

ANNEXURE B

Technical Specification for 3-Phase Smart Meter

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1. Scope of Supply

This specification covers the following for 3-phase 10-80A Static Watt hour smart meters of accuracy class 1.0 with communication modules and integrated load control switches along with Meter Box to house single phase meter.

- a) Design, manufacture, testing at manufacturer works before dispatch, packing, delivery and submission of all documentation.
- b) The meters shall have bi-directional communication capability through RF module compatible with Low-Power-Wide-Area-Network (LPWAN).
- c) Smart meters with provision of TOD (Time of Day) tariff, suitable for measurement of energy (kWh & kVAh) and demand (kW & kVA).
- d) The meter can function in both Post-paid and pre-paid mode, any mode can be enabled remotely.
- e) Any accessories / hardware required for installation, commissioning and operation for the meter.

2. Codes & standards

The meters covered in this specification shall conform to the latest editions and amendments of the following Indian/IEC standards and shall conform to the regulations of local statutory authorities, unless specified separately elsewhere in this specification.

Sl.No.	Standard	Description
1.	Indian Electricity Act	IE Act 2003
2.	CEA Metering Regulations: 2006	Installation and operation of meters with latest amendments
3.	CBIP Report No. 88	Specifications for AC Static Electrical Energy Meter
4.	IS- 13779: 1999	AC Static Watt-hour Meters, Class 1 and 2 – Specification
5.	IEC 61036	Alternating Current Static Watt-Hour Meters for Active Energy (Classes 1 and 2)
6.	IS- 16444 (Part 1): 2015	AC Static Watthour Smart Meters, Direct Connected Class 1 and 2
7.	IS- 15884: 2010	Alternating current direct connected static prepayment meters for active energy (Class 1 and 2) – Specification
8.	IEC 1107	Data Exchange for Meter Reading, Tariff and Load Control and direct local data. Exchange
9.	IEC 735	Testing equipment for electrical energy meters
10.	IEC 62052–11	Electricity metering equipment (AC) – General requirements & test conditions Part II metering equipment.
11.	IEC 62053-21	Electricity Metering equipment (AC)- particular Requirements – Part – 21 Static meters for active Energy (class 1 & 2)
12.	IEC 514	Acceptance inspection of Class 1 alternating current watt-hour meters
13.	IEC 1038	Time switches for tariff and load control
14.	Others	All other relevant IS/IEC specifications for metering equipment

In case of any conflict or discrepancy the order of precedence shall be

- (i) IS
- (ii) IEC
- (iii) CBIP technical report-325 (read with latest amendments)

In case of any difference between the provisions of these standards and the provisions of this specification, the provisions contained in this specification shall prevail.

2. Climatic Conditions for Installation

The meter to be supplied against this specification should be capable of performing and maintaining required accuracy under hot, cold, tropical, rainy, cloudy, and dusty climate typically existing in state of Mizoram (India). The meter shall be required to operate satisfactorily and continuously under the following climatic conditions.

Sl.No.	Parameter	Requirement
3.1	Maximum ambient air temperature	55°C
3.2	Number of months of monsoon condition	5 months
3.3	Maximum altitude above mean sea level	1100 meters
3.4	Average annual rain fall	180 - 200 mm
3.5	Maximum wind pressure	200 kg/sq.m
3.6	Average daily ambient air temperature	35°C
3.7	Maximum relative humidity	96%

The weather in Mizoram remains pleasant for most times of the year, from bright sunny to rainy and cloudy. Temperatures remain in between 3 to 38 degree Celsius. Heavy lightning also occurs during rainy seasons.

