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Technical Specifications of Solar Street Lighting / Flood Lighting Systems 2024

A stand alone solar photovoltaic street lighting system is an outdoor lighting unit used for illuminating a street or an open area. A solar street lighting system consists of a PV Module, control electronics, storage battery, W-LED based Luminaire, inter connecting cables and module mounting 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 pole/ mast at a suitable angle to maximize illumination on the ground. The PV module is placed at the top of the pole facing South direction at an inclination of 10 degree from horizontal. The system should be installed at a place where direct sunlight falls on the PV modules without any hindrance. There should not be any shadows falling on the PV modules during day time. The battery placed inside the battery box is charged by electricity generated by the PV module during day time and the luminaire provides light from dusk to dawn. The system lights at dusk and switches off at dawn automatically.

There are fourteen models of LED based solar street lighting / Flood lighting systems with the following minimum rated parameters.

1. Solar Street Lighting System Model A (Non integrated without dimming)

LED Luminaire	14 W , 2100 lumen
Solar PV Module (Poly/Mono Crystalline Silicon)	60 Wp
Battery (Lithium Ferro Phosphate)	384 Wh
G.I Pole	Height -5m above ground level, Dia -10 cm
Autonomy of operation	24 hours

5 metre hot dip galvanized pole with dia. 10 cm made of 3mm sheet thickness, base plate of size not less than 200 x200x12mm, single arm bracket, foundation bolts and all accessories included. Foundation casting should be with M25 grade concrete in 500x500mm and 800mm under soil and 200 mm above ground level along with required reinforcement as required.

2. Solar Street Lighting System Model B (Integrated with 50% dimming for 4 hours)

LED Luminaire	16 W , 2500 lumen
Solar Module (Poly/Mono Crystalline Silicon)	60 Wp

Battery (Lithium Ferro Phosphate)	384 Wh
G.I Octagonal Pole	Height -5m above ground level, Dia - 10 cm
Autonomy of operation	24 hours

The housing of the luminaire should be of pressure diecast aluminium with 500 hours salt spray tested finish and the transparent cover should be of poly carbonate. 5 metre hot dip galvanized octagonal pole with dia. 10 cm made of 3mm sheet thickness, base plate of size not less than 200 x200x12mm, single arm bracket, foundation bolts and all accessories included. Foundation casting should be with M25 grade concrete in 500x500mm and 800mm under soil and 200 mm above ground level along with required reinforcement as required.

3. Solar Street Lighting System Model C (Non integrated without dimming)

LED Luminaire	20W , 3000 lumen
Solar Module (Poly/Mono Crystalline Silicon)	100Wp
Battery (Lithium Ferro Phosphate)	538 Wh
G.I Pole	Height -6m above ground level, Dia - 10 cm
Autonomy of operation	24 hours

6 metre hot dip galvanized pole with dia. 10 cm made of 3mm sheet thickness, base plate of size not less than 220 x220x16mm, single arm bracket, foundation bolts and all accessories included. Foundation casting should be with M25 grade concrete in 500x500mm and 800mm under soil and 200 mm above ground level along with required reinforcement as required

4. Solar Street Lighting System Model D (Non integrated with 50% dimming for 4 hours)

LED Luminaire	25 W , 3700 lumen
Solar Module (Poly/Mono Crystalline Silicon)	100 Wp
Battery (Lithium Ferro Phosphate)	538 Wh
G.I Pole	Height -6m above ground level, Dia - 10 cm
Autonomy of operation	24 hours

The housing of the luminaire should be of pressure diecast aluminium with 500 hours salt spray tested finish and the transparent cover should be of poly carbonate. 6 metre hot dip galvanized pole with dia. 10 cm made of 3mm sheet thickness, base plate of size not less than 220 x220x16mm, single arm bracket, foundation bolts and all accessories included. Foundation casting should be with M25 grade concrete in 500x500mm and 800mm under soil and 200 mm above ground level along with required reinforcement as required.

