The standard reference temperature for performance shall be 27°C. The mean temperature co-efficient should not exceed 0.07%. Temperature rise shall be as per IS 13779/1999 (amended up to date).

4.04 Power Factor : The meter should work for Zero to unity PF (All lag or lead).

4.05 Power Consumption

> Voltage Circuit : The active & apparent power consumption in each voltage circuit including power supply of meter at reference voltage, reference temperature & frequency shall not exceed 1.0 Watt & 8.0 VA.

> Current Circuit:- The apparent power taken by current circuit at basic current, reference frequency & reference temperature shall not exceed 1.0 VA.

4.06 Starting Current :- The meter should start registering the energy at 0.2 % of basic current (I_b)

4.07 Frequency: The rated frequency shall be 50 Hz with a tolerance of $\pm 5\%$.

5.00 CONSTRUCTION

5.01 The meter shall be projection type and dust and moisture proof. The meter base & cover shall be made out of unbreakable, high grade, fire resistant Polycarbonate material so as to give it tough and non-breakable qualities. The base shall be opaque and cover shall be transparent. The meter body shall be type tested for IP51 degree of protection as per IS 12063 against ingress of dust, moisture & vermin.

5.02 Moulded terminal block for current and voltage connections conforming to IS 13779/1999(amended up to date) to meet the requirement of terminal connection arrangement shall be provided. The termination arrangement shall be provided with a transparent terminal cover and shall be sealable independently to prevent unauthorized tampering.

5.03 All insulating materials used in the construction of the meter shall be substantially non-hygroscopic, non ageing and of tested quality.

5.04 All parts that are likely to develop corrosion under normal working condition shall be effectively protected against corrosion by suitable method to achieve durable results.

5.05 The base and cover shall be ultra-sonically welded so that once the meter is manufactured and tested at factory, it should not be possible to open the cover at site except the terminal cover. The Manufacturer shall put at least one seal on meter body before dispatch. The thickness of material for meter body should be 2mm minimum.

- 5.06 The real time quartz clock shall only be used in the meter for maintaining time (IST) and calendar. The time accuracy shall be as per provision of CBIP-88 Tech. report.
- 5.07 The provision shall be made on the Meter for at least two seals to be put by utility user.
- 5.08 The Push button shall be provided for high-resolution reading of display with two decimal digits, as brought out elsewhere in this specification.
- 5.09 The meter shall be provided with flashing LED to represent the pulse output for testing the meter by suitable testing equipment. The operation indicator must be visible from the front.
- 5.10 It shall be possible to check the accuracy of active energy measurement of the meter on site by means of LED output. Resolution of the test shall be sufficient to enable the starting current test in less than 10 minutes and accuracy test at the lowest load shall be completed with desired accuracy within 5 minutes.
- 5.11 The meter accuracy shall not be affected by magnetic field from all sides of the meter i.e. front, sides, top and bottom of the meter.
- 5.12 Meter shall be Shunt based so that it is totally immune to magnetic interference.
- 5.13 The meter shall be capable to withstand phase to phase voltage (440V) if applied between phase to neutral for minimum 5 min.
- 5.14 Power supply unit in the meter should be transformer less to avoid magnetic influence.
- 5.15 The RTC shall have long life (10 Years) Lithium battery.
- 5.16 Display parameters in the meter should not be accessible for reprogramming at site through any kind of communication.
- 5.17 Complete metering system & measurement shall not be affected by the external electromagnetic interference such as electrical discharge of cables and capacitors, harmonics, electrostatic discharges, external magnetic fields and DC current in AC supply etc. The Meter shall meet the requirement of CBIP Tech-report 88 (amended up to - date) except 0.2 T A.C. magnet test.
- 5.18 The measurement by meter shall not get influenced by injection of high frequency AC Voltage/ chopped signal / DC signal and harmonics on the terminals of the meter.
- 5.19 The meter shall record and display total energy including Harmonic energy.
- 5.20 Self Diagnostic Features.
 - 5.20.1 The meter shall display unsatisfactory functioning or nonfunctioning of Real Time Clock battery.
 - 5.20.2 All display segments: "LCD Test" display shall be provided for this purpose.
- 5.21 The meters (5-30 Amps & 10-60 Amps) shall have facility for communicating with a hand-held terminal (HHT) through INFRA-RED (IrDA) communication Port, provided on the name plate, to facilitate MSEDCL for auto-reading and downloading the billing and history data to a Base Computer. Tamper proof arrangement shall be made to get such a reading even at the time of power