3. Supply/Installation System Data

S. No.	Parameter	Value
4.1	Type of Installation	Indoor/Outdoor
4.2	System	AC, 3 Phase - 4 wire
4.3	Rated Frequency	50 Hz \pm 5%
4.4	System Neutral	Solidly Earthed

4. General Technical Requirements

S.No.	Parameter	Requirement
5.1	Meter Type	3-Phase, 4 wire Static Watt-hour Smart Meter, comprising of measuring elements, display, memory, load switch with bi-directional communication module all to be housed in meter.
5.2	Connection	Whole current
5.3	Reference and operating Voltage	Reference Voltage (V_{ref}) = 240 Volt Meter shall be operational with required accuracy from 60% of V_{ref} to 120% of V_{ref} . However, meter shall with stand with the maximum system voltage of 440 volts (for minimum 5 minutes).
5.4	Rated Current	Base Current - 10 Amps Maximum current (I_{max}) – 80 Amps
5.5	Starting Current	0.2% of base current (Phase or neutral)
5.6	Operating Frequency	50Hz \pm 5%
5.7	Accuracy Class	Class 1.0 accuracy - shall comply accuracy requirements under IS 13779 or IEC 61036
5.8	Power Factor Range	0.5 Lag – unity - 0.8 Lead
5.9	Immunity to phase and earth fault	Meter shall comply requirement of clause no. 9.6 of IS 13779
5.10	Temperature Range	Operating Temperature: -10°C to 60°C Storage / Transport Temperature: -25°C to 70°C
5.11	Relative Humidity	0 to 96%
5.12	Initial start-up of meter	Meter shall be fully functional within 5 seconds after reference voltage is applied to its terminals.
5.13	Display	LCD. Visibility should be sufficient to read the meter mounted at a height of 0.5m to 2.0m and temperature range -25°C to 70°C
5.14	Number of display digits	6 digits in 1 row
5.15	Data Retention	As per CEA regulations
5.16	Real Time Clock (RTC)	The meter shall have internal real time clock to set date and time. The Real Time Clock (RTC) shall have long life (7 Years), it should be with permanent Non-Rechargeable Battery. RTC shall have separate battery backup. Meter should have capability of Time synchronization with proper authentication.
5.17	Meter Body	<ul style="list-style-type: none"> Base body and top cover shall be made of UV stabilized, unbreakable high-grade flame retardant insulating material of good dielectric and mechanical strength Base body shall be opaque Top cover shall be transparent or opaque/translucent with viewing window

		<ul style="list-style-type: none"> • Meter body shall be sealed in such a way that opening of meter base and cover is not possible without breaking the seals • Thickness of meter body (Base and Terminal cover) shall be 2mm minimum • Only unidirectional screws to be used on meter cover wherever required • Usage of equivalent material shall be with prior approval of P&ED Govt. of Mizoram.
5.18	Terminal Block	<ul style="list-style-type: none"> • The terminal block shall be moulded type made of non-hygroscopic, flame-retardant material having good dielectric and mechanical strength • The moulded terminal block shall be made from best quality phenol formaldehyde/Poly carbonate conforming to IS:13779-1999 (latest amended) having adequate insulating properties and mechanical strength with brass inserts for connecting terminals • Terminal block shall be opaque • Terminal block shall be capable of passing the tests as per ISO-75 for a temperature of 135°C and pressure of 1.8MPa • The terminals shall be designed to ensure adequate and durable contact such that there is no risk of loosening or undue heating • Terminal block shall be such that the risk of corrosion due to contact with other metal part is minimized • Electrical connections shall be designed such that contact pressure is not transmitted through insulating material • Usage of equivalent material shall be with prior approval of P&ED, Govt. of Mizoram
5.19	Terminal cover	<ul style="list-style-type: none"> • Provision of sealing at one point through sealing screw • The sealing screws shall be held captive in the terminal cover. • The terminal cover shall be extended type (30 mm) with baffle wall above the cable entry base wall so that access to the terminals is not possible (even with thin metallic wire) without breaking the seal. • Terminal cover should have provision for cable entry from bottom. • Terminal cover shall have sufficient space for incoming and outgoing cable such that these can pass without stressing and damaging the terminal cover. • Diagram of external connections should be embossed on clearly on inside portion of terminal cover. Meter terminals shall also be marked, and this marking shall appear in the above diagram
5.20	Terminals	<ul style="list-style-type: none"> • Terminals shall be suitable for 25 Sq. mm aluminum cable. • Two no's flat head screws and washers per terminal shall be provided • Material of terminals, screws and washers should be brass or tinned copper. Terminals shall be tested for continuous current of 150 % I_{max}. • Terminals shall be clearly marked for phase / neutral / outgoing etc. this marking shall appear in the connection diagram

