SCHEDULE-II (A)
TECHNICAL SPECIFICATIONS FOR THREE PHASE LT STATIC WHOLE CURRENT SOLID STATE ELECTRONIC ENERGY METERS WITH BACKLIT LCD DISPLAY SUITABLE FOR NET METERING

1 SCOPE:-
(a) This specification covers design, engineering, manufacture, stage-inspection, testing and supply of A.C. Three Phase 4 Wire current rating 10-40 Amperes solid state (static) whole current electronic LT energy meters of accuracy class 1.0 with backlit LCD display and communication port for data downloading as per requirement given in this specification. The meters shall be supplied in a push fit type meter box made of transparent engineering plastic, which shall be weather proof having flame retardant properties conforming to relevant specification. The meter and push fit type meter box shall be supplied in suitable packing so as to withstand transit shocks during road transport.

The meters should be suitable for three phase four wire system, capable to record and display monthly average p.f., energy in KWH, and demand in “KW” including other electrical quantities. The meters shall be capable to record over full power factor range of Zero Lag-Unity- Zero Lead, as per requirement given in this specification. These LT Meters should record Net Energy and total energy at basic frequency & harmonics. In addition the meters shall have provision for recording time of day (TOD) energy parameters.

(b) It is not the intent to specify completely herein all the details of the design and construction material. However, the material shall conform in all respects to high standards of engineering, design and workmanship and shall be capable of performing in continuous commercial operation in a manner acceptable to the Purchaser, who will interpret the meanings of drawings and specification and shall have the right to reject any work or material which in his judgment is not in accordance therewith. The offered materials shall be complete with all components, accessories and required software’s necessary for their effective and trouble free operation in the System for measurement of electricity supplied to the consumers. Such components shall be deemed to be within the scope of Bidder’s supply irrespective of whether those are specifically brought out in this specification and/ or the commercial order or not.

(c) It is compulsory that the offered LT meters shall bear BIS certification i.e. the meters shall be ISI marked and the bidder shall have to furnish valid ISI license along with the offer, which, if considered necessary, may be verified by the Purchaser.

2 STANDARDS:
These LT meters and the associated accessories shall conform in all respects to the following relevant Standard Specifications with latest amendment there to:-

<table>
<thead>
<tr>
<th>Indian Standard No.</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>IS:13779-1999 read with latest amendments</td>
<td>Specification for AC static watt hour meter for class 1 &amp; 2</td>
</tr>
<tr>
<td>IS:5133-1969 (Part II)</td>
<td>Specification for boxes for the enclosure of electrical accessories</td>
</tr>
<tr>
<td>IS:9000</td>
<td>Basic environmental and other Testing for Electronic &amp; Electrical items.</td>
</tr>
<tr>
<td>IS:11731</td>
<td>Specification for engineering plastic</td>
</tr>
<tr>
<td>IS: 11000</td>
<td>Resistance to heat &amp; fire</td>
</tr>
<tr>
<td>CEA Regulation with latest amendments</td>
<td>On installation of meters of 17/03/06</td>
</tr>
</tbody>
</table>

3 SERVICE CONDITIONS (CLIMATIC CONDITIONS):
(i) The LT meters to be supplied against this specification should be capable of performing and maintaining required accuracy under extreme hot, cold, tropical and dusty climate and solar radiation typically existing in State of M.P. The LT meter shall be required to operate satisfactorily and continuously under the following tropical climatic conditions:
(a) Maximum ambient air temperature 55°C
(b) Maximum ambient air temperature in shade 45°C
(c) Maximum temperature attainable by the meter exposed to sun 60°C
(d) Minimum ambient temperature (-) 5°C
(e) Average daily ambient air temperature 40°C
(f) Maximum relative humidity 95%
(g) Number of months of tropical monsoon condition 4 months
(h) Maximum altitude above mean sea level 1000 meters
(i) Average annual rain fall 150 cms
(j) Maximum wind pressure 200 kg/sq.m
(k) Isokeraunic level (days per year) 40
(l) Seismic level (horizontal accn.) 0.30 g
(m) Permitted noise level 45db

All the parts & surface, which are subject to corrosion shall either be made of such material or shall be provided with such protective covering and finish, which ensures total protection from any injurious effect of humidity.

4 PRINCIPAL PARAMETERS:
These LT meters shall conform to the following specific parameters:

<table>
<thead>
<tr>
<th>SL No.</th>
<th>Item</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Type of installation</td>
<td>Indoor/Outdoor</td>
</tr>
<tr>
<td>2.</td>
<td>System voltage (phase to neutral)</td>
<td>3X240 V + 20% to - 40%; neutral solidly grounded</td>
</tr>
<tr>
<td>3.</td>
<td>System frequency</td>
<td>50 Hz ±5%</td>
</tr>
<tr>
<td>4.</td>
<td>No. of phases</td>
<td>3 Phase 4 wire (three phase + neutral)</td>
</tr>
<tr>
<td>5.</td>
<td>System earthing</td>
<td>Solidly grounded</td>
</tr>
<tr>
<td>6.</td>
<td>Resistance to surge voltage of 1.2/50 Micro sec.</td>
<td>As per relevant IS</td>
</tr>
<tr>
<td>7.</td>
<td>Test voltage at 50 Hz</td>
<td>4 KV RMS for 1 minute including latest amendments in relevant IS</td>
</tr>
</tbody>
</table>

5 CONSTRUCTIONAL REQUIREMENTS:
The Base of the meter should preferably be opaque so that internal circuitry and design are not visible from outside and push fit type meter box shall be fully transparent designed and constructed in a manner to avoid any danger during use under normal working condition including personal safety against electric shock. The meter case and push fit type box should comply with the following parameters:-

Material Used for Meter case and Push Fit type Meter Box:

i. The meters shall have a case, which shall be ultrasonically welded to the meter base so that access to the internal parts should not be possible without breaking the meter case. The material of meter body (base and cover) shall be made of Engineering plastic.

ii. The meter casing material should be glass reinforced, flame retardant, unbreakable engineering plastic material to ensure high reliability, long trouble free life, safety against electric shock, spread of fire and effects of excessive temperature. The material should be corrosion resistant, inert to chemicals, oxidizing agents, petro-chemical products, acids, salts and ultraviolet radiation. The meter chamber shall be dust proof and moisture proof. The supplier should indicate hardness, melting temperature and tensile yield strength of the material and necessary test certificate of the same shall be furnished. The meter base and cover should be sturdy enough to prevent damage during transportation and installation.

iii. The engineering plastic used shall conform to IS: 11731 besides meeting the test requirement of heat deflection test and as per IS 11000(Part2 sec1) for resistance to heat and fire as per glow wire test specified in the relevant standard.
iv. All electrically live screws shall be of heavily tinned brass/nickel or zinc plated steel. All other screws shall be electro plated.

v. The terminal inserts shall be of heavily tinned brass/nickel or silver plated copper or zinc plated steel.

vi. The meter shall conform to the degree of protection IP51 of IS: 12063 for protection against ingress of dust, moisture and vermin.

vii. The meter should be immune against jump during sudden switching of heavy loads or transient voltage spikes.