failure. The interface for communication between HHT and base computer shall have to be supplied free of cost. The software wherever necessary shall also have to be supplied free of cost. The Infrared reader (HHT) shall be supplied in the ratio of one per 2000 meters. These meters will have to be supplied along with the enclosure.

- 5.22.0 Wire/cable less design:-The meter PCB should be wireless to avoid improper soldering & loose connection/contact.
- 5.22.1 The meter shall be supplied with battery back up feature for displaying the parameters during power OFF condition. Battery life should be minimum ten years.
- 5.22.2 The meter shall withstand any type of high voltage and high frequency surges which are similar to the surges produced by induction coil type instruments without affecting accuracy of the meter.

6.00 Enclosure of meter:- As per Annexure-III

7.00 ANTI TAMPER FEATURES

- 7.01 The meter shall detect and register the energy correctly only in forward direction under any one or combination of following tamper conditions:
 - 7.02 Reversal of phase & neutral.
 - 7.03 Reversal of line and load terminals.
 - 7.04 Load through local Earth.
 - 7.05 The meter should work accurately without earth.
 - > All the above tampers will be verified at basic current at reference voltage.
 - 7.06 Where neutral is disconnected from the load or from the supply side or both the load and supply side, the meter should record the energy proportionate to the current drawn through the meter (min 40 % Ib for 5-30 A & 20% Ib for 10-60 A) at reference voltage and unity Power Factor. $\pm 5\%$ error in recording is admissible.
 - The potential link shall not be provided on terminal block outside the main meter cover.
 - 7.07 Visual indication shall be provided to show tamper condition stated above.
 - 7.08 If the magnetic field (AC/DC/Permanent) is more than 0.2Tesla then the same should be recorded as magnetic tamper event with date & time stamping and the meter should record Energy considering the maximum value current (Imax) at reference voltage & unity power factor.

8.00 DISPLAY OF MEASURED VALUES

- 8.01 The display shall be permanently backlit LCD. The Energy display shall be full 5 digits. The size of digit should be minimum 8X5 mm. The decimal units shall not be displayed for Cumulative kWh in auto scroll mode. However it shall be displayed in push button mode for high resolution display for testing
- 8.02 Measuring Parameters:- All parameters should be available in auto scrolling mode..

- 1) Real time & date.
- 2) Instantaneous active load in watt.
- 3) Active Energy.
- 4) Maximum demand (kWMD) with date & time.

Active cumulative energy shall be displayed for 20 seconds & all other parameters shall be displayed for minimum 6 seconds including LCD check.

8.03 On demand through PUSH BUTTON (each display for about 6 sec)

* Cumulative Active Energy (kWh) for each calendar month for previous six months with display of month.

* Maximum demand (kWMD) in a calendar month for previous six months with date & time.

The meter should have a nonvolatile memory, so that the registered parameters will not be affected by the loss of power.

8.04 The maximum demand shall automatically be reset at 2400 hours of the last day of each calendar month. No reset push button shall be provided

8.05 Maximum Demand Integration Period:-Integration period for KwMD should be of 30 minutes real time based.

9.00 DEMONSTRATION

The purchaser reserves the right to ask for the demonstration of the equipment offered at the purchaser's place.

10.00 CONECTION DIGRAM AND TERMINAL MARKINGS.

The connection diagram of the meter shall be clearly shown on inside portion of the terminal cover and shall be of permanent nature. Meter terminals shall also be marked and this marking should appear in the above diagram. Stickers of any kind will not be accepted.

