

महाराष्ट्र ऊर्जा विकास अभिकरण (महाऊर्जा)

(महाराष्ट्र शासनाची संस्था)

विभागीय कार्यालय, कोल्हापूर



Maharashtra Energy Development Agency (MEDA)

(Government of Maharashtra Institution)

Divisional Office, Kolhapur

2023/DOK/Tech/Desk -1/Quotation/ 353

Date: 26/04/2023

INVITATION TO QUOTE

To,
(Supplier/Developer/Contractor/Integrator)

Sub: Evolving benchmark cost of various types of Solar Street Light and Solar Highmast for FY 2023-24 - Invitation to Quote

MEDA, Divisional Office Kolhapur is desirous of inviting quotes from reputed Manufacturer/ Integrator/ Supplier/ Developer of Solar Street Lights and Solar High Mast system for evolving benchmark cost of various types of Solar Street Lights and Solar High Mast systems for FY 2023-24.

1. Technical Details of Solar Street Lights and Solar Highmasts.

Sr. No.	Type of System	Height (Mtr)	LED Lamp (Watt)	LiFePO4 Battery (Ah)	Type of Pole	SPV Panel (Watt)
1	Solar Street Light	06	12	30	Tubular	75
2	Solar Street Light	06	30	60	Octagonal	150
3	Solar Street Light	06	50	48	Octagonal	125
4	Solar Highmast	06	200 (50 Watt x 04)	400 (100 Ah x 04)	Polygonal	1320 (330 Wp x 04)
5	Solar Highmast	09	300 (50 Watt x 06)	600 (100 Ah x 06)	Polygonal	1980 (330 Wp x 06)
6	Solar Highmast	12	500	800 (100 Ah x 08)	Polygonal	2640 (330 Wp x 08)

* Detailed Technical Specifications is attached separately.

2. Critical dates for submission of quotes are furnished as below.

SR.NO.	Description	Date and time
1	Start Date of Quotation Submission	27/04/2023 At 10:00 Hrs
2	Last Date of Quotation Submission	03/05/2023 at 18:00 Hrs

3. TERMS AND CONDITIONS :

1. Bidder must be at least Manufacturer/Integrator/Supplier/ Developer of Solar Street Light and Solar High Mast.

2. Bidder should note that this quotation is being called only for evolving benchmark cost of Solar Street Light and Solar High-Mast, and not for Work Allocation, OR Empanelment and OR preparation of Rate Contract (RC).
3. Bidder should make himself aware about the attached Technical Specifications and Geographical conditions, Transportation Facilities, Labor Cost, Material cost of districts within Kolhapur Division (Kolhapur, Sangli, Ratnagiri and Sindhudurg) before giving the quotation/ rates.
4. Bidder shall quote the rates by considering the MNRE/BIS/IEC and all applicable standards for each component of Solar Street Light and Solar High-Mast.
5. Bidder shall quote the rates inclusive of Installation, Transportation, RCC foundation, 05 years Insurance, Warranty/Guarantee of product and repair as well as Comprehensive Maintenance of system for 5 Years (5 Yrs. CMC).
6. Bidder shall quote the rates excluding of GST/Taxes.
7. Bidder shall submit schematic design/drawing of all types of Solar Street Lights and Solar Highmast for which rates have been quoted.
8. MEDA shall ask for documentary evidence for verifying whether the bidder is Manufacturer / Integrator/ Supplier / Developer of Solar Street Light and Solar High Mast or NOT.
9. MEDA shall verify that the quoted rates are appropriate to meet all-applicable standards, quality and requirement of the product or NOT.
10. MEDA shall take strict action against Bidder, those are found intentionally or knowingly trying to mislead MEDA by submitting incorrect quotes/rates and hamper the process. In such conditions, false or misleading quotations will be outrightly rejected.
11. Bidder shall quote their rates in attached format and submit it in a **sealed envelope** by mentioning the subject on the envelope.
12. Bidder shall submit their quotation during mentioned time and date. Thereafter quotations will not be accepted.
13. Divisional General Manager reserves the right to accept or reject one or all quotations without assigning any reasons thereof.
14. Sealed quotations in this context may be sent to :

Divisional General Manager,
MEDA Divisional Office,
SR. No. 249/A-1/55, E-Ward,
MHADA Complex, Nagala Park,
Kolhapur – 416003


(S. A. Patil)

Divisional General Manager
MEDA, Divisional Office Kolhapur

Encl:

- 1) Technical Specifications of Solar Street Lights and Solar Highmast
- 2) Quotation Format.

(Company Letter Head)

QUOTATION

Date.:

To ,
Divisional General Manager ,
MEDA , Divisional Office Kolhapur

Sub : Submission of quotation for evolving benchmark cost of various types of Solar Street
Light and Solar High- Mast.

Ref : Your quotation call no.

With reference to your invitation to quote , we are submitting our rates by considering given technical specifications, Geographical conditions, Transportation Facilities, Labor Cost, Material cost , Installation, Transportation, RCC foundation, 05 years Insurance, Warranty/Guarantee of product and Comprehensive Maintenance of system for 5 Years (5 Yrs. CMC) of different type of Solar Street Light and Solar Highmast in given table as below.

Sr. No.	Type of System	Height (Mtr)	Capacity (Watt)	Quoted Rate (exclusive of GST/taxes) (Rs.)
1	Solar Street Light	06	12	
2	Solar Street Light	06	30	
3	Solar Street Light	06	50	
4	Solar Highmast	06	200 (50 Watt x 04)	
5	Solar Highmast	09	300 (50 Watt x 06)	
6	Solar Highmast	12	500	

GST NO. :

Sign and Stamp

TECHNICAL SPECIFICATIONS FOR 12 W WHITE-LED BASED SOLAR STREET LIGHTING SYSTEM

Sr. No	Components	Specification for Solar street light fitting
1.	PV module	75 Wp under STC
2.	Battery	Minimum 12.8V, 30 AH capacity Lithium Ferro Phosphate battery.
3.	Light Source	<p>White Light Emitting Diode (W-LED)</p> <p>12 Watt, W-LED luminaire, dispersed beam, soothing to eyes with the use of proper optics and diffuser.</p> <p>LED Chip should be compliance to IES: LM-80 (Approved Method for Measuring Lumen Maintenance of LED Light Sources and LED lumen depreciation time to L70). Test report for same should be submitted.</p>
4.	Light Out put	<p>The luminaire must use high efficacy W-LED with minimum 135 lumens per watt (and UV free). [A certificate to be submitted by the System supplier to the Test Lab during certification]</p> <p>For single light level:</p> <p>Minimum 24 Lux when measured at a point 4 meters below the light. The illumination should be uniform without dark bands or abrupt variations, and soothing to the eye. Higher light output will be preferred.</p> <p>For Multiple Light levels:</p> <p>The luminaire should have two levels of light to take care of different lighting needs during the night. Minimum 24 Lux when measured at a point 4 meters below the light (at'' High'' illumination level). The illumination Should be uniform without dark bands or abrupt variations. Minimum 12 Lux at lower illumination level. (Higher light output will be preferred)</p> <p>The luminaire shall be tested for Electrical, Photometry and Color parameters as per IES LM-79:2008 or IS: 16106:2012 for following performance parameters like:</p> <ol style="list-style-type: none"> 1) Total luminous flux: ≥ 1500 lm. 2) Luminous efficacy (i.e. system efficacy): ≥ 125 lm/W. 3) Color Temperature: Between 5500 K to 6500 K.