6 **RATINGS:**
The LT meters as specified in scope of this tender shall be rated as follows:

<table>
<thead>
<tr>
<th>(a)</th>
<th>Voltage</th>
<th>3x240 V</th>
</tr>
</thead>
<tbody>
<tr>
<td>(b)</td>
<td>Current</td>
<td></td>
</tr>
<tr>
<td>(i)</td>
<td>Basic current (Ib)</td>
<td>10 A</td>
</tr>
<tr>
<td>(ii)</td>
<td>Rated max. continuous current (Imax)</td>
<td>40A</td>
</tr>
<tr>
<td>(c)</td>
<td>Frequency</td>
<td>50Hz</td>
</tr>
<tr>
<td>(d)</td>
<td>Accuracy</td>
<td>Class 1.0</td>
</tr>
</tbody>
</table>

7 **POWER SUPPLY VARIATION:**
The extreme power supply variations which the LT meter should withstand without damage and without degradation of its metering characteristics, as it operates under its normal operating conditions would be as under:

<table>
<thead>
<tr>
<th>Voltage</th>
<th>+20% to –40% of rated voltage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Current</td>
<td>120% of Imax.</td>
</tr>
<tr>
<td>Frequency</td>
<td>±5% of rated frequency</td>
</tr>
<tr>
<td>PF range</td>
<td>Zero (lag) – unity – Zero (lead)</td>
</tr>
</tbody>
</table>

The LT meter shall work over wide PF range and the limits of errors with the variation of PF shall be as per IS: 13779 (latest amendments).

Meter communication shall remain operative up to -50% of the rated voltage.

8 **POWER CONSUMPTION:**
8.1 **Voltage Circuit:** The active and apparent power consumption in each voltage circuit (per phase) including power supply of LT meter at reference voltage, reference temperature and reference frequency shall not exceed 1.5 Watts and 8 VA respectively as per IS:13779.

8.2 **Current Circuit:** The apparent power taken by each current circuit (per phase) at basic current, reference frequency and reference temperature shall not exceed 4 VA as per IS:13779.

8.3 **Auxiliary Power:** The LT meter shall draw power for working of electronic circuit from phase & neutral.

9 **STARTING CURRENT:**
The LT meter should start registering energy at 0.4% of basic current at UPF as per IS: 13779.

10 **RUNNING WITH NO LOAD:**
When 115% of rated voltage is applied with no current flowing in current circuit, the test output of the LT meter shall not produce more than one output pulse count as per IS: 13779.

11 **INFLUENCE QUANTITIES:**
The meter shall work satisfactory with guaranteed accuracy as per limit prescribed in IS:13779 under presence of the following quantities:-
Three Phase

(i) External magnetic field
(ii) Electromagnetic field
(iii) Radio frequency interference
(iv) Vibration
(v) Harmonic wave form
(vi) Voltage fluctuation
(vii) Electromagnetic high frequency field

12 TEMPERATURE RISE:
(a) Under normal conditions of use at Imax current, winding and insulation shall not reach a temperature, which might adversely affect the operation of these LT meters.
(b) With each current circuit of the meter carrying rated maximum current and with each voltage circuit (and those auxiliary voltage circuits which are energized for periods of longer duration than their thermal time constant) carrying 1.20 times the rated voltage, the temperature rise of the external surface shall not exceed by more than 20ºC, with the ambient temperature between 25ºC to 45ºC.

13 LIMITS OF ERRORS:
When the LT meter is under reference conditions, the percentage errors shall not exceed the limits as specified in IS:13779.

14 DISPLAY:
14.1 The LT meters shall have bright LCD Electronic display with backlit & with minimum 6 digits to read up to one tenth of KWh with another digit for legend. The decimal digits shall be clearly distinguished from integer digits. The backlit should not glow during power off condition. The LCD shall be of STN (Super Twist Nematic) type designed suitably to withstand temperature of 80ºC (storage) & 65ºC (operation).
(i) When the LT meter remains at a constant temperature of 65ºC for a period of 30 minutes, the character of LCD should not deform.
(ii) After keeping the LT meter at a constant temperature of 80ºC for a period of 30 minutes and when restored to normal temperature, LCD display should work as in normal conditions.

The LCD display should have a wide viewing angle of 45º to 60º up to one-meter distance, for clear visibility of the display of the meter reading. Large viewing area with large display icons is desired. However, the display size area shall be approx 60x20 mm (1200 sq.mm.). The registered parameters shall not be affected by loss of power. The display shall not be affected by electrical and magnetic disturbances. The meter shall make use of non-volatile memory capable of storing and retaining all the data required to be stored, without the help of any power source or battery back up and shall have a minimum retention time of 12 years under un-powered condition. The minimum character size i.e. height X width shall be 8.5 mm X 5 mm. for whole digits of kWh Display. **Dot-Matrix type LCD display is not acceptable.** The accuracy of display for all parameters should match with the accuracy class of meter as per IS.

14.2 The display of various parameters in push button mode shall be scrolling one after another. The display shall have ON time of at least 10 seconds for each measured value.

14.3 The meter shall be capable to measure and display continuously “Active Energy KWh” at all loads and in full power factor range of zero lag- unity- zero lead. The LT meter should also have provision for automatic recording and storing of required parameters of meter at 24.00 Hrs on the last day of the month for each calendar month and the same should be transferred to memory.

15 DISPLAY SEQUENCE:
The Liquid Crystal Display register for meter should display the measured value(s). The height of the display character should be minimum 8.5 mm. In addition display of the required parameters should be in two different modes as stated hereunder:-

15.1 Auto scroll Display Mode:
The LT meters shall have following parameters in auto scroll display
(i) Date: DD: MM: YY Real Time: HH:MM
(ii) Cumulative active Import energy
(iii) Cumulative active Export energy
15.2 Display parameter (Push Button) Mode:
(a) The display of the following parameters shall be scrolling one after the other through a push button. The display shall have ‘ON’ time of minimum 10 seconds of each measured value, except LCD segment check. The LCD segment check shall be ‘ON’ on meter display for minimum 2 seconds. Display parameters shall move forward if the button is pressed prior to the programmed time for display of each parameter.

(a) LCD segment check
(b) Meter serial number
(c) Real date and time (Date DD-MM-YY, Time HH-MM)
(d) Cumulative active Import & export energy
(e) Net Active Energy.
(f) Net Apparent energy.
(g) Universal active import & export demand in KW with date and time up to two decimal.
(h) Cumulative MD reset Count
(i) Frequency
(j) Instantaneous Line currents,
(k) Instantaneous Phase to Neutral Voltages.
(l) Instantaneous Phase wise Power Factor with sign of lag/lead
(m) Average P.F. for calendar month and for previous months
(n) Instantaneous load in KW,
(o) Cumulative tamper count
(p) Present PT status
(q) Present CT status
(r) Other status
(s) Last occurred and restored tamper with date and time
(t) High resolution active import & export energy (up to 4 decimal point)

(b) Programmable Optional Requirements of display on pressing push button.

(a) Cumulative apparent import energy while active import
(b) Cumulative apparent export energy while active export
(c) Universal apparent import & export demand in KVA with date and time, up to two decimal
(d) Instantaneous load in KVA,
(e) High resolution apparent import energy while active import and export while active export (up to 4 decimal point)

Since meters are required to be duly fitted with push fit type meter box, hence for reading purpose, an arrangement should be made on top cover of push fit type meter box with its mechanical connection to the meter’s body as described in the Specification of meter box to activate the display push button of meter.