11.00 NAME PLATE AND MARKING

Meter shall have a name plate clearly visible, effectively secured against removal and indelibly and distinctly marked with all essential particulars as per relevant standards. The manufacturer's meter constant shall be marked on the Name Plate.

In addition to the requirement as per IS, following shall be marked on the Name Plate.

Purchase Order No.

Month and Year of manufacture

Name of purchaser i.e. MSEDCL

Guarantee Five Years

ISI mark

The meter Serial No. shall be Bar Coded alongwith numeric No. The size of Bar Code shall not be less than 35X5 mm. Stickers in any case will be not accepted.

12.00 TESTS

12.01 Type Tests

Meter shall be fully type tested as per IS 13779/1999 (amended up to date) and external AC/DC (except 0.2 T AC magnet) magnetic influence tests as per CBIP Tech-Report 88 with latest amendments. The Type Test Reports shall clearly indicate the constructional features of the type tested meters. Separate Type Test Reports for each offered type of meters shall be submitted. All the Type Tests shall have been carried out from Laboratories which are accredited by the National Board of Testing and Calibration Laboratories (NABL) of Govt. of India such as CPRI, Bangalore / Bhopal, ERDA Baroda, to prove that the meters meet the requirements of the specification. Type Test Reports conducted in manufacturers own laboratory and certified by testing institute shall not be acceptable. The tenderer should also furnish the particulars giving specific required details of Meters in schedule 'A' attached. The offers without the details in Schedule 'A' stand rejected.

Type test reports should be submitted along with offer. The type test report of meter having identical constructional and other features carried out during last three years will be valid. The purchaser reserves the right to demand repetition of some or all the type tests in presence of purchaser's representative at purchaser's cost.

12.02 Meters shall pass all the acceptance and routine tests as laid down in IS: 13779/1999(amended up to date) and also additional acceptance tests as prescribed in this specification.

12.03 Additional Acceptance Tests:

The following additional tests shall be carried out in addition to the acceptance tests specified in IS 13779/1999(amended up to date)

12.03.1 Transportation Test:

At least 50% of the samples of the meters be tested for error at I_{max} , I_b and 5% I_b at unity power factor and 50% I_{max} and 10% I_b at 0.5 lagging Power Factor besides checking them for starting current. The meter should be tested with meter cover duly tightened and sealed properly. After recording these errors, the meters be put in their normal packing and transported for at least 50 km in any transport vehicle such as pick up van, Jeep, etc. on uneven rural roads and then re-tested at all these loads after the transportation. The variation in errors recorded before and after transportation should not exceed 1% at higher loads and 1.5% at low loads.

12.03.2 Other Acceptance Tests

- i) The meter shall withstand continuously for a period of at least 5 minutes at a voltage of 440 V between phase and neutral without damage/problems,
- ii) Tamper conditions as stated in this specification,
- iii) Glow wire testing for polycarbonate material.
- iv) Power consumption tests,
- v) The meter shall comply all the test for external AC/DC (except 0.2 T AC magnet) magnetic field as per CBIP Tech Report 88 with latest amendments. Moreover, the magnetic influence test for permanent magnet of 0.5 T for minimum period of 15 minutes shall be carried out, by putting the magnet on the meter body. After removal of magnet, meter shall be subjected to accuracy test as per IS 13779/1999 (amended up to date).

- vi) The meter shall withstand impulse voltage at 10kV.

The test 12.3.2 (i) to (iv) shall be carried out at factory for each inspected lot at the time of pre-dispatch inspection. The tests 12.3.2 (v) & (vi) shall be carried out on one sample from first lot as per procedure laid down in IS13779/1999(amended up to date) and CBIP Tech-Report 88 in NABL LAB. The test report shall be got approved from CE (Dist.) before commencement of supply.