5. Solar Street Lighting System Model E (Non integrated with 50% dimming for 5 hours)

LED Luminaire	35W , 5200 lumen
Solar Module (Poly/Mono Crystalline Silicon)	120Wp
Battery (Lithium Ferro Phosphate)	768 Wh
G.I Pole Height -6m above ground level, Dia - 10 cm	
Autonomy of operation	24 hours

The housing of the luminaire should be of pressure diecast aluminium with 500 hours salt spray tested finish and the transparent cover should be of poly carbonate. 6 metre hot dip galvanized pole with dia. 10 cm made of 3mm sheet thickness, base plate of size not less than 220 x220x16mm, single arm bracket, foundation bolts and all accessories included. Foundation casting should be with M25 grade concrete in 500x500mm and 1000mm under soil and 200 mm above ground level along with required reinforcement as required.

6. Solar Street Lighting System Model F (Non integrated with 50% dimming for 4 hours)

LED Luminaire	50W , 7500 lumen
Solar Module (Poly/Mono Crystalline Silicon)	150Wp
Battery (Lithium Ferro Phosphate)	1152 Wh
G.I Pole Height -6m above ground level, Dia - 10 cm	
Autonomy of operation	24 hours

The housing of the luminaire should be of pressure diecast aluminium with 500 hours salt spray tested finish and the transparent cover should be of poly carbonate. 6 metre hot

dip galvanized pole with dia. 10 cm made of 3mm sheet thickness, base plate of size not less than 220 x220x16mm, single arm bracket, foundation bolts and all accessories included. Foundation casting should be with M25 grade concrete in 500x500mm and 1000mm under soil and 200 mm above ground level along with required reinforcement as required.

7. Solar Street Lighting System Model G (Non integrated with 50% dimming for 4 hours)

LED Luminaire	70W , 10400 lumen
Solar Module (Poly/Mono Crystalline Silicon)	200Wp
Battery (Lithium Ferro Phosphate)	1728 Wh
G.I Mast	Height -7m above ground level, Octagonal
Autonomy of operation	24 hours

The housing of the luminaire should be of pressure diecast aluminium with 500 hours salt spray tested finish and the transparent cover should be of poly carbonate. 7 metre hot dip galvanized octagonal pole with top 70 mm and bottom 155 mm dia. made of 3mm sheet thickness, base plate of size not less than 275 x275x16mm, single arm bracket, foundation bolts and all accessories included. Foundation casting should be with M25 grade concrete in 600x600mm and 1000mm under soil and 200 mm above ground level along with required reinforcement as required. The entire structure should withstand wind velocity of 150 km/hour.

8. Solar Street Lighting System Model H (Non integrated without dimming)

LED Luminaire	80W , 12000 lumen
Solar Module (Poly/Mono Crystalline Silicon)	250Wp
Battery (Lithium Ferro Phosphate)	2150 Wh
G.I Mast	Height -7m above ground level, Octagonal
Autonomy of operation	24 hours

The housing of the luminaire should be of pressure diecast aluminium with 500 hours salt spray tested finish and the transparent cover should be of poly carbonate. 7 metre hot dip galvanized octagonal pole with top 70 mm and bottom 175 mm dia. made of 3mm sheet thickness, base plate of size not less than 275 x275x16mm, single arm bracket, foundation bolts and all accessories included. Foundation casting should be with M25

grade concrete in 600 mm x600mm and 1000mm under soil and 200 mm above ground level along with required reinforcement as required. The entire structure should withstand wind velocity of 150 km/hour.

9. Mini Mast Solar Street Lighting System Model I (Non integrated with 50% dimming for 4 hours)

LED Luminaire	35W , 5200 lumen x 3 Nos
Solar Module (Poly/Mono Crystalline Silicon)	120Wp x 3 Nos
Battery (Lithium Ferro Phosphate)	768 Wh x 3 Nos
G.I Mast	Height -7m above ground level, Octagonal with ring arm bracket for holding the luminaires.
Autonomy of operation	24 hours

The housing of the luminaire should be of pressure diecast aluminium with 500 hours salt spray tested finish and the transparent cover should be of poly carbonate. 7 metre hot dip galvanized octagonal pole with top 90 mm and bottom 210 mm dia. made of 3mm sheet thickness, base plate of size not less than 275 x275x16mm, ring arm bracket, foundation bolts and all accessories included. Foundation casting should be with M25 grade concrete in 600x600mm and 1200mm under soil and 200 mm above ground level along with required reinforcement as required. The entire structure should withstand wind velocity of 150 km/hour.