The display with push button shall be auto off type and after completion of the display cycle it should revert back to normal auto scroll mode approximately after 10 seconds. Fresh button press will be required after resumption of auto scroll cycle to display the above parameters again.

15.3 Meter Reading during Power Outage:
The meter shall have provision to read the meter in no-power condition. The same push button shall be used to display of parameters of auto scroll mode during power outage. In any case, RTC Battery Power shall not be used for display under no-power condition.
15.4 **LCD Least Count**:

The kWh display shall be with one decimal digit in push button mode and in auto scroll mode. The internal least count of the energy recording shall not be more than 0.01 KWh. and every 0.01 KWh, consumption shall be internally stored.

16 **COMMUNICATION CAPABILITY**

16.1 These LT meters should be provided with one optical communication port which should be suitable for establishing local communication with CMRI and remote communication to base computer through purchaser’s modem. These LT meters should also have single phase 240 volt AC power supply port extended from the outgoing load end terminals of the meter for extending power supply to purchaser’s modem. The optical port and power supply port both should be extended on the side cover of push fit type meter box for connecting either CMRI or purchaser’s MODEM for remote meter reading. These meters shall be supplied in a push fit type meter box made of transparent engineering plastic, which shall be weather proof having flame retardant properties conforming to relevant specification.

16.2 Arrangement shall be made to get such a reading even at the time of power failure. The interface for communication between CMRI & Base computer shall be supplied free of cost. The software required for CMRI and Base Computer System to use the remote reading feature with necessary security provisions shall also be supplied free of cost.

a. It should be possible to read the meter through external CMRI via optical port using suitable interface data cable for downloading of billing and all historical data

b. The optical port and power supply port extended from the meter on the side wall of the push fit type meter box both should have pilferage/tamper proof sealing arrangement. The power supply port shall be initially provided with breakable plastic cover and the purchaser shall be able to connect power supply to his modem subsequently for automatic remote meter reading. The meter shall have facility for communicating with a hand held terminal (HHT) i.e. Common Meter Reading Instrument (CMRI) through optical communication port to facilitate reading and downloading the data for billing and historical data to base computer.

c. It should not be possible to reset the energy reading in the meter or make any change in the data stored in the meters either current or historical, with the CMRI.

d. The compatibility of transferring data from the meter to CMRI and then to the base computer system (BC) should be easily established; due to any change in language or any other reasons, the supplier shall modify it at his own cost within the guarantee period.

e. For the purpose of data security, the data transfer from the meter to CMRI and further to Base computer should be fully secured and any unauthorized attempt/change in data should be indicated on computer system. There should be multi-level passwords on the base computer system and in the meter to prevent any unauthorized changes in configurable parameters.

17 **BILLING POINT REQUIREMENTS**:

The predefined date and time for registering the billing parameters of energy, PF and MD as well as Tamper Count and Power-On hours details shall be at 00.00 hours of the first day of each calendar (billing) month and all the billing parameters shall be transferred to the billing registers.

The above billing data, TOD register's data, tamper information and instantaneous parameters data shall all be retrievable through the meter's communication port through a common meter reading instrument (CMRI) and shall be transferred (downloaded) to a PC with Windows based software to get complete details in numerical and/or graphic form. The necessary base computer software (BCS) for this purpose shall be provided by the supplier with complete details.
18 BILLING HISTORY & LOAD SURVEY: -

The meter shall have sufficient non-volatile memory for recording history of energy parameters for minimum last twelve billing cycles.

Following parameters shall be made available for last 45 days with integration period of 15 min:

- Active import, export energy
- Net Active Energy
- Apparent import and export energy while active import & export
- Phase wise voltages
- Phase wise currents

These load survey and history data can be retrieved with the help of Meter Reading Instrument on local interrogation or remotely using the remote communication interface.

19 TOD TARIFF/DEMAND

The meter should be capable of registering the time-of-day energy (TOD) and maximum demand. The time registers shall be programmable by the purchaser. The meter should have in-built capacity to define up to six registers. The meter should also have capacity to define multiple time zones within the registers. The change of the TOD time-period(s) or defining TOD registers should be possible through CMRI with special authenticated command from the BCS so that only authorized person(s) can make such changes. The main control of this system along with proper security password/code should be available on one or more computers located at the authorized location(s) as per the directions to be given by the Purchaser.

Provision should be made for automatic reset of maximum demand at the end of pre-defined period (e.g. end of the month). The billing parameters at the time of automatic reset of MD shall be so programmed that it will transfer data from rate registers to their respective billing registers. The main control of this system along with proper security password/code should be made available on one or more identified computers located at the authorized location(s) as per the directions to be given by the Purchaser.

Necessary compatible meter application software for various programmable features as discussed above in the meter and also necessary software for the IBM compatible computer to obtain various details as discussed above shall be provided by the supplier. No separate cost will be borne by the purchaser on this account.

20 MIDNIGHT ENERGY DATA:

Cumulative active energy import, export and Net Active Energy shall be logged at 00.00 Hrs. every day and shall be maintained for last 45 day on FIFO basis with optional programmable requirement of apparent energies. These daily energy snapshots shall be possible to view at BCS level.

21 TEST OUTPUT DEVICE:

The LT meters shall have a test output device in the form of calibrating LED of red colour having minimum intensity 10 M (Milli-candela) accessible from the meter front and shall be capable of being monitored conveniently with suitable testing equipment while operating at site. The location of the calibrating LED should be such that the calibrating pulses can be sensed easily through sensor for site testing of the LT meter’s accuracy. The LT meters shall also give high-resolution energy values on the display. The resolution will be sufficient to enable conduction of the starting current and accuracy test in less time.

22 BASE COMPUTER APPLICATION SOFTWARE

For efficient and speedy recovery of data read through CMRI, Base computer software shall be supplied having specifications stated as under:

The BCS software shall be user friendly Windows based. The Base Computer software shall give all details adequate for analysis. The software shall have the facility to convert all the consolidated information/data of selectable parameters into ASCII format. It should be possible for the Purchaser to generate its own DBF (data base files) to down load all the required information into it.
Platform: The BCS shall be executable on all WINDOWS system. The BCS shall be suitable to run on IBM compatible PC hardware platform.

Meter Data Display: The software shall show electrical conditions existing at the time of reading the meter in tabular forms as well as in graphical format (Phase diagram)

All the information about energy, maximum demand and their respective TOD register reading, billing register readings shall be shown in a manner which a user can understand easily.

The software shall be capable of preparing CMRI to read the meter information or time setting of the meter.

Support Display: There shall be "user friendly" approach for viewing meter data for the reading collected now or for the reading collected in the past. All information about a particular consumer will be sorted out and available at one place so that locating any consumer’s past data is easy. It shall be possible to retrieve/locate data on the basis of either one of the following particulars:

- Consumer's ID/Numbers.
- Meter Sr. No.
- Date of meter reading.
- Location.

The Data Transfer: It shall be possible to transfer data to and fro from CMRI through serial interface.

Remote Meter Reading option: It should be possible to read remote end meter using GSM/ GPRS infrastructure with configurable auto reading mode and manual mode. The auto dialling and reading mode shall have enough flexibility to define different groups and their priority orders to read the meter etc.