		<ul style="list-style-type: none"> Clearances and creepage shall be as per IS 13779. The terminals and connections shall be suitable to carry up to 120 % of I_{max} continuously The manner of fixing the conductors to the terminals shall ensure adequate and durable contact such that there is no risk of loosening or undue heating.
5.21	Screws	All electrically live screws shall be of brass/ nickel tin-plated. All other screws shall be electro plated.
5.22	Output device	<ul style="list-style-type: none"> Meter shall have flashing LED visible from the front to represent energy recording. Resolution shall be such that satisfactory accuracy test can be conducted at the lowest load in less than 5 minutes and starting current test in less than 10 minutes. Meter shall have provision on LCD for indicating data communication in progress. Meter shall have indicator on LCD for displaying the status of load switch.
5.23	Memory	Non-volatile memory independent of battery backup, memory should be retained up to 10 year without any auxiliary power
5.24	Load Control Switch	<ul style="list-style-type: none"> Smart meter shall be equipped with integrated load control switches to control flow of electricity to the load at the instance of connect/ disconnect commands as per functional need of the system Load switch shall be in compliance to IS 15884 and IS 16444 or equivalent IEC specifications Load switch for connect/ disconnect purpose shall be mounted inside the meter with suitable arrangement
5.25	Communication module of meter for AMI	Smart meter shall have provision of 1 no. of RF communication module. This module should be compatible with low-power wide-area network (LPWAN) for two-way communication
5.26	Meter Sealing Arrangement	<ul style="list-style-type: none"> Reliable sealing arrangement shall be provided to make the meter tamper evident and to avoid fiddling or tampering by unauthorized persons Sealing should be in accordance with IS and CEA metering regulations with latest amendments Approval shall be taken from purchaser for location of seals In case of plug in communication module, sealing arrangement shall also be provided for the same
5.27	Manufacturer's / P&ED Seals	<ul style="list-style-type: none"> Manufacturer must provide one polycarbonate seal on either side/front of the meter Two hologram sticker seals on both sides of meter with logo of P&ED/manufacturer and the polycarbonate and sticker seals having the same number as that of the meter Sr. No. One no. polycarbonate seal in loose condition to be provided for terminal cover of the meter. The Serial Number of Meter, Polycarbonate Body Seal/ Sticker Seal and Loose Seal for Terminal Cover shall be same

5.28	Seal record	<ul style="list-style-type: none"> Record of all seals shall be forwarded to purchaser with each lot. The manufacturer will also provide the software in adequate numbers as per P&ED's requirement for tracking and recording of seals.
5.29	Name Plate and marking	<ul style="list-style-type: none"> Meter should have clearly visible, indelible and distinctly marked name plate in accordance with IS 16444 (Part 1) and clause no.11 of this specification.
5.30	Connection Diagram	The connection diagram of the meter shall be clearly shown on the meter nameplate and shall be of permanent nature. Alternatively, connection diagram can be permanently embossed on the inside/outside portion of terminal cover.

5. Functional Requirement

S. No.	Parameter	Requirement
6.1	Meter category	Smart meter shall comply D2 category of IS 15959 (Part 2)
6.2	Security	Advanced security outlined in clause 7.1.2 of IS 15959 (Part 1) shall be provided
6.3	Encryption for data communication	As per clause 7.1 of IS 15959 (Part 2)
6.4	Self-Registration	<ol style="list-style-type: none"> Last mile network must support auto-registration and self-healing feature to continue operation using easiest possible available route in case of failure of any communication device in the network Meter once powered up, the NIC card should be self-detected by communication network and its basic nameplate details & current readings should be transferred to HES
6.5	Load survey Data	<p>Following parameters shall be measured and recorded at the end of each 30 min interval for last 60 days.</p> <ol style="list-style-type: none"> Real time clock date and time Real time clock date and time Current, R phase Current, Y phase Current, B phase Neutral Current Voltage, R Phase Voltage, Y Phase Voltage, B Phase Block energy KWH- Forwarded Block energy KVARH- (Lag) Block Energy, KVARH- (lead) Block energy KVAH- Forwarded Block energy, KWh, KVAH <ol style="list-style-type: none"> Voltages and currents are average values during the block period time. Energies are consumption during the block period. All parameters are stored at the end of capture period.