		<p>4) $CRI \geq 70$</p> <p>5) Luminous intensity distribution should follow the batwing patterns in polar curves.</p> <p>6) Require validation report using .ies file, which is generated during luminous intensity distribution test and using maintenance factor 0.9 and pole height of 4m., Road width 5m and Pole span 15m. The average illuminance level and uniformity should comply with requirement as per IS 1944, wherever applicable.</p> <p>7) The luminaire should be tested for all type tests as per IS 10322 Part 5 Sect 3 or IEC 60598-2-3 standards.</p>
5	Mounting of light	Pole height 5 m above the ground level and 1 m below the ground. Luminaire shall be at least 4.5 m above the ground level.
6	Electronics Efficiency	Overall total Efficiency of the Electronics should be Minimum 90%
7	Duty Cycle	<p>Dusk to dawn:</p> <p>First 4 Hours full light (Min. 24 Lux), rest of the time at lower light (50%, Min. 12 Lux) level.</p> <p>(Higher light output will be preferred)</p>
8	Autonomy	3 days or Minimum 36 operating hours per permissible discharge with fully charged Lithium-Ferro Phosphate Battery.
9	Ingress Protection – IP	Optical and Control gear compartment - IP 65 / IP 66
10	Impact resistance of casing	$\geq IK 08$
11	Radiated Emission Test	As per CISPR-15
12	ESD (Electro Static Discharge) and Radiated susceptibility test	As per IEC 61547

TECHNICAL DETAILS:

PV MODULE

- i. Indigenously manufactured PV module should be used.
- ii. The PV module should have crystalline silicon solar cells and must have a certificate of testing conforming to IEC 61215 Edition II / BIS 14286 from an NABL or IECQ accredited Laboratory.
- iii. The power output of the module under STC should be a minimum of 75Wp.
- iv. The module efficiency should not be less than 14 %.
- v. The terminal box on the module should have a provision for opening it for replacing the cable, if required.
- vi. There should be a Name Plate fixed inside the module which will give:
 - a. Name of the Manufacturer or Distinctive Logo.
 - b. Model Number
 - c. Serial Number
 - d. Year of manufacture
- vii. A distinctive serial number starting with NSM will be engraved on the frame of the module or screen printed on the tedlar sheet of the module.

BATTERY

- i. Minimum 12.8V, 30 AH capacity Lithium Ferro Phosphate Battery.
- ii. Battery pack should have proper 'Battery management System' (BMS) for cell balancing, over charge and over temperature protection.
- iii. Battery should conform to the latest BIS/ International standards.

LIGHT SOURCE

- i. The light source will be a white LED type.
- ii. The colour temperature of white LED used in the system should be in the range of 5500°K–6500°K.
- iii. W-LEDs should not emit ultraviolet light.
- iv. The light output from the white LED light source should be constant throughout the duty cycle.
- v. The lamps should be housed in an assembly suitable for outdoor use.
- vi. The temperature of heat sink should not increase more than 20°C above ambient temperature during the dusk to dawn operation.

ELECTRONICS

- i. The total electronic efficiency should be at least 90 %.

- ii. Charge controller should be MPPT Type.
- iii. Electronics should operate at an appropriate voltage suitable for proper charging of the battery.
- iv. No Load current consumption should be less than 20 mA.
- v. The PV module itself should be used to sense the ambient light level for switching ON and OFF the lamp.
- vi. The PCB containing the electronics should be capable of solder free installation and replacement.
- vii. Necessary lengths of wires/cables, switches suitable for DC use and fuses should be provided.

ELECTRONIC PROTECTIONS

- i. Adequate protection is to be incorporated under “No Load” conditions e.g. when the lamp is removed and the system is switched ‘ON’.
- ii. The system should have protection against battery overcharge and deep discharge conditions.
- iii. The System should have protection against short circuit conditions.
- iv. Protection for reverse flow of current through the PV module(s) should be provided.
- v. Adequate protection should be provided against battery reverse polarity.
- vi. Load reconnect should be provided at 80% of the battery capacity status.

MECHANICAL COMPONENTS

- I. A corrosion resistant metallic frame structure should be fixed on the pole to hold the SPV module.
- II. The frame structure should have provision so that the module can be oriented at the suitable tilt angle.
- III. Pole should be Hot dip galvanized pipe as per IS1161 & IS4736 i.e. Class B.
- IV. Pole height 5 m above the ground level and 1 m below the ground. Luminaire shall be at least 4.5 m above the ground level.
- V. The pole should have the provision to hold the luminaire.
- VI. The battery shall be either included in the luminaire enclosure, which should be water proof (IP 65) and corrosion resistant or outside the luminaire enclosure in a vented, acid proof and corrosion resistant, hot dip galvanized metallic box (IP 65) with anti-theft locking arrangement for outdoor use.

INDICATORS

- The system should have two indicators, green and red.
- The green indicator should indicate the charging under progress and should glow only when the charging is taking place. It should stop glowing when the battery is fully charged.

- Red indicator should indicate the battery “Load Cut Off” condition.

QUALITY AND WARRANTY

- The street lighting system (including the battery) will be warranted for a period of five years from the date of supply.
- The PV module(s) will be warranted for a minimum period of 25 years from the date of supply. The PV modules must be warranted for their output peak watt capacity, which should not be less than 90% at the end of Ten (10) years and 80% at the end of Twenty five (25) years.
- The Warranty Card to be supplied with the system must contain the details of the system.