Configurability: It shall be possible to have selective printing of all available data of the meter. Print out should not include anything and everything available with the BCS. The software shall support "print wizard" whereby user can decide what to print. The user of the software need not revert back to the supplier of the software for modifying the software just to print what he desires.

BCS shall have facility to export data to ASCII or spreadsheet format for integrating with the purchaser's billing system. Here again an "Export wizard" or similar utility shall be available whereby user can select file format, what data to export, the field width selection etc.

Security: The BCS shall have multilevel password for data protection and security. The first level shall allow the user to enter the system. The different software features shall be protected by different passwords. The configuration of passwords shall be user definable. The software installed on one PC shall not be copyable on another PC.

Help: The exhaustive online help shall be available with the software so that user can use all the features of the software by just reading the help contents.

23 APPLICATION PROGRAMME INTERFACE (API)

The bidder shall provide Application Programme Interface (API) to read their meters and convert the meter data as per IEEMA MIOS standard. Supply of API with the meter is mandatory.

24 Communication with Common Meter Reading Instrument (CMRI)

The salient points of CMRI are mentioned below:

a. The data download time shall not exceed 5 Minute.
b. After successful downloading, indication shall be available on both meter and CMRI.
c. Manufacturer shall provide necessary application software of the CMRI to the utility.
d. Software shall be compatible with MS DOS Ver.6.22 operating system.
e. The communication software shall be capable to transfer the billing data and meter serial number required by automatic Spot Billing Machine to automatically generate the energy consumption bills at consumer premises (if required) without any human intervention after the data is collected by the CMRI. The CMRI shall continuously
transmit the data till an acknowledgement is received from the SBM (Spot Billing Machine). The manufacturer shall provide the protocol and other information to interpret the transmitted billing data. The data storage inside the CMRI and communication of CMRI with the meter shall be encrypted so that there is no possibility of tampering with the downloaded data.

It shall be responsibility of the meter manufacturer to provide the required software and all the facilities and support required by the purchaser, to use the CMRI for reading and retrieving the data from the meter and to download the data to Base Computer on free of cost basis even after expiry of guarantee period. Meter manufacturers shall also provide assistance to the MPPKVCL for understanding the protocol/ software and also impart training & provide application to compile / add further/ update the CMRI in-house for reading other makes and types of new and legacy meters.

22.1 Readings to be downloaded with CMRI:
The CMRI should support in down loading all-important data stored in the meter whether specified or not but required essentially for deriving billing parameters including MD parameters that shall be by default in KW programmable to KVA respectively. Following minimum parameters should be downloaded by CMRI.

i. Meter serial number

ii. Real date and time (Date DD-MM-YY, Time HH-MM)

iii. Cumulative active Import & export energy (with twelve history)

iv. Net Active Energy (with twelve history)

v. Net Apparent Energy (with twelve history)

vi. Cumulative apparent import energy while active import (with twelve history)

vii. Cumulative apparent export energy while active export (with twelve history)

viii. Universal active import & export demand in KW with date and time, up to two decimal (with twelve history).

ix. Universal apparent import & export demand in KVA with date and time, up to three decimal (with twelve history)

x. Cumulative MD reset Count

xi. Frequency

xii. Instantaneous Line currents.

xiii. Instantaneous Phase to Neutral Voltages.

xiv. Instantaneous Phase wise Power Factor with sign of lag/lead

xv. Average P.F. for calendar month and for previous months (with twelve history)

xvi. Instantaneous load in KW.

xvii. Instantaneous load in KVA.

xviii. Cumulative tamper count

xix. Present PT status

xx. Present CT status

xxi. Other status

xxii. Last occurred and restored tamper with date and time

xxiii. TOD 1,2,...,6 Cum. Net KWh register (Programmable)

xxiv. TOD 1,2,...,6 MD register KW (Programmable)

xxv. TOD 1,2,...,6 Cum. Net KWh billing register (Programmable) for the last 12 months

xxvi. TOD 1,2,...,6 MD KW billing register (Programmable) for the last 12 months

xxvii. Phase wise power ON time in HH:MM in a calendar month and for last 12 months

xxviii. Tamper information including cover open tamper

xxix. Mid night energy data for last 45 days


xxxi. Transaction history i.e. details (particulars, date & time) of last three transactions to change the particular configurable parameter of the meter.

Any other information whether specified or not, which is necessary for satisfactory performance of the meter should be incorporated and the manufacturer shall indicate such features in their offer without demanding additional cost.

The LT meter shall possess a optical communication port for automatic transfer of data from Meter to CMRI. Arrangement in the meter should be such that, even in case of power failure, it should be possible to download the data.
In case of optical communication port the data transfer rate (from meter to CMRI) should not be less than 9.6 kbps. However, the total downloading time (from meter to CMRI) shall be approx. 5 minute.

The CMRI shall possess a specific serial number, which cannot be changed/ altered.

The downloaded data along with date and time stamp of such reading shall remain on CMRI with suitable encryption and it should not be possible to pre-program or manipulate the recorded data on the CMRI before downloading the same on computer. The Supplier shall supply Software (compatible with Windows 98 system and/or higher) and training, free of cost for use of the software at multiple data collection and RMS Centres/Billing Centres of the utility.

After successful downloading of meter data to CMRI, an indication on CMRI or meter or both for confirmation of successful data transfer shall be provided. During this period the energy recording in meter should not be affected.

Necessary upgrades shall be possible in CMRI software and shall be supplied free of cost for downloading simultaneously the existing parameters and any parameters added in future specifications of meters. A copy of operation manual shall be supplied along with each CMRI.

It is the responsibility of the supplier to make their CMRI common/compatible to read all types (Optical and IrDA port) & makes of meters installed in the existing base.

The Supplier shall also provide meter-reading protocols in simple English language and other related information/ application software free of cost, which shall not be complicated and shall be easily understandable by utility officials to ensure compatibility between meters and CMRIs of different makes and for providing to other successful suppliers. An undertaking to this effect shall be submitted with the bid that you will provide secured meter reading protocol and required software’s as indicated above unconditionally and without any NDA. This will be binding on the meter suppliers and nothing contrary to this shall be acceptable.

25 MAXIMUM DEMAND REGISTRATION AND MD RESETS:

The Meter shall continuously monitor and calculate the maximum demand at the point of supply, during any consecutive 15 minutes during the calendar month as per sliding window principle with sub integration period not greater than 5 minutes. It shall store the maximum demand with date and time, when it occurred. The maximum demand shall automatically reset at 24.00 Hrs of the last date of each calendar month for which minimum 30 years calendar shall be programmed by the manufacturer.

26 REAL TIME CLOCK AND BATTERY:

The MD integration cycle shall be on the basis of Real time clock of the meter. The maximum drift in real time clock of the meter shall not exceed ± 3 minutes per year and its oscillator crystal should be temperature compensated for temperature range of 0°C to 50°C. A lithium battery of adequate storage energy shall be used for energy supply to real time clock during no voltage or power off condition. The metering data stated above including integration etc shall be independent of battery. The minimum life of battery should be ten years.

27 CALIBRATION:

The meters should be software based factory calibrated and there shall not be any mechanical adjustment in calibration after freezing the parameters at works. This is to ensure that the meter cannot be calibrated at site.