		d. The time stamp shall be at the end of capture period.
6.6	Dailyload profile	Following parameters shall be measured and recorded at each midnight i.e. 00:00 hrs for last 60 days. i. Real Time clock- date andtime ii. Cumulative energy, kWh and kVAh
6.7	NamePlate Detail	a. Meter SLNo. b. DeviceID c. Manufacture'sname d. Firmware version formeter e. Meter type-(3P-4W) f. Category-(D2) g. Current Rating - Amps h. Meter Year of manufacture-YYYY
6.8	Programmable parameters	a. Following parameters can be programmed and Every transaction shall be logged in non-volatile memory of the meter with date and time stamp. i. Real time clock, date andtime ii. Load Limit(kW) iii. Enable/Disable load limitfunction b. On change of time zone settings, the on-going billing cycle data will be generated, and a new billing cycle shall be commencedas per new activitycalendar c. Programming of any of the parameters shall increment the 'Cumulative programmable count'value
6.9	Push Services	As per clause no. 6 of IS 15959 (Part 2) Smart meter must automatically notify data, event, and messages to a destination client system in an unsolicited manner (without a request from a client) as per IS 15959 (Part 2)
6.10	Periodic push	Meter shall be able to push following instantaneous parameters to HES at predefined intervals. 1. Device ID 2. Real Time clock- Date and time 3. Voltage R Phase 4. Voltage Y Phase 5. Voltage B Phase 6. Current R Phase 7. Current Y Phase 8. Current B Phase 9. Current Neutral 10. Signed Power factor R Phase 11. Signed Power factor Y Phase 12. Signed Power factor B Phase

		<p>13. Signed Power factor Net</p> <p>14. Apparent power KVA</p> <p>15. Active power Kw</p> <p>16. Cumulative Energy, Kwh</p> <p>17. Cumulative energy KVAH</p>
6.11	Event Push	<p>a. Meter is able to report HES, the status change of any of the identified events like,</p> <ul style="list-style-type: none"> • Earth Loading • Influence of permanent magnet or AC/DC electromagnet • Neutral disturbance- HF, DC or AC • Meter cover opening • Meter load Disconnected/ meter load connected • Power Outage • Power Restoration • Manual/ MR reset
6.12	Firmware upgrade	<p>a. As per clause 9 of IS 15959 (Part 2)</p> <p>b. Smart meter shall support remote firmware upgrade feature.</p> <p>c. Firmware upgrade shall be limited to the communication firmware only.</p>
6.13	Disconnection mechanism	<p>a. The Smart meter shall support disconnection (all the switches shall operate) on the following conditions as per clause 11 of IS 16444 (Part 1):</p> <ol style="list-style-type: none"> i. Over current (105 % of I_{max} in any phase for predefined persistence time.) ii. Load control limit (Programmable) iii. Pre-programmed tamper conditions (Factory programmed) iv. Disconnection signal from Head end system v. Pre-paid meter disconnection functionality for prepayment mode <p>b. Load Control limits shall be programmable locally and remotely</p> <p>c. Relay for connect/disconnect shall comply all relevant requirements of IS 15884</p>
6.14	Local reconnection	<ol style="list-style-type: none"> 1. The meter will try to reconnect the load up to predefined time, with predefined interval (Time and interval is programmable) 2. If the consumption is still more than the programmed limits, it will lock out and wait for 30 minutes 3. If the consumption is still above the limit, the procedure defined above in 1 and 2 shall be repeated
6.15	Reconnection mechanism	<p>Reconnection shall be done from HES except for over current and load control limit.</p> <p>Reconnection in case of prepayment meter shall be as per prepayment profile and balance/credit availability in the meter.</p>
6.16	Outage Management	<p>The meter shall send abnormalities at the OMS end like Power failure (Last Gasp), Power Restoration (First Breath) to HES</p>