12.03.2 Limits of error

Limits of variation in percentage error due to change in voltage shall not exceed the values given in the following table:

	Influence quantities	Value of current	Power factor	Limits of variation in % error for class 1 meters
a)	Voltage variation – 15% to +10%	I_b I_b	1 0.5 lag	0.7 1.0
b)	Voltage variation – 40% , – 15%, + 10% and + 20%	I_b I_b	1 0.5 lag	1.1 1.5

- ii) The meters shall be tested at (-) 15% and at (-) 40% of reference voltage as well as (+) 10% and (+) 20% of reference voltage and shall record energy within limits of variation indicated above. However the meter shall continue to register energy up to 50% of the rated voltage.
- iii) For other influence quantities like frequency variation the limits of variation in percentage error will be as per IS:13779/1999 (amended up to date).

12.03.4 PRE DESPATCH INSPECTION

All Acceptance tests and Inspection shall be carried out at the place of manufacturer unless otherwise specially agreed upon by the manufacturer and purchaser at the time of purchase. The manufacturer shall offer to the inspector representing the purchaser, all the reasonable facilities, free of charge, for inspection and testing, to satisfy him that the material is being supplied in accordance with this specification. The Board's representative / Engineer attending the above testing will carry out testing on suitable number of meters as per sampling procedure laid down in IS 13779/1999 (amended up to date) and additional acceptance test as per this specification and issue test certificate approval to the manufacturer and give clearance for dispatch. All the meters offered for inspection shall be in sealed condition. The seals of sample meters taken for testing & inspection will be break open & resealed after inspection.

The first lot of meter may be jointly inspected by the representative of the Chief Engineer (Distribution) and the Executive Engineer (INSPECTION WING).

12.03.5 INSPECTION AFTER RECEIPT AT STORES

(Random Sample Testing)

From each lot (lot means the total number of meters received in a Store out of inspected and approved lot by E.E. (IW) or purchaser's representative under one approval letter) of meters received at Stores, sample meters shall be drawn as per Appendix 'C' of IS 13779/1999 (amended up to date) tested by MSEDCL Testing Engineer in presence of supplier's representative jointly for (i) starting current (ii) Limits of error, (iii) Repeatability of error as IS 13779/1999 (amended up to date).

The 15 days advance intimation will be given to the supplier and if the supplier fails to attend the joint inspection on the date informed, the testing will be carried out by our testing Engineer in absence of supplier's representative. If the meters failed in above random sample testing, the lot will be rejected.

13.00 GUARANTEE

The meter shall be guaranteed for the period of five years from the date of commissioning or five and half year from the date of despatch whichever is earlier. The meter found defective within above guarantee period shall be replaced by the supplier free of cost, within one month of receipt of intimation. If defective meters are not replaced within the specified period as above, the Board shall recover an equivalent amount plus 15% supervision charges from any of the bills of the supplier.

14.00 PACKING

14.01 The meters shall be suitably packed in order to avoid damage during transit or handling. Each meter may be suitably packed in the first instance to prevent ingress of moisture and dust and then placed in a cushioned carton of a suitable material to prevent damage due to shocks during transit. The lid of the carton may be suitably sealed. A suitable number of sealed cartons may be packed in a case of adequate strength with extra cushioning. The cases may then be properly sealed against accidental opening in transit. The packing cases may be marked to indicate the fragile nature of the contents.

14.02 The following information shall be furnished with the consignment:

- > Name of the consignee
- > Details of consignment
- > Destination
- > Total weight of the consignment
- > Sign showing upper / lower side of the crate
- > Sign showing fragility of the material
- > Handling and unpacking instructions
- > Bill of Material indicating contents of each package and spare material

15.00 TENDER SAMPLE

Tenderers are required to submit 10 (TEN) nos. of sample meters of each offered type / item along with the offer for evaluation. The samples shall be clearly marked with each type / item for which sample is submitted and name of bidder. Out of these, Two samples should be without ultrasonic welding to confirm constructional features..