OPERATION and MAINTENANCE MANUAL

An Operation, Instruction and Maintenance Manual, in English and the local language, should be provided with the Solar Street Lighting System. The following minimum details must be provided in the Manual:

- Basic principles of Photovoltaics.
- A small write-up (with a block diagram) on Solar Street Lighting System - its components, PV module, battery, electronics and luminaire and expected performance.
- Type, Model number, Voltage & capacity of the battery, used in the system.
- The make, model number, country of origin and technical characteristics (including IESNA LM-80 report) of W-LEDs used in the lighting system.
- About Charging and Significance of indicators.
- Clear instructions about erection of pole and mounting of PV module (s) and lamp housing assembly on the pole.
- Clear instructions on regular maintenance and troubleshooting of the Solar Street Lighting System.
- DO's and DONT's.
- Name and address of the contact person for repair and maintenance, in case of non-functionality of the solar street lighting system.

List of BIS standards applicable for components of Solar PV Applications

Sl. No. (1)	Product (2)	Indian Standard Number (3)	Title of Indian Standard (4)
1.	Crystalline Silicon Terrestrial Photovoltaic (PV) modules (Si wafer based)	IS 14286	Crystalline Silicon Terrestrial Photovoltaic (PV) modules - Design Qualification And Type Approval
2.	Thin Film Terrestrial Photovoltaic (PV) Modules (a-Si, CiGs and CdTe)	IS 16077	Thin-Film Terrestrial Photovoltaic (PV) Modules - Design Qualification and Type Approval
3.	PV Module (Si wafer and Thin film)	IS/ IEC 61730 (Part 1) IS/ IEC 61730 (Part 2)	Photovoltaic (PV) Module Safety Qualification Part 1 Requirements for Construction Photovoltaic (PV) Module Safety Qualification Part 2 Requirements for Testing
4.	Power converters for use in photovoltaic power system	IS 16221 (Part 1) IS 16221 (Part 2)	Safety of Power Converters for use in Photovoltaic Power Systems Part 1- General Requirements Safety of Power Converters for Use in Photovoltaic Power Systems Part 2- Particular Requirements for Inverters
5.	Storage batteries	IS 16270 IS 16046	Secondary Cells and Batteries for Solar Photovoltaic Application General-Requirements and Methods of Test Standard for Lithium ion battery
6.	LED Lights & Luminaires	IS 16101 IS 16102 IS 16103 IS 16107	General Lighting - LEDs and LED modules – Terms and Definitions Self-Ballasted LED Lamps for General Lighting Services Led Modules for General Lighting Luminaires Performance

TECHNICAL SPECIFICATIONS FOR 30 WATT SOLAR STREET LIGHTS

Sr. No	Components	Specification for Solar street light fitting
1	PV module	150 Wp under STC (MNRE ALMM Approved)
2	Battery	Minimum 12.8V, 60 AH capacity Lithium Ferro Phosphate battery.(LiFePo4)
3	Light Source	White Light Emitting Diode (W-LED) 30 Watt, W-LED luminaire, dispersed beam, soothing to eyes with the use of proper optics and diffuser.Test report for same should be submitted. (LED + Driver) DC operated confirming to IP65 or above with proper dimmer arrangement Using LEDs which emits ultraviolet light will not be Permitted
4	Light Out put	The luminaire must use high efficacy W-LED with minimum 122 lumens per watt (and UV free). [A certificate to be submitted by the System supplier to the Test Lab during certification]
5	Mounting of light	Luminaire shall be at 6 m above the ground level & mounted properly. Foundation should be properly done to ensure safety.
6	Electronics Efficiency	Overall total Efficiency of the Electronics shouldbe Minimum 90%
7	Duty Cycle	Dusk to dawn: First 6 Hours full light (Min. 24 Lux), rest of thetime at lower light (50%, Min. 12 Lux) level. (Higher light output will be preferred)
8	Autonomy	2 days or Minimum 24 operating hours perpermissible discharge with fully charged Lithium- Ferro Phosphate Battery.
9	Ingress Protection – IP	Optical and Control gear compartment - IP 65 / IP66
10	Pole	6 mtr long Hexagonal hot dip galvanized Pole of 3 mm Thickness having base plate arrangement to fix with nut& bolt on concrete platform.
11	Civil Work	M20 Grade RCC Foundation of 500 MMx500MMx1000MM

TECHNICAL DETAILS:

1. PV MODULE:

- I. Indigenously manufactured PV module should be used.
- II. The PV module should have crystalline silicon solar cells and must have a certificate of testing conforming to IEC 61215 Edition II / BIS 14286 from an NABL or IECQ accredited Laboratory.
- III. The power output of the module under STC should be a minimum of 125Wp.
- IV. The module efficiency should not be less than 14 %.
- V. The terminal box on the module should have a provision for opening it for replacing the cable, if required.
- VI. There should be a Name Plate fixed inside the module which will give:
 - a. Name of the Manufacturer or Distinctive Logo.
 - b. Model Number
 - c. Serial Number
 - d. Year of manufacture
- VII. A distinctive serial number starting with NSM will be engraved on the frame of the module or screen printed on the tedlar sheet of the module.

2. BATTERY

- I. Minimum 12.8V, 60 AH capacity Lithium Ferro Phosphate Battery.(LiFePo₄)
- II. Battery pack should have proper 'Battery management System' (BMS) for cell balancing, overcharge and over temperature protection.
- III. Battery should conform to the latest BIS/ International standards.

3. LIGHT SOURCE

- I. The light source will be a white LED type.
- II. W-LEDs should not emit ultraviolet light.
- III. The light output from the white LED light source should be constant throughout the duty cycle.
- IV. The lamps should be housed in an assembly suitable for outdoor use.
- V. The temperature of heat sink should not increase more than 20°C above ambient temperature during the dusk to dawn operation.

4. ELECTRONICS

- I. The total electronic efficiency should be at least 90 %.
- II. Charge controller should be MPPT Type.
- III. Electronics should operate at an appropriate voltage suitable for proper charging of the battery.
- IV. The PV module itself should be used to sense the ambient light level for switching ON and OFF the lamp.
- V. The PCB containing the electronics should be capable of solder free installation and replacement.
- VI. Necessary lengths of wires/cables, switches suitable for DC use and fuses should be provided.

5. ELECTRONIC PROTECTIONS

- I. Adequate protection is to be incorporated under "No Load" conditions e.g. when the lamp is removed and the system is switched 'ON'.
- II. The system should have protection against battery overcharge and deep discharge conditions.

- III. The System should have protection against short circuit conditions.
- IV. Protection for reverse flow of current through the PV module(s) should be provided.
- V. Adequate protection should be provided against battery reverse polarity.
- VI. Load reconnect should be provided at 80% of the battery capacity status.