28 CONSTRUCTION:

Meter shall be designed and constructed to be capable of withstanding all severe stresses and vibration and dust environments likely to be encountered in actual field conditions. All parts that are likely to develop corrosion shall be effectively protected against corrosion by providing suitable protective coating.

29 TERMINALS, TERMINAL BLOCK AND COVER:

29.1 The terminals may be grouped in a terminal block having adequate insulating properties and mechanical strength. The terminal block should be made from best quality non-hygroscopic, flame retardant material (capable of passing the flammability tests given
Three Phase

in IS:11731) with nickel plated brass for connecting terminals. It shall be an integral part of the meter base.

29.2 Terminal holes shall be of minimum 9.5 mm to accommodate the insulation of conductor and shall be of adequate length in order to have proper grip of the conductor/ crimping pins with the help of two screws such that there is no risk of loosening or undue heating. Electrical connection shall be so designed that contact pressure is not transmitted through insulating material. Required number of pins along with one additional pair shall be supplied with each meter.

29.3 Sufficient clearance shall be allowed between terminals. Further, the supporting webs between the two terminals of the terminal block should be sufficiently high to ensure that the two neighbouring terminals do not get bridged by dust or it is not possible to have flashover between adjacent terminals of terminal block.

29.4 The terminals shall be of suitable rating to carry 200% of Imax and shall be made of electro-plated (or tinned) brass.

29.5 All connection screws and washers should be tinned/ nickel-plated brass. The terminal screws shall not have pointed end at the bottom. All terminals shall have two screws. The terminals shall be properly bound in the insulating material of terminal block.

29.6 The terminal block shall have provision with single/two screws for fixing of meter to the meter board. It shall not be possible to remove the meter from the hanging screw without removing the screws from the terminal block.

29.7 The voltage circuit and current circuit shall be solidly connected inside the meter body without any link. A firm connection shall be established within the meter case to energize the voltage/current circuit. The connections shall be as per the recommended methods given in IS-13779.

29.8 TERMINAL BLOCK COVER:- The terminal block cover for the energy meters shall be provided, transparent type having hinge, which can be sealed independently of the meter cover. The Extended Terminal Block Cover (ETBC) shall have a clear space of at least 30mm, thus allowing sufficient clearance space for inserting cables. The terminals, their fixing screws and the insulated compartment housing them with meter fixing arrangement on the base of meter box shall be enclosed by extended terminal cover in such a way that no part of meter or accessories at terminal block shall be accessible from the front of the meter. There shall be provision of fixing of seals so that screws cannot be loosened without breaking the seals. The terminals shall not be accessible without removing the seal(s) of terminal cover when energy meter is mounted on the meter board / box.

30 CURRENT AND VOLTAGE CIRCUITS:

The current and voltage circuits shall be made of appropriate material such as enamelled copper wire of EC grade. The current circuit shall be appropriately insulated and potential circuit shall be appropriately encapsulated. The cross section of current circuit shall be properly designed so as to withstand the temperature rise of 50°C over the ambient temperature at maximum current. PT less design shall be used for power supply to PCB. The meter design shall be based on CT or CT and shunt combination or shunts. It is necessary to ensure accurate recording by the meters during the condition when DC component exists in the load, EM CT/Shunt currents should be compared and higher of the two should be used for measurement. Specific confirmation shall be submitted by the bidders that accuracy of measurement will not suffer due to utilization of shunt on account of thermal variation and temperature coefficient up to an operational temperature of 80°C.

31 CT/Shunt Fixing arrangement:- The CTs/Shunts & other measurement devices when provided in the meter shall be mounted through proper fixing arrangement so that it should have a firm support and should not move from its position in any case.
32 METER FIXING ARRANGEMENT:
Every meter shall have at least three fixing holes one at the top and two at the bottom. The top hole shall be provided with a special clip at the back of the meter so that holding screw is not accessible after the fixing of the meters. The lower fixing screws shall be provided under the terminal block. The requisite fixing screws shall be supplied with each meter.

33 CONNECTION DIAGRAM & TERMINAL MARKINGS:
The connection diagram of the meter shall be clearly shown on the nameplate of meter and shall be of permanent nature. The meter terminals shall also be marked and this marking should appear in the above diagram.

34 TERMINAL ARRANGEMENT:
Connecting terminals of meter shall be in the following sequence:
R(in) R(out), Y(in) Y(out), B(in) B(out), N(in) N(out),

35 NON FLAMMABILITY:
The terminal block and the meter case shall be such as to ensure reasonable safety against spread of fire. It shall not be ignited by thermic overload of live parts in contact with them. To comply with this requirement, all the parts shall fulfill the conditions of the glow wire test as per relevant standard.

36 SEALING ARRANGEMENT:
36.1 The meters should be software calibrated at factory and sealed suitably before dispatch.

36.2 At-least two sealing screws of Nickel plated steel / brass shall be provided for proper fixing of meter body (cover & base). Each sealing screw shall have two independent sealing holes. One hole should be provided in the head and other in the bottom portion. The diameter of the hole shall be 2.0 mm & 1.5 mm for the head and thread portion respectively. The sealing screw shall be tightened from the bottom of the extended flange on the meter body cover & base. The sealing screws shall be provided with patented lash wire tamper proof polycarbonate seals by the meter manufacture with additionally laser marked sr. no. matching with the meter sr. no., company logo and high rise logo of MPPKVCL. All the seals should be provided on the front side only. Access to the working part should not be possible without breaking the seals.

36.3 The serial number of meter is to be laser –etched on the base as well as on the cover of the meter box, and can be easily viewed to check duplication attempts for the purpose of keeping track of meter seals with serial no. matching with that of meter.

36.4 Meter cover shall be permanently and solidly welded with the Base of the meter so that it could not be opened without breaking.

36.5 The provision shall also be made to provide additional lash wire seals on the meter body by MPPKVCL.

36.6 TRACKING SOFTWARE FOR SEALS:
It is mandatory to provide Tracking and recording software for all new seals so as to track total movement of seals starting from manufacturing, procurement, storage, record keeping, installation, series of inspections, removal and disposal etc.

37 TAMPER AND FRAUD PROTECTION:
Logics for design of various tampers, the value of voltage, current, time etc. to be selected for design of tamper shall be done in consultation with the purchaser. It may be noted that the approved logics used in designing tampers are explained to our field officers, and based on their input, the bidder has to modify the logic if necessary (The last tamper date and time of occurrence and tamper counts must appear in the DISPLAY and rest of the details in VIEW PARAMETERS).
The meter shall record and store last 200 events of tampers (occurrence + restoration) along with the date and time of occurrence and restoration of each and every event. The event recording shall be compartment wipe and roll over type i.e. it shall always maintain record of last 200 events occurred of selected tamper for logging.

The tamper information shall be available along with the date & time of occurrence and restoration of the event and phase indication on which tamper was attempted.

The meter shall continue to register the active energy accurately even under following conditions:

37.1 The meter should continue to record energy even when
   (a) Any two phases are disconnected i.e. in presence of any one phase and neutral. Under this condition the meter should record correctly.
   (b) One phase and neutral are disconnected i.e. in presence of any two phases and the load is drawn through local earth. Under this condition, earth load LED indication shall appear on meter and the maximum limit of error allowed is ±3% from the reference condition.
   Meter shall store the date & time of occurrence and restoration in the non-volatile memory.

