PROJECT SPECIFICATIONS

INSTALLATION OF SOLAR POWERED LED STREET LIGHTS FOR AREAS WITHIN THE JOHN HAY SPECIAL ECONOMIC ZONE (JHSEZ)

1. SCOPE OF WORK FOR BIDDERS

1.1 To provide the infrastructure for the Installation of Solar Powered LED Street Lights for Areas Within the John Hay Special Economic Zone (JHSEZ).

1.2 To conduct site visit to familiarize with the on-site conditions and existing facilities.

1.3 To provide as-built plans for the Installation of Solar Powered LED Street Lights for Areas Within the John Hay Special Economic Zone (JHSEZ), one (1) set original CAD drawing in A3 size bond paper, three (3) photo copies, and electronic file.

1.4 As-built plans shall indicate the following drawings in any scale not less than 1:100 meters:

a. Actual layout of foundation
b. Actual pedestal details
c. Actual wiring connection of LED solar street lights
d. All other details of the project that may be required

1.5 To submit weekly accomplishment reports.

1.6 To properly and safely dispose all wastes generated from the project.

1.7 To ensure that all workers are equipped with construction safety gear at all times.

1.8 To shoulder all costs for power and water utilities used for the duration of the project.

1.9 To provide first aid requirements for workers throughout the duration of the project.

1.10 To report immediately to JHMC all unearthed hazardous materials, buried treasures or artifacts. JHMC shall coordinate with concerned agencies to handle the same. Activities in said area shall cease until such time that the hazardous materials, treasures have been properly dealt with.

2. DPWH STANDARDS and SPECIFICATIONS

The scope of work shall be in conformity with of the DPWH standards and specifications.

ITEM 1 - EXCAVATION, BACKFILLING AND DISPOSAL

1.1 Description

The Contractor shall perform all earthworks both for roadway, structures, drainage and borrow excavation and the disposal of material in accordance with this Specification and in conformity with the lines, grades and dimensions shown on the Plans or established by the JHMC Representative.

1.2 Construction Requirements

1.2.1 General

When there is evidence of discrepancies on the actual elevations and that shown on the Plans, a pre- construction survey referred to the datum plane used in the approved Plan shall be undertaken by the Contractor under the control of the JHMC Representative to serve as basis for the computation of the actual volume of the excavated materials.

All excavations shall be finished to reasonably smooth and uniform surfaces. No materials shall be wasted without authority of the JHMC Representative. Excavation operation shall be conducted so that material outside of the limits of slopes will not be disturbed. Prior to excavation, all necessary clearing and grubbing in the area shall have been performed in accordance with Item 100, Clearing and Grubbing.

The Contractor shall furnish, place and maintain all supports and shoring that may be required for the sides of the excavations, and all pumping, ditching or other approved measures for the removal or exclusion of water, including taking care of storm water and waste water reaching the site of the work from any source so as to prevent damage to the work or adjoining property.

1.2.2 Conservation of Topsoil

Where provided for on the Plans or in Special provisions, suitable topsoil encountered in the excavation and on areas where embankment is to be placed shall be removed to such extent and to such depth as the JHMC Representative may direct. The removed topsoil shall be transported and deposited in storage piles at locations approved by the JHMC Representative. The topsoil shall be completely removed to the required depth from any designated area prior to the beginning of excavation or embankment work in the area and shall be kept separate from other excavated materials for later use.

1.2.3 Utilization of Excavated Materials

All suitable material removed from the excavation shall be used in the formation of the embankment, subgrade, shoulders, slopes, bedding and backfill for structures,

and for other purposes shown on the Plans or as directed.

The JHMC Representative will designate as unsuitable those soils that cannot be properly compacted in the embankments. All suitable materials shall be disposed-off as shown on the Plans or as directed without delay to the Contractor.

Only approved materials shall be used in the construction of embankments and backfills. All excess material, including rock and boulders that cannot be used in embankments shall be disposed-off as directed. Materials encountered in the excavation and determined by the JHMC Representative as suitable for topping, road finishing, slope protection, or other purposes shall be conserved and utilized as directed by the JHMC Representative.