6. MECHANICAL COMPONENTS

- I. Pole should be Hot dip galvanized pipe as per IS1161 & IS4736 i.e. Class B.
- II. Pole height 6 m above the ground level. Luminaire shall be at 6 m above the ground level & fixed properly in foundation to ensure safety.
- III. The pole should have the provision to hold the luminaire.
- IV. The battery shall be included in the luminaire enclosure, which should be water proof (IP 65) and corrosion resistant.

7. INDICATORS

- I. The system should have two indicators, green and red.
- II. The green indicator should indicate the charging under progress and should glow only when the charging is taking place. It should stop glowing when the battery is fully charged.
- III. Red indicator should indicate the battery "Load Cut Off" condition.

8. QUALITY AND WARRANTY

- I. The street lighting system (including the battery) will be warranted for a period of five years from the date of supply.
- II. The PV module(s) will be warranted for a minimum period of 25 years from the date of supply. The PV modules must be warranted for their output peak watt capacity, which should not be less than 90% at the end of Ten (10) years and 80% at the end of Twenty five (25) years.
- III. The Warranty Card to be supplied with the system must contain the details of the system.

9. OPERATION and MAINTENANCE MANUAL

An Operation, Instruction and Maintenance Manual, in English and marathi, should be provided with the Solar Street Lighting System. The following minimum details must be provided in the Manual:

- A small write-up (with a block diagram) on Solar Street Lighting System - its components, PV module, battery, electronics and luminaire and expected performance.
- Type, Model number, Voltage & capacity of the battery, used in the system.
- About Charging and Significance of indicators.
- Clear instructions about erection of pole and mounting of PV module (s) and lamp housing assembly on the pole.
- Clear instructions on regular maintenance and troubleshooting of the Solar Street Lighting System.
- DO's and DON'T's.
- Name and address of the contact person for repair and maintenance, in case of non-functionality of the solar street lighting system.

ANNEXURE I

TECHNICAL SPECIFICATIONS FOR 50 W WHITE-LED BASED SOLAR STREET LIGHTING SYSTEM

Sr. No	Components	Specification for Solar street light fitting
1	PV module	125 Wp under STC
2	Battery	Minimum 12.8V, 48 AH capacity Lithium Ferro Phosphate battery.
3	Light Source	White Light Emitting Diode (W-LED) 50 Watt, W-LED luminaire, dispersed beam, soothing to eyes with the use of proper optics and diffuser. Test report for same should be submitted. (LED + Driver) DC operated confirming to IP65 or above with proper dimmer arrangement Using LEDs which emits ultraviolet light will not be Permitted
4	Light Out put	The luminaire must use high efficacy W-LED with minimum 140 lumens per watt (and UV free). [A certificate to be submitted by the System supplier to the Test Lab during certification]
5	Mounting of light	Luminaire shall be at 6 m above the ground level & mounted properly. Foundation should be properly done to ensure safety.
6	Electronics Efficiency	Overall total Efficiency of the Electronics should be Minimum 90%
7	Duty Cycle	Dusk to dawn: First 6 Hours full light (Min. 24 Lux), rest of the time at lower light (50%, Min. 12 Lux) level. (Higher light output will be preferred)
8	Autonomy	3 days or Minimum 36 operating hours per permissible discharge with fully charged Lithium-Ferro Phosphate Battery.
9	Ingress Protection – IP	Optical and Control gear compartment - IP 65 / IP 66
10	Pole	6 mtr long Octagonal hot dip galvanized Pole of 3 mm thickness having base plate arrangement to fix with nut & bolt on concrete platform.
11	Civil Work	As shown in diagram

TECHNICAL DETAILS:

PV MODULE:

- I. Indigenously manufactured PV module should be used.
- II. The PV module should have crystalline silicon solar cells and must have a certificate of testing conforming to IEC 61215 Edition II / BIS 14286 from an NABL or IECQ accredited Laboratory.
- III. The power output of the module under STC should be a minimum of 125Wp.
- IV. The module efficiency should not be less than 14 %.
- V. The terminal box on the module should have a provision for opening it for replacing the cable, if required.
- VI. There should be a Name Plate fixed inside the module which will give:
 - a. Name of the Manufacturer or Distinctive Logo.
 - b. Model Number
 - c. Serial Number
 - d. Year of manufacture
- VII. A distinctive serial number starting with NSM will be engraved on the frame of the module or screen printed on the tedlar sheet of the module.

BATTERY

- I. Minimum 12.8V, 48 AH capacity Lithium Ferro Phosphate Battery.
- II. Battery pack should have proper 'Battery management System' (BMS) for cell balancing, over charge and over temperature protection.
- III. Battery should conform to the latest BIS/ International standards.

LIGHT SOURCE

- I. The light source will be a white LED type.
- II. W-LEDs should not emit ultraviolet light.
- III. The light output from the white LED light source should be constant throughout the duty cycle.
- IV. The lamps should be housed in an assembly suitable for outdoor use.
- V. The temperature of heat sink should not increase more than 20°C above ambient temperature during the dusk to dawn operation.

ELECTRONICS

- I. The total electronic efficiency should be at least 90 %.
- II. Charge controller should be MPPT Type.
- III. Electronics should operate at an appropriate voltage suitable for proper charging of the battery.
- IV. The PV module itself should be used to sense the ambient light level for switching ON and OFF the lamp.
- V. The PCB containing the electronics should be capable of solder free installation and replacement.
- VI. Necessary lengths of wires/cables, switches suitable for DC use and fuses should be provided.

ELECTRONIC PROTECTIONS

- I. Adequate protection is to be incorporated under “No Load” conditions e.g. when the lamp is removed and the system is switched ‘ON’.
- II. The system should have protection against battery overcharge and deep discharge conditions.
- III. The System should have protection against short circuit conditions.
- IV. Protection for reverse flow of current through the PV module(s) should be provided.
- V. Adequate protection should be provided against battery reverse polarity.
- VI. Load reconnect should be provided at 80% of the battery capacity status.

MECHANICAL COMPONENTS

- I. Pole should be Hot dip galvanized pipe as per IS1161 & IS4736 i.e. Class B.
- II. Pole height 6 m above the ground level. Luminaire shall be at 6 m above the ground level & fixed properly in foundation to ensure safety.
- III. The pole should have the provision to hold the luminaire.
- IV. The battery shall be included in the luminaire enclosure, which should be water proof (IP 65) and corrosion resistant.

INDICATORS

- I. The system should have two indicators, green and red.
- II. The green indicator should indicate the charging under progress and should glow only when the charging is taking place. It should stop glowing when the battery is fully charged.
- III. Red indicator should indicate the battery “Load Cut Off” condition.