6.17	Status of load switch	Indication of status of relay i.e. connected/ disconnected should be available on display as well as through communication to HES. Connection and disconnection should be logged as events.
6.18	Ondemand readings	On request from HES
6.19	Instantaneous Parameters	<p>Following parameters shall be continuously updated by the meter hardware/software as per internal sampling and computation time and last updated value shall be available for downloading as and when required.</p> <ol style="list-style-type: none"> 1. Real time clock date and time 2. Current R Phase 3. Current Y Phase 4. Current B Phase 5. Voltage R Phase 6. Voltage Y Phase 7. Voltage B Phase 8. Neutral Current 9. Signed power factor, R Phase 10. Signed power factor, Y Phase 11. Signed power factor, B Phase 12. Three Phase Power Factor, PF 13. Frequency, Hz 14. Apparent power KVA 15. Signed Active power, kW (+Import, -Export) 16. Signed Reactive Power Kvar (+Lag, -Lead) 17. Number of Power failures 18. Cumulative Power off Duration in Min. 19. Cumulative tamper count 20. Cumulative billing count 21. Cumulative programming count 22. Billing date 23. Cumulative energy, kWh (Import) 24. Cumulative energy, kWh (Export) 25. Cumulative energy, kVAh (While kWh Import) 26. Cumulative energy, kVAh (While kWh Export) 27. Maximum Demand, kW 28. Maximum Demand, kVA 29. Load switch Function Status

6. Anti-tamper and Fraud Detection Requirement

7.1	Current Related	<ul style="list-style-type: none"> a. Occurrence and restoration of following current related events shall be logged in meter memory as per table A5 of IS 15959 (Part 2) b. For each occurrence event captured, the cumulative tamper count shall be incremented c. Selective access shall be provided as per clause 11.3 of IS 15959 (Part1)
7.2	Earth Tamper	Whenever a Meter should log earth tamper. Continuous indication through LED flag or icon on display shall be provided for this tamper
7.3	Power related	<ul style="list-style-type: none"> a. Occurrence and restoration of following Power related events shall be logged in meter memory as per table A6 of IS 15959 (Part2). b. Only Real clock (date and time) and event codes shall be captured. c. Selective access shall be provided as per clause 11.3 of IS 15959 (Part1).
7.4	Power On/ Off	Meters shall detect occurrence and restoration of power off if the phase voltage is absent more than a threshold period of time
7.5	Voltage related	<ul style="list-style-type: none"> a. Occurrence and restoration of following Voltage related events shall be logged in meter memory b. For each occurrence event captured, the cumulative tamper count shall be incremented
7.6	Low Voltage Logging	Event shall be logged in memory along with Occurrence and restoration event data. Threshold should be below 180 Volts. Manufacturer should explain behavior of meter below 120V.
7.7	Others	<ul style="list-style-type: none"> a. Occurrence and restoration of following events shall be logged in meter memory as per table A8 of IS 15959 (Part2) b. For each occurrence event captured, the cumulative tamper count shall be incremented c. Selective access shall be provided as per clause 11.3 of IS 15959 (Part1)
7.8	Single wire power	Meter should log this tamper when incoming and outgoing neutral/ phase are disconnected and load connected to earth. Meter should record energy as per load, Vref and UPF. Meter display should not go blank during this tamper.
7.9	Connection Related Tamper Conditions	The meters shall not get affected by any remote control device & shall continue recording energy
7.10	I/C & O/G Interchanged	Meter should record forward energy within limits of accuracy class 1.0.
7.11	Phase & Neutral Interchanged	Meter should record forward energy within limits of accuracy class 1.0.
7.12	I/C (Phase & Neutral) Interchanged,	Meter should record forward energy within limits of accuracy class 1.0
7.13	I/C Neutral Disconnected, O/G Neutral & Load Connected To Earth.	Meter should record forward energy