16.0 QUALITY CONTROL

- 16.01 The purchaser has a right to send a team of experienced engineers for assessing the capability of the firm for manufacturing and testing of meters as per this specification. The team should be given all assistance and cooperation for inspection and testing at the bidder's works.
- 16.02 The meters supplied shall give service for a long period with out drifting from the original calibration & performance must be near to zero percent failure.

17.0 MINIMUM TESTING FACILITIES

Manufacturer should possess fully computerized Meter Test Bench System for carrying out routine and acceptance Tests as per IS 13779/1999 (amended up to date). Test Reports for each and every meter shall be generated. The list of testing equipments shall be enclosed.

The manufacturer should have the necessary minimum testing facilities for carrying out the following tests:

Insulation resistance measurement

No load condition

Starting current

Accuracy requirement

Power consumption

Repeatability of error

Transportation test – as per clause no. 12.03.1

Tamper conditions - as per clause no. 7.00

> The manufacturer should have duly calibrated RSS meter of class 0.1 or better accuracy. The bidder should have fully automatic Test Bench having in-built constant voltage, current and frequency source with facility to select various loads automatically and print the errors directly.

> The manufacturer should have Glow Wire Testing facility

18.0 MANUFACTURING ACTIVITIES

The manufacturer shall submit the list of plant and machinery along with the offer.

i) Meter should be manufactured using SMT (Surface Mount Technology) components and by deploying automatic SMT pick and place machine and reflow solder process. The loops/wired joints must be avoided on PCB. Further, the Bidder should own or have assured access (through hire, lease or sub-contract, documentary proof shall be attached with the offer) of above facilities.

ii) Quality should be ensured at the following stages:

> At PCB manufacturing stage, each Board shall be subjected to computerized bare board testing.

- > At insertion stage, all components should undergo computerized testing for conforming to design parameters and orientation
- > Complete assembled and soldered PCB should undergo functional testing using Automatic Test Equipments (ATEs).
- > **Important:-** Prior to final testing and calibration, all meters shall be subjected to aging test (i.e. Meters will be kept in heating chamber for 72 hours at 55 °C temperature at full load current. After 72 hours, meters should work satisfactory) to eliminate infant mortality.

(iii) The calibration of meters shall be done in-house on a computerised testing bench having stabilized power supply.

(iv) The bidders should submit the list of all (imported as well as indigenous) components to be used in meter, separately along with the offer. List of makes of components is attached herewith as a guide line.

(v) Bought out items

A detailed list of bought out items which are used in the manufacturing of the meter, should be furnished indicating the name of firms from whom these items are procured. The bidder shall also give the details of quality assurance procedures followed by him in respect of the bought out items.

19.0 QUALITY ASSURANCE PLAN

19.01 The tenderer shall invariably furnish QAP as specified in Annexure-I along with his offer the QAP adopted by him in the process of manufacturing.

19.02 Precautions taken for ensuring usage of quality raw material and sub component shall be stated in QAP.

20.00 The COMPONENT SPECIFICATION as per Annexure -II enclosed..

21.00

22.00 SCHEDULES:-

The tenderer shall fill in the following schedules and submit alongwith the offer. If the schedules are not submitted duly filled in with the offer, the offer shall be rejected.

Schedule `A' ... Guaranteed Technical particulars.

Schedule `C' ... Tenderer's Experience

The discrepancies if any between the specification and the catalogs and/or literatures submitted as part of the offer by the bidders, the same shall not be considered and representations in this regard will not be entertained.

If it is observed that there are deviations in the offer in Guaranteed Technical Particulars other than those specified in the deviation schedules then such deviations shall be treated as deviations.

SCHEDULE - "B"

TENDERER'S EXPERIENCE

Tenderer shall furnished here list of similar orders executed/under execution for supplying single phase static energy meters by him to whom a reference may be made by purchaser in case he consider such a reference necessary.