QUALITY AND WARRANTY

- I. The street lighting system (including the battery) will be warranted for a period of five years from the date of supply.
- II. The PV module(s) will be warranted for a minimum period of 25 years from the date of supply. The PV modules must be warranted for their output peak watt capacity, which should not be less than 90% at the end of Ten (10) years and 80% at the end of Twenty five (25) years.
- III. The Warranty Card to be supplied with the system must contain the details of the system.

OPERATION and MAINTENANCE MANUAL

An Operation, Instruction and Maintenance Manual, in English and marathi, should be provided with the Solar Street Lighting System. The following minimum details must be provided in the Manual:

- A small write-up (with a block diagram) on Solar Street Lighting System - its components, PV module, battery, electronics and luminaire and expected performance.
- Type, Model number, Voltage & capacity of the battery, used in the system.
- About Charging and Significance of indicators.
- Clear instructions about erection of pole and mounting of PV module (s) and lamp housing assembly on the pole.

- Clear instructions on regular maintenance and troubleshooting of the Solar Street Lighting System.
- DO's and DONT's.
- Name and address of the contact person for repair and maintenance, in case of non-functionality of the solar street lighting system.

TECHNICAL SPECIFICATIONS OF 06 METER , 09 METER AND 12 METER SOLAR LED HIGH MAST SYSTEM

- **DEFINITION:**

A standalone Solar High Mast Lighting system (SHMLS) is an outdoor lighting unit used for illuminating a street or an open area. The Solar High Mast Lighting System consists of solar photovoltaic (SPV) module, a luminaire, storage battery, control electronics, inter- connecting wires/cables, module mounting steal tower/ pole including hardware and battery box. The luminaire is based on White Light Emitting Diode (W-LED), a solid state device which emits light when electric current passes through it. The luminaire is mounted on the steal tower/ pole at a suitable angle to maximize illumination on the ground. The PV module must be place on separate structure placed at the top of the steal tower/ pole at an angle facing south so that it receives solar radiation throughout the day, without any shadow falling on it. A battery is placed in a box attached to the steal tower/ pole. Electricity generated by the PV module charges the battery during the day time which powers the luminaire from dusk to dawn. The system lights at dusk and switches off at dawn automatically.

FOR 6 METER SOLAR LED HIGH MAST LIGHTING SYSTEM:

PV Module	Only indigenous modules shall be used in the project. For each High mast SPV module aggregate capacity 1320Wp (min 330Wp X 4Nos Module.
Battery	Li Ferro Phosphate (LiFePo4) batteries of capacity 12.8 Volt, 400Ah @, (12.8V, 100 Ah x 4 nos.) for each High Mast. With cells in a suitable weather resistant enclosures and sophisticated designed battery management system (appropriate over charging, over heating deep discharge protection) without paralleling battery bank. Battery should be in IP-65 enclosure
Light Source	White Light Emitting Diode (W-LED) flood light 4*50Watt (LED +Driver) DC operated confirming to IP65 or above with proper dimmer arrangement Using LEDs which emits ultraviolet light will not be Permitted
Light Output	White color (color temperature 5500-6500 K). Lumen efficiency of LED- min 140 lumens/Watt. The illumination

	should be uniform without dark bands or abrupt variations, and soothing to the eye. Higher light output will be preferred.
Pole (Minimum 80 Microns)	6M Long, polygonal Raising lowering mast shaft in Single section Suitable for basic wind speed 50 m/sec (180 Km/Hr) complete with head frame, Luminaries carriage suitable to install 4 nos. Luminaries, Solar Panels & battery on the top of the mast .There should be provision to install the type tested Winch inside the mast for raising & lowering of complete solar lighting system along with compact unit of modules through a mounting structure around the pole including hardware. The mast must be hot dip galvanized 20 sided polygonal structure having Bottom A/F minimum Dia 330 mm and top A/ F Dia 150 mm of 3 mm thick. The high mast should have a designed life of 25 years.
Stainless Steel Wire Rope	Wire rope of Grade AISI 316 grade, 7/19 construction, with two ropes continuous min.6 mm diameter and breaking load capacity min. 2000 kg x 2. The breaking load test report obtained from govt. laboratory of the wire rope should justify the desired breaking load capacity.
Raising and Lowering lighting mast	Manual pulley system
Electronics Efficiency	Minimum 85% total

FOR 9 METER SOLAR LED HIGH MAST LIGHTING SYSTEM:

PV Module	Only indigenous modules shall be used in the project. For each High mast SPV module aggregate capacity 1980Wp (min 330Wp X 6Nos Module.
Battery	Li Ferro Phosphate (LiFePo4) batteries of capacity 12.8 Volt, 600Ah @, (12.8V, 100 Ah x 6 nos.) for each High Mast. With cells in a suitable weather resistant enclosures and sophisticated designed battery management system (appropriate over charging, over heating deep discharge protection) without paralleling battery bank. Battery should be in IP-65 enclosure
Light Source	White Light Emitting Diode (W-LED) flood light 6*50Watt (LED +Driver) DC operated confirming to IP65 or above with proper dimmer arrangement Using LEDs which emits ultraviolet light will not be Permitted
Light Output	White color (color temperature 5500-6500 K). Lumen efficiency of LED- min 140 lumens/Watt. The illumination should be uniform without dark bands or abrupt variations, and soothing to the eye. Higher light output will be preferred.
Pole (Minimum 80 Microns)	9M Long, polygonal Raising lowering mast shaft in Single section Suitable for basic wind speed 50 m/sec (180 Km/Hr) complete with head frame, Luminaries carriage suitable to install 6 nos. Luminaries, Solar Panels & battery on the top of the mast .There should be provision to install the type tested Winch inside the mast for raising & lowering of complete solar lighting system along with compact unit of modules through a mounting structure around the pole including hardware. The mast must be hot dip galvanized 20 sided polygonal structure having Bottom A/F minimum Dia 330 mm and top A/ F Dia 150 mm of 3 mm thick. The high mast should have a designed life of 25 years.