37.2 Current Imbalance (CT shorting/by-passing):
   In case of CT open or shorting, which may result in the current imbalance between the phases, the tamper indication should appear by means of measuring neutral current. Meter shall store the date & time of occurrence and restoration in the non-volatile memory.
   Better design/logic for such detection shall also be acceptable but bidder should satisfy/explain logically.

37.3 Power ON Time: The meter shall have provision to record the phase wise power ON time in HH:MM in a calendar month for last 12 months

37.4 The meter should record energy as per IS for balanced and unbalanced load.

37.5 Meter should continue to record in unbalance load condition when neutral is removed. In this condition maximum limit of the error allowed is ±3% from the reference condition.

37.6 The meter should record energy accurately irrespective of the phase sequence of supply.

37.7 The three phase LT meter should continue to function when DC signals through Diodes from any or all the three phases are injected on the neutral of the meter.

37.8 **Cover opening**:
   If attempt is made to open the meter body, the meter shall detect /log with date and time of meter body opening tamper, even in the absence of supply. This tamper shall also be displayed on the meter LCD in auto scroll mode. The auto scroll mode shall be locked with display of this tamper and push button mode shall work as normal on pressing the push button.

37.9 **DC Immunity**: The meter should not saturate on passing of direct current which can cause the meter either to stop recording or record inaccurately as per IS: 13779 (latest version).

37.10 **External Magnetic Influence**:
   The meter shall not get influenced by any external magnetic fields (AC Electro Magnet or DC Magnet) in accordance with the test procedures specified in IS: 13779 with its latest amendment for AC Magnetic Field. However, the meter alone should comply up to 0.27 Tesla DC.

   The meter accuracy or accuracy in display under normal conditions shall not be affected by the placement of a permanent magnet of not less than 0.27 Tesla anywhere on the surface of the meter without meter box.

   Meter shall have provision to record the tamper of abnormal magnetic induction with date and time of occurrence and restoration.
On application of external DC magnetic field of higher intensity against which meter is not immune, the meter should log the events of abnormal magnetic induction with date and time. The positive error may be beyond the limit of 4% but not exceeding power value equivalent to the product of rated voltage and maximum current.

37.11 Application of abnormal voltage/frequency:
A) The accuracy of the meter, Real time clock malfunction/disturbance, Memory data corruption, meter functioning hang up etc. should not occur with the application of abnormal voltage/frequency such as spark discharge of approximately 35KV with 0.01-10 mm spark gap in any of the following manner when applied for 10 minutes:
a) On any of the phases or neutral terminals
b) On any connecting wires of the meter
c) At any place in load circuit
d) Spark on meter body.
B) Meter should also be immune to tamper by the application of remote loop induction device (jammer).

37.12 EMC/EMI Test:
The meter shall also pass all EMC/EMI tests as per IS:13779 with latest amendments.

37.13 Further the bidder shall carefully note and confirm that:
(i).The measurement of meter shall not be influenced by the injection of AC voltages/chopped signal/DC signal and harmonics on the outgoing leads of the meter.
(ii).The meter shall not get affected by any remote device.
(iii) The bidder should furnish detailed explanation as to how the meter is able to detect/Protect recording the above tamper and fraud features with sketches and phaser Diagram. Additional features, if any, in the meter may also be clearly indicated.

Along with the tamper information, the meter shall also record the instantaneous values of voltages, currents and power factors phase wise to simulate and elaborate the existing condition during all type of tamper events.

38 LED INDICATIONS:
The following indications must be provided on the meter:

(i) KWh indicator for Meter calibration - Red (Calibration LED-Imp/KWh)
(ii) Earth Tamper indication - Green LED indicator or Icon on LCD
(iii) Power supply ON and Phase indication - LED or ICON on LCD for line1, 2 & 3.

All the LEDs shall be of low power consumption and distinctly visible from a distance. Except KWh indicator, all the other indications may be provided as Icon on backlit LCD.

39 SALIENT FEATURES:
The meter shall have the following additional features.

39.1 The meter shall be compact in design. The entire design and construction shall be capable of withstanding stresses likely to occur in actual service and rough handling during transportation/loading/unloading etc. The meter shall be convenient to transport and immune to shock and vibration during transportation and handling.

39.2 The short time over current rating shall be 30 Imax for one half cycle at rated frequency as per clause No.9.2.3 of IS:13779.

39.3 The meters shall remain within ±1% accuracy when tested at basic current at rated voltage at 0.3 lag and 0.5 lead power factor.

39.4 Meter shall work accurately up to max. loading up to 120%Imax.
39.5 Even if phase to phase voltage (i.e. 440 Volts) is applied for 5 minutes between phase and neutral of the meter, the meter should not get damaged and continue to record correctly within class 1.0 accuracy after restoration of normal supply.

39.6 The meter shall also withstand impulse Voltage without any damage in accordance with the clause 12.7.6.2 of IS: 13779:1999.

39.7 The meter shall make use of Non Volatile Memory capable of storing & retaining all the data required to be stored, without the help of any power source or battery back up.

39.8 Computation of demand shall be on the basis of Real Time Clock of the meter itself.

39.9 Provision shall be there to do billing operation automatically at a predefined date by programming the meter.

39.10 Meters covered under this specification shall be fully static type with non-volatile memory to register various billing parameters and complete with other features as detailed out in this specification. Any other design meeting technical specification or features/accuracy etc., better than this specification and manufactured as per relevant IEC/IS/CBIP report shall also be acceptable.

39.11 Meter shall be suitable for accurate measurement and display of energy and other billing parameters within the specified limits of errors under balance and unbalanced load conditions in a poly phase network.

39.12 Indication shall be provided on the display to show the healthiness of phase voltage.

39.13 The meter shall be fully programmable by the user for TOD timing and billing dates etc. For security reasons, the meter operating software should have at least “two level write protection” against any modification/editing of the parameters, data, settings etc. except those required for billing data, TOD metering.

39.14 The meter shall conform to the degree of protection IP 51 of IS: 12063/IEC: 529 for protection against ingress of dust, moisture and vermin.

39.15 The meter base & meter cover shall be made of high grade, fire-resistant, non-inflammable high-grade and good quality engineering plastic.

39.16 The entire design and construction shall be capable of withstanding stresses likely to occur in actual service and rough handling and transportation. The meter shall be convenient to transport and immune to shock and vibrations during transportation and handling.

39.17 The voltage circuit and current circuit shall be solidly connected inside the meter body without any link. A firm connection shall be established within the meter case to energize the voltage/current circuit. The connections shall be as per the recommended methods given in IS:13779.

39.18 The bidder should specify the make & origin of components used in samples and should supply meters with same components in the event of order. If purchaser observes any change in make of components from the sample or approved list of components, then the lot will be summarily rejected.