SR.NO.	Name of client	Order No.& date	Qty. ordered	Qty. supplied
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NAME OF FIRM _____

NAME & SIGNATURE OF TENDERER_____

DESIGNATION _____

DATE _____

ANNEXURE I

Quality Assurance Plan :

A) The bidder shall invariably furnish the following information alongwith his bid, failing which his bid shall be liable for rejection. Information shall be separately given for individual type of material offered.

- i) Statement giving list of important raw materials, names of sub- suppliers for the raw materials, list of standards according to which the raw materials are tested. List of test normally carried out on raw materials in presence of Bidder's representative, copies of test certificates :
- ii) Information and copies of test certificates as in (i) above in respect of bought out accessories.
- iii) List of manufacturing facilities available.
- iv) Level of automation achieved and list of areas where manual processing exists.
- v) List of areas in manufacturing process, where stage inspections are normally carried out for quality control and details of such tests and inspections.
- vi) List of testing equipment available with the bidder for final testing of equipment specified and test plan limitation. If any, vis-a-vis the type, special acceptance and routine tests specified in the relevant standards. These limitation shall be very clearly bought out in schedule of deviation from specified test requirements.

B) The successful bidder shall within 30 days of placement of order, submit following information to the purchaser.

- i) List of raw materials as well as bought out accessories and the names of sub-suppliers selected from those furnished alongwith offers.
- ii) Type test certificates of the raw materials and bought out accessories if required by the purchaser.
- iii) Quality assurance plan (QAP) with hold points for purchaser's inspection.

The quality assurance plant and purchasers hold points shall be discussed between the purchaser and bidder before the QAP is finalized.

C) The contractor shall operate systems which implement the following :

- i) Hold point : A stage in the material procurement or workmanship process beyond which work shall not proceed without the documental approval of designated individuals organizations. The purchaser's written approval is required to authorize work to progress beyond the hold points indicated in quality assurance plans.

- ii) Notification point : A stage in the material procurement or workmanship process for which advance notice of the activity is required to facilitate witness. If the purchaser does not attend after receiving documented notification in accordance with the agreed procedures and with the correct period of notice then work may proceed.

- D) The successful bidder shall submit the routine test certificates of bought out accessories and central excise passes for raw material at the time of routine testing if required by the purchaser and ensure that Quality Assurance program of the contractor shall consist of the quality systems and quality plans with the following details.
 - i) The structure of the organization.
 - The duties and responsibilities assigned to staff ensuring quality of work.
 - The system for purchasing taking delivery and verification of material.
 - The system for ensuring quality workmanship.
 - The system for retention of records.
 - The arrangements for contractor's internal auditing.
 - A list of administration and work procedures required to achieve and verify contract's quality requirements these procedures shall be made readily available to the project manager for inspection on request.

 - ii) Quality Plans :
 - An outline of the proposed work and programme sequence. The structure of the contractor's organization for the contract.
 - The duties and responsibilities assigned to staff ensuring quality of work.
 - Hold and notification points.
 - Submission of engineering documents required by the specification.
 - The inspection of materials and components on receipt. Reference to the contractor's work procedures appropriate to each activity.
 - Inspection during fabrication/ construction.
 - Final inspection and test.

ANNEXURE II :

Sr.No.	Component function	Requirement	Makes and Origin
1	Shunt Element	The Meters should be with shunts as measuring elements .	
2	Measurement computing chips or	The measurement or computing chips used in the Meter should be with the Surface mount type..	USA: Anolog Devices, Cyrus Logic, Atmel, Philips South Africa :SAMES Japan : NEC
3	Memory chips	The memory chips should not be affected by external parameters like sparking, high voltage spikes or electrostatic discharges.	USA: Atmel, National Semiconductors, Texas Instruments, Philips, ST, Japan : Hitachi
4	Display modules	a) The display modules should be well protected from the external UV radiations. b) The display visibility should be sufficient to read the Meter mounted at height of 0.5 meter as well as at the height of 2 meters (refer 3.2 d for Viewing angle). c) The construction of the modules should be such that the displayed quantity should not disturbed with the life of display (PIN Type). d) It should be trans-reflective HTN or STN type industrial grade with extended temperature range.	Hongkong : Genda Singapore: Bonafied Technologies. Korea: Advantek China : Success Japan : Hitachi, Sony.