1.2.4 Removal of Unsuitable Materials

Where the Plans show the bottom portion of the disposal cell bed to be selected, all unsuitable materials shall be excavated to the depth necessary for replacement of the selected clay liner to the required compacted thickness.

Where excavation to the finished graded section results in a subgrade or slopes of unsuitable soil, the JHMC Representative may require the Contractor to remove the unsuitable material and backfill to the finished graded section with approved material. The Contractor shall conduct his operations in such a way that the JHMC Representative can take the necessary cross-sectional measurements before the backfill is placed.

1.3 Method of Measurement

The cost of excavation of material which is incorporated in the works or other areas of fill shall be deemed to be included in the Items of work where the material is used.

For measurement purposes, surplus suitable material shall be calculated as the difference between the net volume of suitable material required to be used in embankment or cover material corrected by applying a shrinkage factor or swell factor in case of rock excavation, determined by laboratory tests to get its original volume measurement, and the net volume of suitable material from excavation in the original position. Separate pay items shall be provided for surplus common, unclassified and rock material.

The Contractor shall be deemed to have included in the contract unit prices all costs of obtaining land for the disposal of unsuitable or surplus material.

1.4 Basis of Payments

The accepted quantities, measured as prescribed in Section 102.3, shall be paid for the contract unit price for each of the particular pay items listed below that are included in the Bill of Quantities which price and payment shall be full compensation for the removal and disposal of excavated materials including all labor, equipment, tools and incidentals necessary to complete the work prescribed in this item.

Pay Item Number	Description	Unit of Measurement
102 (1)	Unsuitable Excavation	m^3
102 (2)	Surplus Common Excavation	m^3

ITEM 2 - REINFORCED CONCRETE

2.1 Description

This item shall consist of furnishing, placing and finishing concrete in buildings and related structures, flood control and ports, and water supply structures in accordance with this specification and conforming to the lines, grades and dimension shown in the plans.

2.2 Materials Requirements

2.2.1 Portland Cement

This item shall conform to the requirement of ITEM 700, Hydraulic Cement, Volume I.

Concrete Aggregates

The concrete aggregates shall conform to the requirement of Subsection 311.2.2 and 311.2.3 under ITEM 311 of Volume I and ASTM C 33 for lightweight aggregates, except that aggregates failing to meet these specifications but which have been shown by special that or actual service to produce concrete of adequate strength and durability maybe used under method (2) of determining the proportion of concrete, where authorized by the Engineer.

Except as permitted elsewhere in this section, the maximum size of the aggregate shall be not larger than one-fifth (1/5) of the narrowest dimensions between size of forms of the member for which the concrete is to be used nor later than three-fourths of the minimum clear spacing between individual reinforcing bars or bundles of bars or pretensioning strands.

Aggregate Test

Samples of the fine and coarse aggregates to be used shall be selected by the Engineer for tests at least 30 days before the actual concreting operations are to begin. It shall be the responsibility of the contractor to designate the source or sources of aggregate to give the Engineer sufficient time to obtain the necessary samples and submit them for testing.

No aggregates shall be used until official advice has been received that it has satisfactory passed all test, at which time written authority shall be given for its use.

2.2.3 Water

Water used in mixing concrete shall conform to the requirement of Subsection 311.2.4 under ITEM 311, Part D of Volume 1.

2.2.4 Metal Reinforcement

Reinforcing Steel bars shall conform to the requirements of the following

Specifications; Deformed & Plain Billet Steel	ASTM A 6151
Bars for concrete reinforcement	AASHTO M 31

If reinforcing bars are to be welded, these ASTM specifications shall be supplemented by requirements assuring satisfactory weldability.

Bars and rod for concrete Reinforcement	ASTM A 187
For concrete reinforcement	AASHTO M 55

2.2.5 Storage of Materials

Cement and aggregates shall be stored in such a manner as to prevent their deterioration or intrusion of foreign matter. Cement shall be stored immediately upon arrival on the site of the work, in substantial waterproof bodegas, with a floor raised from the ground sufficiently high to be free from dampness. Aggregates shall be stored in such a manner as to avoid the inclusion of foreign materials.