7.14	I/CNeutralDisconnected, O/GNeutral Connected to Earth Through Resistor& Load Connected To Earth.	Meter should record forward energy
7.15	I/CNeutral connected, O/GNeutralConnected To Earth Through Resistor& Load Connected To Earth.	Meter should record forward energy
7.16	Event Logging	Total number of events to be stored shall be minimum 20 for power On/OFFeventandnotmorethan50forallothereventsinFIFObasis.
7.17	Parameter Snapshot	Captured parameters mentioned above are to be captured when event occurrence and restoration is logged as per table A11 of IS 15959 (Part 2). <ol style="list-style-type: none"> 1. Date and time of event 2. Event code 3. Current R Phase - instantaneous current. 4. Current Y Phase - instantaneous current. 5. Current B Phase - instantaneous current. 6. Voltage R Phase 7. Voltage Y Phase 8. Voltage B Phase 9. Power factor R Phase 10. Power factor Y Phase 11. Power factor B Phase 12. Cumulative energy- kWh
7.18	Tamper Indication	Appropriate Indications/Icons for all tampers should appear on the meter display either continuously or in auto display mode.
7.19	Tamper Logics	A logic sheet for tamper/ event detection and logging shall be submitted for purchaser's approval. Following details should be provided for each tamper in tabular form <ol style="list-style-type: none"> a. Detailed Tamperlogic b. Thresholdvalues c. Persistencetimes d. Restorationtime e. Eventcount

7. MeterDisplay

The measured value(s) should be displayed on a Liquid Crystal display (LCD) register. The display should have backlit capability for easy reading. When the LCD is placed at a constant temperature of 65°C for a period of 30 minutes in operating condition and 80°C for 30 minutes under de-energized / storage condition, it should not get deformed. Dot Matrix type LCD will not be acceptable.

S. No.	Parameter	Requirement																														
8.1	LCD Type	Backlit LCD																														
8.2	Viewing angle	a) Display should have viewing angle 35 degree up & down from eye level. b) The display visibility should be sufficient to read the Meter mounted at height of 0.5 m as well as at the height of 2m.																														
8.3	Size of LCD	Minimum 10X5mm																														
8.4	LCD Digits	Total 6 digits in one row																														
8.5	LCD language	English																														
8.6	Display mode	<p>Following parameters should be displayed in Auto scroll with programmable interval</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th>Order</th> <th>Parameter</th> <th>Display Time</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>LCD Test</td> <td>5 sec</td> </tr> <tr> <td>2</td> <td>Meter Sr no.</td> <td>5 sec</td> </tr> <tr> <td>3</td> <td>Date</td> <td>5 sec</td> </tr> <tr> <td>4</td> <td>Time</td> <td>5 sec</td> </tr> <tr> <td>5</td> <td>Cumulative kWh</td> <td>30 sec</td> </tr> <tr> <td>6</td> <td>Current Month MD</td> <td>5 sec</td> </tr> <tr> <td>7</td> <td>Instantaneous Voltage</td> <td>5 sec</td> </tr> <tr> <td>8</td> <td>Instantaneous Current</td> <td>5 sec</td> </tr> <tr> <td>9</td> <td>Instantaneous Load KW</td> <td>10 sec</td> </tr> </tbody> </table> <p>Meter with push button for manual display shall not be acceptable. Permanent Display on LCD</p> <p>a) Supply indication b) Relay Status c) Earth Load Indication (If conditioned occurred)</p>	Order	Parameter	Display Time	1	LCD Test	5 sec	2	Meter Sr no.	5 sec	3	Date	5 sec	4	Time	5 sec	5	Cumulative kWh	30 sec	6	Current Month MD	5 sec	7	Instantaneous Voltage	5 sec	8	Instantaneous Current	5 sec	9	Instantaneous Load KW	10 sec
Order	Parameter	Display Time																														
1	LCD Test	5 sec																														
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3	Date	5 sec																														
4	Time	5 sec																														
5	Cumulative kWh	30 sec																														
6	Current Month MD	5 sec																														
7	Instantaneous Voltage	5 sec																														
8	Instantaneous Current	5 sec																														
9	Instantaneous Load KW	10 sec																														
8.7	Display indications	a) Appropriate indications/flags for all tampers and self-diagnostic features should be provided b) Data Communication c) Relay Status																														