5	Power supply	The power supply should be with the Capabilities as per the relevant standards. The power supply unit of the meter should not be affected in case the maximum voltage of the system appears to the terminals due to faults or due to wrong connections. Also it shall not be affected by (AC/DC/Permanent).	Transformer less.
6	Electronic components	The active & passive components should be of the surface mount type & are to be handled & soldered by the state of art assembly processes.	USA : National Semiconductors, Atmel,, Philips, Texas Instruments Japan : Hitachi, Oki, AVZ or Ricon Korea; Samsung
7	Mechanical parts	a)The internal electrical components should be of electrolytic copper & should be protected from corrosion, rust etc. b) The other mechanical components should be protected from rust, corrosion etc. by suitable plating/painting methods.	
8	RTC.	The accuracy of RTC shall be as per CBIP-88	USA : Philips, Dallas, ST, Xicor Atmel, Motorola, Microchip Japan : NEC or Oki.
9	P.C.B.	Glass Epoxy, fire resistance grade FR4, with minimum thickness 1.6 mm.	

ANNEXURE-III
MAHARASHTRA STATE ELECTRICITY DISTRIBUTION COMPANY LTD.

TECHNICAL SPECIFICATION FOR SINGLE PHASE POLY-CARBONATE METER BOX
SPECIFICATION NO. DIST/MM-IV/001(Dt. 09-08-2006)

1.00 SCOPE :

This specification covers design, manufacturing, testing and supply of fully transparent poly-carbonate Meter Box suitable for Single phase Static Energy meter. The meter box shall be suitable for wall mounting and indoor or outdoor application.

2.00 SERVICE CONDITION:

The meter box to be supplied against this specification shall be suitable for satisfactory continuous operation under the following service conditions.

- i. Max. ambient temperature 50° C
- ii. Max. relative humidity..... 100%
- iii. Max. annual rainfall..... 1450 mm
- iv. Max. wind pressure..... 150Kg./ sq.m.
- v. Max. altitude above mean sea level..... 1000 meters
- vi. Seismic level (Horizontal acceleration)..... 0.3 g
- vii. Climatic condition.....Moderately hot & humid tropical climate conducive to rust and fungus growth
- viii. Ref. Ambient temperature for temperature rise..... 50° C

3.00 APPLICABLE STANDARDS:

Unless otherwise modified in this specification the meter box shall be generally conform to IS :14772/2000 (amended up to date)

4.0 DESIGN AND CONSTRUCTION:

4.1 The meter box shall be so constructed as to have roof tapering down on both side for easy flow of rain water and box should be totally transparent poly-carbonate material natural white colour and having good workmanship.

4.2 The meter box shall be made of anti corrosive, dust proof, weather proof, unbreakable, scratch resistant, water proof, ultra violet, stabilized and flame retardant high grade poly-carbonate material having good dielectric and mechanical strength. The overall dimension of the meter box shall be suitable to all types of meters purchased from various meter manufacturers.

4.3 The box material must be UV stabilized to ensure that the base and cover does not get 'Yellow' over a period of time. The surface appearance of part must be smooth, non porous and homogeneous, free of ripples, defects and marks. No fillers or fibers should be visible at any place.

4.4 a) The meter box shall be made from Poly-carbonate as per IS:14772/2000 and as per requirement of this specification.

b) The wall thickness of meter box shall be minimum 3 mm on load bearing side and cover shall be 2 mm.