Stainless Steel Wire Rope	Wire rope of Grade AISI 316 grade, 7/19 construction, with two ropes continuous min.6 mm diameter and breaking load capacity min. 2000 kg x 2. The breaking load test report obtained from govt. laboratory of the wire rope should justify the desired breaking load capacity.
Raising and Lowering lighting mast	Manual pulley system
Electronics Efficiency	Minimum 85% total

FOR 12 METER SOLAR LED HIGH MAST LIGHTING SYSTEM:

PV Module	Only indigenous modules shall be used in the project. For each High mast SPV module aggregate capacity 2640Wp (min 330Wp X 8Nos Module)
Battery	Li Ferro Phosphate (LiFePo4) batteries of capacity 12.8 Volt, 800Ah @, (12.8V, 100 Ah x 8 nos.) for each High Mast. With cells in a suitable weather resistant enclosures and sophisticated designed battery management system (appropriate over charging, over heating deep discharge protection) without paralleling battery bank. Battery should be in IP-65 enclosure
Light Source	White Light Emitting Diode (W-LED) flood light 500 Watt (LED +Driver) DC operated conforming to IP65 or above with proper dimmer arrangement Using LEDs which emits ultraviolet light will not be Permitted
Light Output	White color (color temperature 5500-6500 K). Lumen efficiency of LED- min 140 lumens/Watt. The illumination should be uniform without dark bands or abrupt variations, and soothing to the eye. Higher light output will be preferred.

Pole (Minimum 80 Microns)	12M Long, polygonal Raising lowering mast shaft in Single section Suitable for basic wind speed 50 m/sec (180 Km/Hr) complete with head frame, Luminaries carriage suitable to install 8 nos. Luminaries, Solar Panels & battery on the top of the mast .There should be provision to install the type tested Winch inside the mast for raising & lowering of complete solar lighting system along with compact unit of modules through a mounting structure around the pole including hardware. The mast must be hot dip galvanized 20 sided polygonal structure having Bottom A/F minimum Dia 330 mm and top A/ F Dia 150 mm of 3 mm thick. The high mast should have a designed life of 25 years.
Stainless Steel Wire Rope	Wire rope of Grade AISI 316 grade, 7/19 construction, with two ropes continuous min.6 mm diameter and breaking load capacity min. 2000 kg x 2. The breaking load test report obtained from govt. laboratory of the wire rope should justify the desired breaking load capacity.
Raising and Lowering lighting mast	Manual pulley system
Electronics Efficiency	Minimum 85% total

- **MINIMUM TECHNICAL REQUIREMENTS / STANDARDS:**

5. DUTY CYCLE

The Solar PV White- LED High Mast Light system should be designed to operate from dusk to dawn.

6. MODULES

- Only indigenous modules (Make in India) of reputed brand IEC Tested shall be used in the project. Crystalline high power/efficiency cells shall be used in the Solar Photovoltaic module.
- The open circuit voltage of the PV modules under STC should be at least 21.0 Volts.
- Crystalline high power/efficiency cell shall be used in the Solar Photovoltaic

module. The cell efficiency should not be less than 16%.

- PV module must be warranted for output wattage, which should not be less than 90% at the end of 10 years and 80% at the end of 25 years.
- The terminal box on the module shall be IP 65 and designed for long life outdoor operation in harsh environment should have a provision of opening for replacing the cable, if required.
- The offered module shall be in accordance with the requirements of MNRE.
- Latest edition of IEC 61215 edition II / IS 14286 for Crystalline and shall be certified by MNRE authorized test centre. The bidder shall submit appropriate certificates.
- PV modules must qualify to IEC 61730 Part 1- requirements for construction & Part 2 – requirements for testing, for safety qualification.
- Protective devices against surges at the PV module shall be provided. Low voltage drop bypass diodes shall be provided and if required, blocking diode(s) may also be provided.
- Identification and traceability
- Each PV module must use a RF identification tag (RFID), which must contain the following information:
 - a) Name of the manufacturer of PV Module
 - b) Name of the Manufacturer of Solar cells
 - c) Month and year of the manufacture (separately for solar cells and module)
 - d) Country of origin (separately for solar cells and module)
 - e) I-V curve for the module
 - f) Peak Wattage, I_m , V_m and FF for the module
 - g) Unique Serial No and Model No of the module
 - h) Date and year of obtaining IEC PV module qualification certificate
 - i) Name of the test lab issuing IEC certificate
 - j) Other relevant information on traceability of solar cells and module as per ISO 9000 series.
 - k) The RFID should be inside the module laminate

5. BATTERY:

Battery shall be Lithium Ferro phosphate (LiFePo_4) with maximum Depth of Discharge 90%, the batteries should conform to the latest BIS /International standards. The battery shall be of LiFePo_4 storage batteries as per

MNRE/BIS/IEC standards with control electronics, BMS, interconnecting wire/cables properly sealed. Should have designed battery management system (appropriate over charging, over heating deep discharge protection).

- a) Capacity of each battery shall not be less than 12 .8V, 100Ah and 75 Ah as per above table.
- b) DOD shall be 90% i.e., at least 90% of the rated capacity of the battery should be between fully charged & load cut off conditions.
- c) Battery terminal shall be provided with covers.
- d) Suitable carrying handle shall be provided.
- e) Bidder shall mention the design cycle life of batteries at 75%, 50% and 25% depth of discharge at ambient temperature up to 45 degree C.
- f) The batteries shall be designed for operating in ambient temperature of site upto 55 degree C.
- g) The self-discharge of batteries shall be less than 2 % per month of rated capacity at 27 degree C.

6. LIGHT SOURCE:

- The light source will be of white LED type The color temperature of white LEDs used in the system should be in the range of 5500 degree K – 6500 degree K. Use of LEDs which emits ultraviolet light will not be permitted.
- The illumination should be uniform without dark bands or abrupt variations, and soothing to the eye. Higher light output will be preferred. The light output from the white LED light source should be almost constant.
- The lamps should be housed in an assembly suitable for outdoor use and shall comply with IP65. The LED housing should be made of pressure die cast aluminium having sufficient area for heat dissipation and heat resistant toughened clear glass/ high quality poly carbonate fitted with pressurized die cast aluminium frame with SS screws. The temperature of heat sink should not increase more than 30 degree C above ambient temperature even after 48 hrs of continuous operation. This condition should be complied for the dusk to dawn operation of the lamps while battery operating at any voltage between the loads disconnect and charge regulation set point.
- High power LED of minimum capacity 1 watt each capable to withstand maximum 1 amp driving current having lens angle greater than 120 degree shall be used. The LED LM 80 test report shall only be used.
- The LED efficiency should be more than 140 lumen / watt.