10. Mini Mast Solar Street Lighting System Model J (Non integrated with 50% dimming for 4 hours)

LED Luminaire	50W , 7500 lumen x 3 Nos
Solar Module (Poly/Mono Crystalline Silicon)	150Wp x 3 Nos
Battery (Lithium Ferro Phosphate)	1152 Wh x 3 Nos
G.I Mast	Height -7m above ground level, Octagonal with ring arm bracket for holding the luminaires.
Autonomy of operation	24 hours

The housing of the luminaire should be of pressure diecast aluminium with 500 hours salt spray tested finish and the transparent cover should be of poly carbonate. 7 metre hot

dip galvanized octagonal pole with top 90 mm and bottom 210 mm dia. made of 3mm sheet thickness, base plate of size not less than 350 x350x25mm, ring arm bracket, foundation bolts and all accessories included. Foundation casting should be with M25 grade concrete in 600x600mm and 1300mm under soil and 200 mm above ground level along with required reinforcement as required. The entire structure should withstand wind velocity of 150 km/hour.

11. Mini Mast Solar Flood Lighting System Model K (Non integrated with 50% dimming for 4 hours)

LED Luminaire	50W , 7500 lumen x 4 Nos
Solar Module (Poly/Mono Crystalline Silicon)	150Wp x 4 Nos
Battery (Lithium Ferro Phosphate)	1152 Wh x 4 Nos

G.I Mast Height -7m above ground level, Octagonal with ring arm bracket for holding the luminaires.

Autonomy of operation	24 hours

The housing of the luminaire should be of pressure diecast aluminium with 500 hours salt spray tested finish and the transparent cover should be of poly carbonate. 7 metre hot dip galvanized octagonal pole with top 90 mm and bottom 210 mm dia. made of 3mm sheet thickness, base plate of size not less than 350 x350x25mm, ring arm bracket, foundation bolts and all accessories included. Foundation casting should be with M25 grade concrete in 750x750mm and 1500mm under soil and 200 mm above ground level along with required reinforcement as required. The entire structure should withstand wind velocity of 150 km/hour.

12. Mini Mast Solar Flood Lighting System Model L (Non integrated with 50% dimming for 4 hours)

LED Luminaire	70W , 10400 lumen x3 Nos
Solar Module (Poly/Mono Crystalline Silicon)	200Wp x3 Nos
Battery (Lithium Ferro Phosphate)	1728 Wh x 3 Nos

G.I Pole Height -8m above ground level, Octagonal with ring arm bracket for holding the luminaires.

Autonomy of operation	24 hours

The housing of the luminaire should be of pressure diecast aluminium with 500 hours salt spray tested finish and the transparent cover should be of poly carbonate. 8 metre hot dip galvanized octagonal pole with top 90 mm and bottom 210 mm dia. made of 3mm sheet thickness, base plate of size not less than 350 x350x25mm, ring arm bracket, foundation bolts and all accessories included. Foundation casting should be with M25 grade concrete in 750x750mm and 1500mm under soil and 200 mm above ground level along with required reinforcement as required. The entire structure should withstand wind velocity of 150 km/hour.

13. Mini Mast Solar Flood Lighting System (Model M) (Non integrated with 50% dimming for 4 hours)

LED Luminaire	70W , 10400 lumen x4 Nos
Solar Module (Poly/Mono Crystalline Silicon)	200Wp x4 Nos
Battery (Lithium Ferro Phosphate)	1728 Wh x 4 Nos
G.I Pole	Height -8m above ground level, Octagonal with ring arm bracket for holding the luminaires.
Autonomy of operation	24 hours

The housing of the luminaire should be of pressure diecast aluminium with 500 hours salt spray tested finish and the transparent cover should be of poly carbonate. 8 metre hot dip galvanized octagonal pole with top 90 mm and bottom 210 mm dia. made of 4mm sheet thickness, base plate of size not less than 350 x350x25mm, ring arm bracket, foundation bolts and all accessories included. Foundation casting should be with M25 grade concrete in 750x750mm and 1500mm under soil and 200 mm above ground level along with required reinforcement as required. The entire structure should withstand wind velocity of 150 km/hour.