4.5 The internal dimensions of m

4.6

- 4.7 Meter box shall be such that there should be minimum 100 mm clearance at the bottom, 75 mm clearance on three sides, 25 mm clearance on front and 10 mm clearance from back of the meter.
- 4.6 The meter box should not change in colour, shape, size, dimension when subjected to 200 hours on UV ageing test. Also it shall be capable of withstanding temperature of boiling water for five minutes continuously without distortion or softening.
- 4.7 The cover shall be made overlapping type having collars on all four sides. The cover of the box shall be provided with semi circular/circular gasket of sufficient size to completely fit in the grooves of the base. The gasket should be made of neoprene rubber or equivalent good quality rubber.
- 4.8 The cover should be fitted with base by non detachable self locking push fit type arrangement. It should have suitable handle or knob that if pushed once inside, the cover shall rest on the base of box in such a way that any access from outside to the meter is not possible.
- 4.9 Meter box shall confirm IP-51.
- 4.10 The meter base support inside the box should be raised by about 10mm in the box for easy wiring. While fixing the meter, the meter screws should not protrude outside.
- 4.11 Suitable circular holes shall be provided at the bottom of the box for inlet and outlet cables with glands of 25 mm size made of brass or poly-carbonate material for the cable securely fixed to the bottom of the box on both side by chucknuts with rubber grommet. All the screws and washers shall be properly zinc plated.
- 4.12 For fixing the box to wall or wooden board 4 nos. key holes of min.6 mm diameter shall be provided at the four corners of meter box. The meter is to be installed in the box and the box in assembled condition shall have provision to fix it to pole or a wall. The 4 nos. screws of size 6 mm diameter and 60 mm long with suitable washers shall be provided with each meter box.
- 4.13 The tolerance permissible on the various dimensions of the meter box shall be $\pm 3\%$.
- 4.14 The surface appearance of part must be smooth, non porous and homogeneous, free of ripples, defects and marks. No fillers or fibers should be visible at any place.
- 4.15 The meter box should comply with magnetic influences of **0.5** Tesla permanent magnet.

5.0 TESTS :

The meter box should have been successfully type tested as per 14772/2000 from NABL Accredited independent testing laboratories such as CPRI/ERDA. The type test report shall clearly indicate the constructional features of the type tested meter box. The tenderer should also furnish certificate from laboratories where type test carried out. The requisite test facility available in house for that particular test should be approved by NABL. The type tests conducted in manufacturer's own laboratory and certified by testing institute shall not be acceptable. The tenderer should also furnish the particulars giving specific required details of meter box in schedule 'A' attached. The offers without the details in schedule 'A' and Type Test reports stands rejected.

6.0 TESTING AND MANUFACTURING FACILITIES:

6.1 The manufacturer should have necessary machinery for production of poly-carbonate meter box.

6.2 The manufacturer should have in house testing facilities for carrying out following tests :-

Sr. no.	Test Details	Reference standard
1	Flammability (Vo)	UL 94 or IS : 11731 (Pt.II)
2.	Heat deflection temp. at (min.150 ° C) 0.45 SUB MPA Load	ISO 75
3.	Glow wire test	IEC – 695 –2-1 or IS : 11000(Pt 2/sec.1)
4.	Ball pressure test	IEC : 335
5.	Water absorption	IS : 14772
6.	Mechanical Strength	IS : 14772
7.	Marking, Dimensions and construction	IS : 14772
8.	Spirit burner test	IS : 4249

7.0 DRAWING :

Enclosed drawings are only for general guidelines, however, the detailed dimensional drawing showing clearly the dimensions and material for meter box and its constructional features should invariably furnished with the offer.

8.0 MARKING / EMBOSSING :

The following information shall be clearly and indelibly embossed (not printed) on the cover of the meter Sr. No. which may be indelibly printed with inkjet printing.

- i) Purchase order number and date.
- ii) Year and month of manufacture.
- iii) Purchaser's name : MSEDCL.
- iv) Guarantee : Years (as specified in GTP)
- v) Sign of danger
- vi) Code name of manufacturer
- vii) Meter Sr. No.

9.0 PACKING :

The meter box shall be suitably packed in corrugated boxes in order to avoid damage during transit or handling.

10.0 GUARANTEE:-

The supplier shall have to give 10 years guarantee of meter box from date of supply to MSEDCL.