- All LED in circuit must be connected in series only. It must incorporate fail short mechanism in all LEDs
- The LEDs used in the luminary should have life time more than 50,000 hrs.
- The lumen depreciation of LED shall not be more than 30% even after 50,000 burning hours.
- Power consumption of the each LED Luminary / Lighting unit shall not be more than 30 W (including LED Driver power loss).
- The LED efficacy should be more than 140 lumen / watt.
- Other Parameters :
 5. LED DC current regulation – better than 3 %
 6. Input – 12 V DC
 7. Driver Type- DC-DC (as per IEC 62384)
 8. CRI - 70 % Typical
 9. Lighting quality- Free from glare and flickering and UV
 10. Ambient temp– up to 50 deg
 11. DC to DC converter efficiency >= 90 %
- The connecting wires used inside the luminaries, shall be low smoke halogen free, fire retardant e-beam cable and fuse protection shall be provided at input side.
- Auto reset table reverse polarity protection shall be provided
- LED lighting unit shall comply with LM -79-08 and LM -80-08 Standards and copy of test certificate (LM 80-08) should be submitted.
- The make, model number, country of origin and technical characteristics of white LEDs used in the lighting system must be furnished.
- The luminaries must have light distribution polar curve as per LM 79 test specifications.

5. ELECTRONICS:

MPPT charge controller to maximize energy drawn from the Solar PV array. The MPPT charger shall be microcontroller based. The MPPT should have four stage charging facilities i.e Bulk, Absorption, Float and Equalization. The auto equalization facilities for every (30+_3 days) and provision to verify it during testing. The PV charging efficiency shall not be less than 90% and shall be suitably designed to meet array capacity. The charge controller shall conform to IEC 62093, IEC 60068 as per specifications

- a. Protection against polarity reversal of PV array and battery, Over Current, Short Circuit, Deep Discharge, Input Surge Voltage, Blocking diode protection against battery night time leakage through PV Module
- b. Electronics should operate from 10 volt to 21 volt and its Euro efficiency should be at least 90%.
- c. The system should have protection against battery overcharge and deep discharge conditions. The numerical values of the cut off limits of lower voltage should not be less than 12 Volt
- d. The system should have protection against Microwave radar sensor auto Dimming system.
- e. Full protection against open circuit, accidental short circuit and reverse polarity should be provided.
- f. Charge controller shall have automatic dusk-dawn circuit based on SPV module as sensor for switching on/off the high mast light without manual intervention. The sensor must not get triggered by impulse lighting like lightning flashes and firecrackers.
- g. The self-consumption of the charge controller shall not be more than 20 mA at rated voltage and rated current. Adequate protection shall also be incorporated under no-load conditions (i.e. when the system is ON & the load (LED Lamp is removed)
- h. The system should be provided with 2 LED indicators: a green light to indicate charging in progress and a red LED to indicate deep discharge condition of the battery. The green LED should glow only when the battery is actually being charged.
- i. All capacitors shall be rated for max. temp. of 105° C.
- j. Resistances shall preferably be made of metal film of adequate rating.
- k. Device shall have adequate thermal margin should be at least 25 degree below the allowable junction temperature while operating at an ambient temperature of 55 degree C and full load.
- l. Fibre glass epoxy of grade FR 4 or superior shall be used for PCBboards.

6. MECHANICAL HARDWARE

- I. A galvanized metallic frame structure to be fixed on the pole to hold the SPV module(s). The frame structure should be fixed at 30 degree from horizontal facing true south.
- II. The pole should be hot dip Galvanized Iron Octagonal pole of 12.5.0 mtr. Height

as per specification as under:

- III. The Octagonal poles shall be Hot dip galvanized to min 80 microns. The material of pole shall be as per specification of BS EN 100025, ISO1461.
- IV. The size of the pole shall be min 150 mm (A/F) at Top side, 330 mm (A/F) at bottom side with thickness of 3 mm minimum.
- V. Diameter of base plate min. (mm)= 540mm; Thickness of base plate (mm)= min 16 mm.
- VI. Separate Pole should have the arrangement for module and battery at top for mounting of Solar panel of design capacity with mounting structure at an angle of latitude $\pm 2^0$ degree.
- VII. The batteries shall also be mounted on this pole at suitable height hence provision should be made accordingly
- VIII. The pole shall be mounted on suitable RCC foundation at least 1.5 meter deep and 600mm above ground with 6 bolt of min 24 mmsize
- IX. The Nut -Bolts in battery box and panel structures should be proper riveted to ensure the theft proof.
- X. The design and foundation details of the pole shall be got approved before execution of work.
- XI. Battery box:
Two vented metallic box of 20 SWG thick made of pre coated galvanized ms sheet with 60 microns thickness for housing the storage battery outdoors should be provided with proper lock and key.. The size of box should be as per battery size (including vent plug/level indicator) providing minimum clearance of 25 mm on all sides. The battery box is to be properly rest/mounted on pole at least 04 meters of height from ground level. Louvers for proper ventilation should be provided on one side and back of the battery box. No vents shall be provided on top of battery box. Box should be provided with proper locking arrangement. The edges of box should be turned properly to give smooth edge and good strength. Two wooden battens should be fixed inside the battery box to avoid the electrical contact between battery and box. Components and hardware shall be vandal and theft resistant. All parts shall be corrosion- resistant

Electric cable:

The electric cable used shall be twin core PVC insulated water and UV resistance copper cable of minimum size 1.5sq mm. Cable shall meet IS 1554 / 694 Part

1:1988 & shall be of 650 V/ 1.1 kV.

7. INSTALLATION OF SYSTEM:

The system should be properly installed at site. The SPV module mounting structure along with telescopic octagonal pole should be properly grouted depending upon the location and requirement of the site. The grouting should be such that it should withstand the maximum wind speed /storm of 180 kmph. The pole should rest on a suitable RCC foundation. Of (RCC Foundation minimum size of 900 mm x 900 mm x 1500 mm deep and 600 mm above the ground level. must have min 6 nos. foundation bolts of min 1000 mm & 24mm dia.) Adequate space should be provided behind the PV module/array for allowing un-obstructed air flow for passive cooling. Cables of appropriate size should be used to keep electrical losses to a bare minimum. Care should be taken to ensure that the battery is placed with appropriate levelling on a structurally sound surface. The control electronics should not be installed directly above the battery. All wiring should be in a proper conduit or capping case. Wire should not be hanging loose. Any minor items which are not specifically included in the scope of supply but required for proper installation and efficient operation of the SPV systems is to be provided by the manufacturer as per standards.