14. Mini Mast Solar Flood Lighting System (Model N) (Non integrated with 50% dimming for 4 hours)

LED Luminaire	80W, 12000 lumen x4 Nos
Solar Module (Poly/Mono Crystalline Silicon)	250Wp x4 Nos
Battery (Lithium Ferro Phosphate)	2150 Wh x 4 Nos

G.I Pole Height -8m above ground level, Octagonal with ring arm bracket for holding the luminaires.

Autonomy of operation 24 hours

The housing of the luminaire should be of pressure diecast aluminium with 500 hours salt spray tested finish and the transparent cover should be of poly carbonate. 8 metre hot dip galvanized octagonal pole with top 90 mm and bottom 210 mm dia. made of 4mm sheet thickness, base plate of size not less than 350 x350x25mm, ring arm bracket, foundation bolts and all accessories included. Foundation casting should be with M25 grade concrete in 750x750mm and 1500mm under soil and 200 mm above ground level along with required reinforcement as required. The entire structure should withstand wind velocity of 150 km/hour.

1 DUTY CYCLE

The W-LED solar street lighting system should be designed to operate from dusk to dawn, under average daily insolation of 5 kWh /sq.m on a horizontal surface.

2 LUMINAIRE

The light source will be a white LED type. The colour temperature of white LED used in the system should be in the range of 5000°K–6500°K. Use of LEDs which emits ultraviolet light is not permitted.

The minimum luminous efficacy of the white LED should be 160 lumen/watt and that of the luminaire should be 150 lumen/watt

The light output from the white LED light source should be constant throughout the duty cycle.

The lamps should be housed in an assembly suitable for outdoor use. The temperature of heat sink should not increase more than 20°C above ambient temperature during the dusk to dawn operation.

The make, model number, country of origin and technical characteristics (including LM-80, LM-79 report) of white LEDs/LED Luminaire used in the lighting system must be furnished The enclosure of luminary should be with IP66 protection.

3 BATTERY

Lithium Ferro Phosphate Battery.

Battery should conform to the latest BIS/International standards (IEC 62133).

- Battery should have minimum 5 year warranty.

- The battery should be fixed at a minimum height of 3 metre from ground level on the pole in a battery box with IP66 protection.

4 PV MODULE

- The PV module(s) should be indigenously manufactured and contain crystalline silicon cells. It is required to have certificate for the supplied PV module as per IEC 61215, IEC 61730 and IEC 61701 specifications or equivalent BIS specifications. Or the SPV modules offered should be enlisted under latest ALMM (Approved List of Models and Manufacturers) order of MNRE. Copy of the ALMM list to be provided.
- The power output of the PV module must be reported under standard test conditions (STC) at 16.4 volt load voltage. I-V curve of the sample module should be submitted.
- The open circuit voltage of the PV modules under STC should be at least 21.0 volt.
- The PV module efficiency should be above 14 %.
- The terminal box on the module should have a provision for opening for replacing the cable, if required.
- Each PV module should be provided with the following information mentioned on each one

  a) Name of the Manufacturer or distinctive Logo

  b) Model or Type No.

  c) Serial No.

  d) Year of make

5 ELECTRONICS, INCLUDING PROTECTIONS

- The total electronic efficiency should be at least 85%.
- Electronics should operate at 12 V/24V/36V/48V and should have temperature compensation for proper charging of the battery throughout the year.
- The light output should remain constant with variations in the battery voltages.
- The system should have protection against battery overcharge and deep discharge conditions.
- Fuse should be provided to protect against short circuit conditions.
- A blocking diode should be provided as part of the electronics, to prevent reverse flow of current through the PV module(s). In case such a diode is not provided with the PV module, full protection against open circuit, accidental short circuit and reverse polarity should be provided.