40 SELF DIAGNOSTIC FEATURE

The meter shall be capable of performing complete self-diagnostic check and continuously monitor all the circuits for any malfunctioning and ensure integrity of the data and memory location all the time. The meter shall have display indication for unsatisfactory/nonfunctioning/malfunctioning of the following:

a) Time and date on meter display
b) All display segments on meter display
c) Real Time Clock (RTC) status in meter reading print out at BCS end
d) Non-volatile Memory (NVM) status in meter reading prints out at BCS end.
41 ELECTROMAGNETIC COMPATIBILITY AND INTERFERENCE REQUIREMENT:
41.1 The meter shall meet EMI/EMC requirements as specified in the relevant standards and shall also be protected against radiated interference from either magnetic or radio frequency sources.

41.2 The offered whole current meter shall also withstand DC Immunity test as per IS:13779 for all the phases so as to ensure that the meter current circuits do not saturate on passing of direct current.

41.3 The meter shall be designed in such a way that the conducted or radiated electromagnetic disturbances as well as electrostatic discharge do not damage or influence the meter.

41.4 The disturbance(s) to be considered are:
(i) Harmonics
(ii) Voltage dips and short interruptions
(iii) Fast transient burst test
(iv) External D.C. and A.C. magnetic fields
(v) Electromagnetic H.F. fields
(vi) Electrostatic discharges
(vii) Radio frequency interference suppression.

42 GUARANTEED TECHNICAL PARTICULARS:
The bidder shall furnish all the necessary information as desired in the Schedule of Guaranteed Technical Particulars and data, appended with this specification. If the bidder desires to furnish any other information(s) in addition to the details asked for, the same may be furnished against the last item of that Annexure.

43 NAME PLATE AND MARKING:
Every meter shall have a name plate clearly visible and indelible and distinctly marked in accordance with IS:13779 (latest version). The following information should appear on the name plate affixed on to the meter:-

(i) Manufacturer’s name or trade-mark and place of manufacture.
(ii) Designation of type
(iii) Number of phases and number of wires for which the meter is suitable.
(iv) Guarantee period – 5 years from the date of commissioning or 5-1/2 years from the date of supply, whichever occurs first.
(v) Purchase Order No. & Date.
(vi) Property of MPPKVVCL.
(vii) Bar coding of SN, Month & Year of manufacture
(viii) Sign of Insulation Class
(ix) Connection diagram
(x) Serial number, year and month of manufacture
(xi) Principal unit in which the meter records Reference voltage
(xii) Basic current and rated maximum current
(xiii) Reference frequency in Hz
(xiv) Meter constant (Imp/KWh)
(xv) Accuracy class
(xvi) Reference tamperature
(xvii) ISI mark and license number

44 TESTS:
(A) Type Test:
The type test certificate for all tests as indicated in IS:13779-1999 (with latest amendments) shall be furnished along with the bid. Type test certificates from any one of the standard laboratories NABL accredited for particular equipment/test shall only be considered. Type test report, amongst other details, should contain the following information clearly:
(i) Type of meter and display
(ii) Class of Accuracy.

Type test certificate from educational institute(s) will not be accepted. The type test certificate shall not be more than 24 months old as on the date of opening of bid.

(B) Additional Type Test:
In addition to the tests mentioned at (A) above, bidder shall have to furnish the type test reports of compliance of anti-tamper features as per tender specification.

(C) Acceptance tests:
All Acceptance tests as laid down in this tender specification shall be carried out.

(D) Verification during Inspection:
Inspecting officer shall verify that no DC supply/ signal is given to reference meter during the DC injection test. The accuracy of display parameters shall be verified at the time of inspection in line with class of accuracy of the meter.

i. Voltage variation test
ii. Accuracy tests under all anti tamper conditions.
iii. Permanent magnet test
iv. Special accuracy test – the meters shall remain within ±1% accuracy when tested at basic current at rated voltage at 0.3 lag and 0.5 lead power factor.
v. The accuracy of the meter. Real time clock disturb, Memory data corruption, meter functioning hang up etc. should not occur with the application of abnormal voltage/ frequency such as spark discharge of approximately 35KV with 0.01-10 mm spark gap in any of the following manner when applied for 10 minutes:
a) On any of the phases or neutral terminals
b) On any connecting wires of the meter
c) At any place in load circuit
d) Spark on meter body.
vii. Immunity from remote loop induction device (jammer)

The accuracy and above indicated parameters of the meter shall be checked before and after the application of above device(s) with site conditions.

v. During the inspection / acceptance test at the place of supplier / manufacturer, all the major components (with make) used in the offered meters shall be verified as per approved list / sample and listed by the inspecting officer of MPPKVVCL. The invoices of the components shall also be verified. Similar practice shall be adopted for component verification after receipt of lot(s) at the consignee stores and at meter testing lab on random sample by the Committee, if required so by MPPKVVCL for confirmation that the supplied meter is of similar design or not.

(E) Routine Tests:
All the routine tests as stipulated in IS:13779 and in addition tamper and fraud protection tests as per TS shall be carried out and test certificates shall be furnished for approval of the Purchaser.

45 MINIMUM TESTING FACILITIES:
Manufacturer should posses fully computerized Meter Test Bench for carrying out routine and acceptance tests as per relevant ISS. In addition this facility should produce Test Reports for each and every Meter. The bidder should have the necessary minimum testing facilities for carrying out the following tests.

i) A.C. Voltage test
ii) Insulation Resistance Test
iii) Test on limits of errors
iv) Test on meter constant
v) Test of starting condition
vi) Test of no load condition
vii) Repeatability of error test
viii) Test of power consumption
ix) Vibration test
x) Tamper conditions - as per MPEZ Specification
The manufacturer should have duly calibrated ESS meter of class 0.1 or higher accuracy.

Bidders should carefully note that the standard meters used for conducting tests shall be calibrated periodically at NABL Accredited Test Laboratories and test certificates shall be available at Works for verification of Purchaser’s representative.

46 INSPECTION:
46.1 The Purchaser’s authorized representative may carry out inspection at any stage of the manufacture. The Supplier/Manufacturer 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 absolve the Supplier of his obligation of furnishing the equipment in accordance with the specification and shall not prevent subsequent rejection if the equipment is found to be defective.

46.2 All acceptance tests and inspection shall be made at the place of Supplier/Manufacturer. The Supplier shall provide all reasonable facilities without demanding any charge to the inspector representing the Purchaser to satisfy him that the equipment is being manufactured and furnished in accordance with this specification.

46.3 The Supplier/Manufacturer shall keep the Purchaser informed in advance, about the manufacturing/readiness activities so that arrangement can be made for inspection.

46.4 The Purchaser reserves the right to insist for witnessing the acceptance/routine testing of the bought out items. The Supplier shall give 15 days advance intimation to enable the Purchaser to depute his representative for witnessing the acceptance and routine tests.

46.5 The Purchaser reserves the right to get the type tests done in respect of any meter, or Box from any of the lots received at any Destination Stores at Supplier’s expenses.

47 Installation:

The meter shall be verified as per the technical specification requirement at the utility testing lab before installation.

48 QUALITY ASSURANCE PLAN:

48.1 The designed life of the meter shall be minimum of 20 years and to prove the designed life, the firm shall have to follow at least the following Quality Assurance Plan:-

(i) The factory shall be completely dust proof.

(ii) The testing rooms shall be temperature and humidity controlled as per relevant standards.

The testing and calibrating equipments should be automatic and all test equipment shall have their valid calibration certificates.