8. Software and Communication

9.1	Communication Ports	The meter should have 1 RF communication module
9.2	RF NIC Module	Meters shall have provision for RF NIC Module as per the communication topology requirement to ensure data availability with LPWAN network
9.3	Integration	It should be the responsibility of the bidder to ensure integration of meter into HES

9.4	Software for local communication	The manufacturer must provide software capable of downloading all the data stored in meter memory.
9.5	Training	Manufacture shall impart training to P&ED personnel for usage of Software
9.6	Port protection	All ports shall be optically isolated from the power circuit
9.7	Communication protocol	As per IS 15959 (Part 2). Other protocols shall not be acceptable
9.8	Data transfer rate	Communication ports should support data transfer rate of 9600 bps (minimum)

9. Name Plate

Meter shall have a nameplate 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 nameplate. In addition to the requirement as per IS, following shall all be marked on the Nameplate

11.1	Meter Serial number. Serial number shall be printed in black colour. Embossing is not acceptable.
11.2	Size of the digit shall be minimum 5X3mm
11.3	Bar code shall be printed along with serial number; The Size of Bar Code shall not be less than 35 x 5 mm. Stickers in any case will Not be accepted.
11.4	BIS registration mark (ISI mark)
11.5	'P&ED' insignia
11.6	Purchase order Number & Date
11.7	Manufacturers name and country of origin
11.8	Model type / number of meter
11.9	Month & Year of manufacturing
11.10	Reference voltage / current rating
11.11	The number of phases and the number of wires for which the meter is suitable. Graphical symbol as per IS 12032 can be used.
11.12	Meter constant
11.13	Class index of meter
11.14	Reference frequency
11.15	Warranty period
11.16	Communication technology with carrier frequency
11.17	Symbol of load switch

10. Quality Control, Inspection and Testing

- a) In case material/equipment is not found ready in good / acceptable condition by the representative(s) of the purchaser deputed for inspection to the extent of the quantity indicated in the inspection call with tolerance of (-) 10% or if the inspection is not got carried out by any reasons on account of the supplier an amount of Rs.7,500/- for the supplier's works located in Mizoram, and an amount of Rs.15,000/- for the supplier's works located outside Mizoram will become payable by the supplier on this account to the P&ED, Mizoram. All Acceptance tests as laid down in the ISS/IEC and this specification shall be carried out. The suppliers shall provide all routine test report for entire offered quantity of energy meters in CD to the inspecting officers.
- b) Following tests shall also be carried out as Acceptance tests by adopting methods specified in ISS:13779/IS:9000/IS16444/IS15959/ relevant IEC standard / CBIP 325 (latest amended) on Automatic meter test bench with electronic reference sub- standard of preferably 0.02 class accuracy or better.
- i. AC voltage test.
 - ii. Test of meter constant
 - iii. Tests of limits of error clause. 11.11 of IS:13779 at 400 % Ib, 600% Ib and 800 % Ib at pf 0.5 lag, 0.8 lead & unity.
 - iv. Vibration Test (IS13010/1990/IS:9000)
 - v. Shock Test Vibration & shock tests shall be carried out as acceptance test by adopting procedure laid down in related Standard and its latest amendments.
 - vi. Test of Voltage variation as per this specification.
 - vii. Test of no load condition at 70% and 120 % of rated voltage. The minimum test period shall be as per Clause 8.3.2 of IEC : 6205321-2003.
 - viii. Test of DC components in AC circuit- The limit of variation in percentage error shall be 3.0% for class 1.0 meter as per Annex-D of IS: 13779/IEC 62053 -21 for phase & neutral circuit(s).
 - ix. Diode test
 - x. Accuracy test under anti tamper conditions mentioned at Cl.7.6.
 - xi. Permanent magnet test
 - xii. Acceptance test of poly-carbonate seals shall be carried out as per specification of Poly-carbonate seals
 - xiii. The inspecting officer shall verify that no DC supply/ signal is given to reference meter during the DC injection test
 - xiv. Display parameters shall be verified at the time of inspection
 - xv. Test of application of abnormal Voltage/frequency generating devices (electronic gadgets) as per this specification
 - xvi. Verification of continuous ultrasonic welding
 - xvii. When the meter is placed in oven at a constant temperature of 65°C for period of 120 minutes during power ON condition, the character of LCD should not deform. After keeping the meter at a constant temperature of 80°C for period of 120 minutes during power OFF condition and when restored at normal temperature, the LCD should work satisfactorily.