8. WARRANTIES:

The mechanical structures, electrical works including power conditioners /charge controllers/ maximum power point tracker units/distribution boards/digital meters/ switchgear/ storage batteries, etc. and overall workmanship of the Solar LED High Mast / systems must be warranted against any manufacturing/ design/ installation defects for a minimum period of 5 years

9. PROTECTIONS:

LIGHTING PROTECTION:

The SPV module shall be provided with lightning & over voltage protection. The main aim in this protection shall be to reduce the over voltage to a tolerable value before it reaches the PV or other sub system components. The source of over voltage can be lightning, atmosphere disturbances etc the entire space occupying the SPV array shall be suitably protected against Lightning by deploying required number of Lightning Arrestors. Lightning protection should be provided as per NFC 17-102:2011 standard. The protection against induced high-voltages shall be provided

by the use of metal oxide varistors (MOVs) and suitable earthing such that induced transients find an alternate route to earth.

Earthing

1. Equipment grounding (Earthing) shall connect all non-current carrying metal receptacles, electrical boxes, appliance frames, chassis and PV panel mounting structures in one long run. The grounding wire should not be switched, fused or interrupted.
2. The complete earthing system shall be electrically connected to provide return to earth from all equipment independent of mechanical connection.
3. The equipment grounding wire shall be connected to solar PV module.
4. Earthing system design should be as per the standard practices.

CABLES & WIRES

Cabling shall be carried out as per IE Rules

- Wires: Only FRLS copper wires of appropriate size and of reputed make shall have to be used.
- Cables Ends: All connections are to be made through suitable cable / lug / terminals; crimped properly & with use of Cable Glands.
- Cable Marking: All cable/wires are to be marked in proper manner by good quality ferule or by other means so that the cable can be easily identified. Any change in cabling schedule/sizes if desired by the bidder/supplier be got approved after citing appropriate reasons, All cable schedules/layout drawings have to be got approved from the purchaser prior to installation. All cable tests and measurement methods should confirm to IEC 60189.

Electrical Safety, Earthing Protection Electrical Safety

- Internal Faults: In built protection for internal faults including excess temperature, commutation failure, overload and cooling fan failure (if fitted) is obligatory.
- Over Voltage Protection: Over Voltage Protection against atmospheric lightning discharge to the PV array is required
- Cabling practice: Cable connections must be made using PVC Cu cables, as per BIS standards. All cable connections must be made using suitable terminations for effective contact. The PVC Cu cables must be run in GL trays with covers for protection.

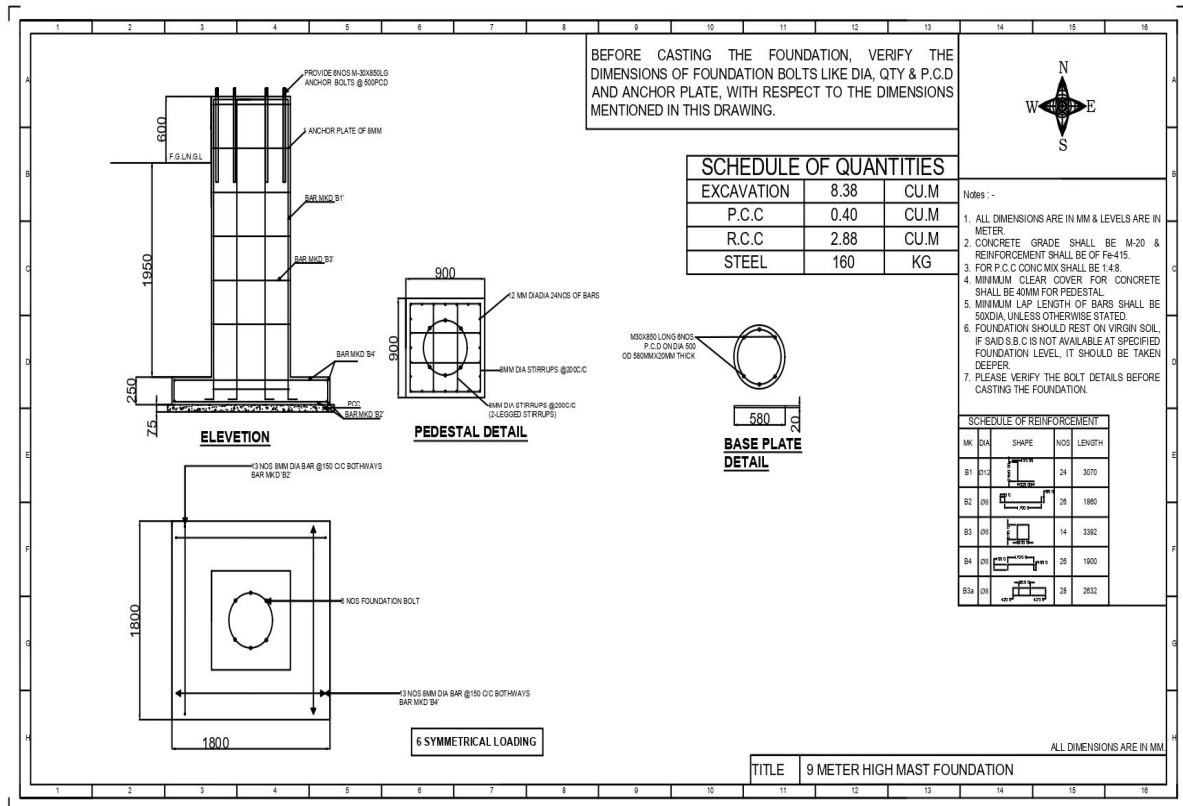
EARTHING PROTECTION

Each array structure of the PV yard should be grounded properly. In addition the lightning arrester/masts should also be provided inside the array field. Provision should be kept be provided inside the array field. Provision should be kept for shorting and grounding of the PV array at the time of maintenance work Warranties and Guarantees

1. Solar Modules: Workmanship/ product replacement for 10 years.
2. Solar Modules: 90% power output for 10 years & 80% power output for 25 years.
3. BoS: Parts and Workmanship for 10 years, service for 25 years.
4. Power Plant Installation : Workmanship for 10 years, service for 25 years
5. PV Array Installation : Structural for 25 years

Detailed specifications of Foundation are as per Annexure B.

ANNEXURE - B



ANNEXURE - C

S. No.	Particulars
1	<p>Size Width 610mm(W) x Tall 915mm (T) Media : 3M - 40C-20R PRINT FILM SF Printing : ECO-UV Flatbed Piezoelectric Printing Coating : Matte Coated Cold type Base : Non Corrosive, Termite proof Polyethylene flat panels consisting of two thin coil-coated sheets bonded to a non-aluminium core 2.8 mm Mounting Elements : Hooks mounted with 3M Teflon® 25 mm Strong Acrylic Clear Double Sided Adhesive + fabrication HSN Code : 8310 GST Rate 18%</p>

B

Mounting Details Of Display Board