(iii) Power supplies used in testing the equipment shall be distortion free with sinusoidal wave forms and should maintain constant voltage, current and frequency as per the relevant standards.

(iv) During the manufacturing of the meters the following checks shall be carried out:-

(i) Meter frame dimensions.

(ii) The assembly of parts shall be done with the help of jigs and fixtures so that human errors are eliminated.

(iii) The meters shall be batch tested on automatic, computerized test bench and the results shall be printed directly without any possibility of human errors.

48.2 The Supplier/Manufacturer’s laboratory must be well equipped for testing of the meters. They must have computerized standard power source and standard equipment calibrated not later than a year (or as per standard practice). The details of testing facilities available for conducting (a) The routine tests and (b) Acceptance tests shall be furnished in Schedule annexed with tender document.

49 MANUFACTURING ACTIVITIES:

(i) All the materials, electronics and electrical components, ICs used in the manufacture of the meter shall be of highest quality and reputed make to ensure higher reliability, longer life and sustained accuracy.
(ii) The manufacturer should use Application Specific Integrated Circuit ASIC or Micro controller for metering functions.

(iii) The electronic components shall be mounted on the printed circuit board using latest Surface Mounted Technology (SMT) except power components by deploying automatic SMT pick and place machine and re-flow solder process. The electronic components used in the meter shall be of high quality. Further, the Supplier should own or have assured access (through hire, lease or sub-contract) of the above mentioned facilities. The PCB material should be of glass epoxy FR-4 grade conforming to relevant standards.

(iv) All insulating materials used in the construction of meters shall be non-hygrosopic, non-aging and of tested quality. All parts that are likely to develop corrosion shall be effectively protected against corrosion by providing suitable protective coating.

(v) Quality should be ensured at the following stages:
   (a) At PCB manufacturing stage, each board shall be subjected to bare board testing.
   (b) At insertion stage, all components should undergo testing for conforming to design parameters and orientation.
   (c) Complete assembled and soldered PCB should undergo functional testing using test equipments (testing zig).
   (d) Prior to final testing and calibration, all meters shall be subjected to aging test (i.e. meters will be kept in ovens for 72 hours at 55°C temperature and atmospheric humidity under real life condition at its full load current. After 72 hours meters should work satisfactorily to eliminate infant mortality. At least one meter should be kept under testing conditions and records maintained in detail.

1. The calibration of meters shall be done in-house.
2. The Supplier/Manufacturer should submit the list of all components used in the meter along with the offer.
3. A detailed list of bought-out items which are used in the manufacture of the meter should be furnished indicating the name of firms from whom these items are procured. The Supplier shall also give the details of quality assurance procedures followed by him in respect of the bought-out items.
4. The details of testing facilities available for conducting the routine and acceptance tests and other special tests on the meter shall be furnished with the bid. The facility available if any for conducting type test may also be furnished.

50 GUARANTEE:
(i) The meters shall be guaranteed for a period of 5 years from the date of commissioning or 5-1/2 years from the date of supply, whichever occurs first.

(ii) The meter found defective within the above guarantee period shall be replaced by the supplier free of cost within one month of the receipt of intimation. If the defective meters are not replaced within the above specified period, the same shall be treated as breach of performance of the contract and shall be liable for consequential penal action.

51 PACKING & FORWARDING:
51.1 The equipment 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 the appropriate caution symbol. 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 immediately by Supplier without any extra cost.

51.2 Each consignment shall be accompanied with a detailed list containing the following information.
Three Phase

a) Name of the consignee 
b) Details of consignment 
c) Destination 
d) Total Weight of Consignment 
e) Handling and packing instruction 
f) Bill of material indicating contents of each package

51.3 The packing shall be done as per the Manufacturer’s standard practice. However, he should ensure the packing is such that the material should not get damaged during transit by Rail/Road.

52 GENERAL :

52.1 The Technical Specification of Push Fit Type Meter Box made of Engineering Plastic has been described in Schedule-II(B)
1. The meter box shall be weather proof, tamper proof and made of transparent engineering plastic conforming to IS: 11731. Type test of material is required to be furnished along with the sample.

2. The meter box should be unbreakable un-deformable and should withstand the temperature up to 140 deg. Celsius.

3. Thickness of the base should be at least 2 mm and cover should be of not less than 0.8 mm.

4. Clearance of 30 mm shall be maintained from top and both sides of the meter. However, the clearance at bottom should be of 75 mm. from the meter and 45 mm from the terminal block. Besides, there should be minimum clearance of 15 mm in the front from the face of the meter.

5. The top cover of the meter box should be of push fit type having at least 4 self locks so that once the top cover of the box is fitted with the base it cannot be removed without breaking the top cover. The cover and base shall have groove all along with the fitting edge, so that after fixing the top cover, no wire or any device can be, temporarily or permanently, inserted in the box. The top cover of the box, provided with self-lock, should have arrangement/barrier so that after getting locked, it cannot be detached from latches even by applying external pressure through any means. The locks will be moulded in the cover and base and will not be separate pieces fixed later. There will be no holes to access the locks from any side.

Additional provision to provide lash wire utility seals on the meter box shall be made.

6. Meter shall be fitted with the base of box through unidirectional type screw or by some other better means in such a way so that once the meter is fitted with the base; it cannot be removed from the base and it becomes an integral part with base. The meters shall be supplied duly mounted on the base of meter box and the cover shall be placed separately in the carton.

7. Suitable circular holes with adjustable cable glands shall be provided at the bottom of the meter box for inlet and outlet of consumer’s service cables. The incoming and outgoing gland shall be so positioned that disable direct access to meter terminals through glands.

8. The meter box cover or base shall have a barrier so positioned that any possibility of fiddling with the meter terminal from outside of the meter box through cable entry holes is not possible. The barrier shall have reinforcement/lock at both sides to restrict its movement up and down even by applying external pressure through any tools.

9. The top cover of meter Box should have a spring loaded push button with spindle in moulded barrel perfectly in alignment, to operate push button of the meter to read display parameter on push button mode.

10. In case of meter with optical port, the side wall of the push fit type meter box should have a optical port extended from meter and also a power supply port taken out from the out going load end terminals of the meter for connecting GSM modem of the purchaser for automatic remote meter reading in future. Initially power supply port shall be provided on the meter box with breakable plastic cover which will be broken by the purchaser subsequently to connect modem. All the relevant details should be furnished for approval of the purchaser. Confirmation to this effect is mandatory by the bidder for data transfer and for connecting modem for Automatic Remote Meter Reading.

11. The boxes shall be specific to the meter mounted in it. Thus, the Serial Number of the meter should be indelibly engraved /marked on the base of meter box as well as on the cover of meter box.

12. The box should have proper mounting arrangement so that it could be mounted on the wall or the pole, as the case may be.
13. The meter box comprises of base and cover and shall pass the following tests;
   
   i) **Unbreakability test**: Shall not get damaged or deformed while dropping from a height of 10 ft. and hammered with a 2 kg. hammer to test its unbreakability.
   
   ii) **Boiling water test**: It should pass the boiling water test as prescribed in IS:13010.

14. The overall dimensions of the meter box shall vary according to the different make of meters. However, it shall comply with the minimum requirements as described above.

15. The individual meter manufacturers shall submit the specific drawing and sample accordingly to accommodate meters of their male only.