11. Quality Assurance Plan

The design life of the meter shall be minimum 10 years and to prove the design life, the firm shall have at least the following quality Assurance Plan:

- i. The factory shall be completely dustproof
- ii. The testing rooms shall be temperature and humidity controlled as per relevant standards
- iii. The testing and calibrating equipment should be automatic, and all test equipment shall have their valid calibration certificates
- iv. Power supplies used in testing equipments shall be distortion free with sinusoidal wave-forms and maintaining constant voltage current and frequency as per the relevant standards
- v. During the manufacturing of the meters the following checks shall be carried out
 - a. Meter frame dimensions tolerance shall be minimum
 - b. The assembly of parts shall be done with the help of jigs and fixtures so that human errors are eliminated
 - c. The meters shall be batch tested on automatic, computerized test bench and the results shall be printed directly without any human errors.
- vi. The bidder shall invariably furnish the following information along with his bid, failing which his bid shall be liable for rejection. The information shall be separately given for individual type of material offered.
 - a. 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 tests normally carried out on raw material in presence of bidder's representative and copies of test certificates
 - b. Information and copies of test certificates as in (i) above in respect of bought out accessories
 - c. List of manufacturing facilities available
 - d. Level of automation achieved and list of areas where manual processing exists
 - e. List of areas in manufacturing process, where stage inspections are normally carried out for quality control and details of such tests and inspections
 - f. List of testing equipment available with the bidder for final testing of equipment specified and test-plant limitations, if any, viz. the type, special acceptance and routine tests specified in the relevant standards and this specification. These limitations shall be very clearly brought out in schedule of deviations provided with the tender

12. Packing, Marking, Shipping, Handling and Storage

Each meter with meter box shall be packed in superior quality three ply corrugated cardboard carton or thermocol packing box. Such single cartons shall be additionally packed in five (5) ply corrugated cardboard carton accommodating 12-24 meters with meter boxes for easy transportation, storage & handling.

13. Deviations

- a) Deviations from this specification can be acceptable, only where the Seller has listed in his quote

the requirements she cannot, or does not, wish to comply with and which deviation the Purchaser has agreed to in writing, before any order is placed. Bidder shall provide deviation list for purchaser approval

- b) In the absence of any list of deviations from the Seller, it will be assumed by the Purchaser that the Seller complies with the Specification fully

14. Drawing and Document Submission

Detailed dimensional drawing & detailed leaflet showing clearly the dimensions & material for meter box and its constructional features should be furnished with the tender offer.

15. Guarantee

The Bidder/manufacturers shall undertake a guarantee to replace meter up to a period of 60 months (including 12 months of project period) from the date of supply. The meters which are found defective/inoperative within the guarantee period, these defective/inoperative meters shall be replaced within 14 days of receipt of report for such defective/inoperative meters.

16. Discrepancies

The discrepancies if any between the specification and the catalogues 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.