- The charge controller should be in corporate with MPPT/PWM.
- Adequate protection to be provided against battery reverse polarity
- Adequate protection is to be incorporated under No Load conditions.
- Load reconnect should be provided at 70% of the battery capacity status.
- Necessary lengths of wires / cables and appropriate fuses should be provided.

6 MECHANICAL COMPONENTS AND INSTALLATION

Aluminum frame structure, with anodizing to be fixed on the pole to hold the SPV module. The frame structure should be inclined at an angle of 10 degree from the horizontal to mount the PV module. The luminaire should be fixed to the pole on GI/aluminium arm. The GI/aluminum arm for holding the luminaire should have suitable length and should be set at a suitable angle to maximize lumen of desired level over the specified area.

A Hot Dip Galvanised Iron /ABS/Aluminium box (IP66 protection) of suitable structure to be fixed on the pole for housing the storage battery.

All mechanical metallic parts shall be of aluminium/ hot dip galvanised iron of suitable thickness to withstand loads including wind loads and should have good aesthetic appearance. All external parts should be Aluminium/Stainless Steel and should be replaced during the warranty period in case of any defects. All nuts and bolts used should be of stainless steel. Foundation of the poles/ masts should be more strengthened according to the nature of the soil.

7 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

8 OTHER FEATURES

There will be a Display Board of size 60cm X 30cm on the pole. The material of the board shall be stainless steel / G.I of minimum gauge 20 and the following details are to be displayed.

a) Name of the scheme.
b) Description of item
c) Date of installation.

d) Name of ANERT and its logo.

There should be a name plate in addition to the Display Board in which the name of the Empanelled Agency and phone number for service are clearly visible.

9 QUALITY AND WARRANTY

Components and parts used in White LED solar street lighting systems should conform to the latest BIS/ International specifications, wherever such specifications are available and applicable. A copy of the test report/ certificate stating conformity of BIS/ International standards must be submitted.

White LED solar street lighting system including the battery, luminaire, pole and other components will be warranted for a period of 5 years from the date of commissioning.

The PV module used should be warranted for its output peak watt capacity, which should not be less than 90% at the end of 10 (ten) years.

10 DOCUMENTATION

An Operation, Instruction and Maintenance Manual, in English and Malayalam, should be provided with the solar street lighting system. Besides other information the Manual should contain the following minimum details:

a) About Photo Voltaics. A small write up (with a block diagram) on PV Module, electronics, lamps and battery.

b) About White LED solar street lighting system - its components and expected performance The make, model number, country of origin and technical characteristics of W-LEDs should be stated in the product data sheet

c) Clear instructions about mounting of pole, grouting details, fixing of PV module, battery and luminaire., clear wiring instructions with line diagram

d) About significance of indicators

e) DO's and DONT's

f) Clear instructions on regular maintenance and troubleshooting of the system

g) Name and address of the person or service centre to be contacted in case of failure or complaint.

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11. Test Reports/ Compliance Certificates Required for Solar LED Street Lighting systems

- Solar module must have IEC 61215, IEC 61730 & IEC 61701 test certificates or equivalent BIS standard. Copy of the test certificate should be attached with the tender document (for the quoted model of module). Or the SPV modules offered should be enlisted under latest ALMM (Approved List of Models and Manufacturers) order of MNRE. Copy of the ALMM list to be provided.
- Lithium ferro phosphate battery must have 5 year warranty. Copy of certificate of IEC 62133/equivalent BIS standard should be provided with the tender document.
- Light unit must have IESNA LM 80 report for LED and LM 79 report for luminaire. Copy of the report should be attached with the tender document.
- Compliance certificate for the enclosure of luminary should be with IP66 protection.
- **The test certificate of the solar SLS issued from laboratories authorised by MNRE / NABL / IEC to be provided along with submission of bid for compliance of the electrical/ electronic parameters. The test certificate of luminaire should clearly indicate the make and model of the test sample of solar SLS and the make and model number of the LED used in the luminaire.**