2.3 Construction Requirements

Notations: The notations used in these regulations are defined as follows:

f'c = compressive strength of concrete

Fsp = ratio of splitting tensile strength to square root compressive strength

2.3.1 Concrete Quality

All plans submitted for approval or used for any project shall clearly show the specified strength, f'c', of concrete of the specified age for which each part of the structure was designed.

Concrete that will be exposed to sulfate containing or other chemically aggressive solutions shall be proportioned in accordance with "Recommended Practice for Selecting proportions for Concrete (ACI 613)" and with "Recommended Practice for Selecting proportions for Structural Lightweight Concrete (ACI 613A)."

2.3.2 Methods of Determining the Proportions of Concrete

The determination of the proportions of cement, aggregate, and water to attain the required strengths shall be made by one of the following methods, but lower water-cement ratios may be required for conformance with the quality of concrete.

Method 1. Without preliminary test

Where preliminary test data on the materials to be used in the concrete have not been obtained the water- cement ratio for a given strength of concrete shall not exceed the values shown in Table 900.1.

Where previous data are not available, concrete trial mixtures having proportions and consistency suitable for the work shall be made using at least three different water-cement ratios (or cement content in the case of lightweight aggregates) which will produce a range of strength s encompassing those required for the work. For each water-cement ratio (or cement content) at least three specimens for each age to be tested shall be made, cured and tested for strength in accordance with ASTM C 39 and C 192.

The strength test shall be made at 7, 14 and 28 days at which the concrete is to receive load, as indicated on the plans. A curve shall be established showing the relationship between water-cement ratio (or cement content) and compressive strength. The maximum permissible water-cement ratio for the concrete to be used in the structure shall be that shown by the curve to produce an average strength to satisfy the requirements of the strength test of concrete provided that the water-cement ratio shall be no greater than that required by concrete quality when concrete that is to be subjected to the freezing temperature which weight shall have a water-cement ratio not exceeding 6 gallon per bag (50 kgs.) and it shall contain entrained air.

Where different materials are to be used for different portions of the work, each combination shall be evaluated separately.

Table 2.1 Maximum Permissible Water-Cement Ratios for Concrete (Method 1)

Specific Compressive strength at 28 days, psi fc'	Maximum permissible Water-Cement Ratio			
	Non Air-entrained Concrete		Air-entrained Concrete	
	U.S. gal. per 42.5 kg. bag of cement	Absolute Ratio by weight	U.S. gal. per 42.5 kg. bag of cement	Absolute Ratio by weight
2500	7 ¼	0.642	6 ¼	0.554
3000	6 ½	0.576	5 ¼	0.465
3500	5 ¾	0.510	4 ½	0.399
4000	5	0.443	4	0.354

2.3.3 Concrete Proportions and Consistency

The proportion of aggregate to cement for any concrete shall be such as to produce a mixture which will work readily into the corners and angles on the form and around reinforcement with the method of placing employed on the work, but without permitting the materials to segregate or excess free water to collect on the surface. The methods of measuring concrete materials shall be such that the proportions can be accurately controlled and easily checked at any time during the work.

2.3.4 Sampling and Testing of Structural Concrete

As work progress, at least one (1) set of sample consisting of three (3) concrete cylinder test specimens, 150 x 300 mm. shall be taken from each class of concrete placed each day, and each set to represent not more than 75 cu. m. of concrete.

2.3.5 Consistency

Concrete shall have a consistency such that it will be workable in the required position. It shall be such a consistency that it will flow around reinforcing steel but individual particles of the coarse aggregate when isolated shall show a coating or mortar containing its proportionate amount of sand. The consistency of concrete shall be gauged by the ability of the equipment to properly placed it and not by the difficulty of mixing water shall be determined by the Engineer and shall not be varied without his consent. Concrete as dry as it is practical to place with the equipment specified shall be used.

2.3.6 Strength Test of Concrete

When strength is the basis of acceptance, each class of concrete shall be represented by at least five test (10 specimens). Two specimens shall be made for each test at a given age, and not less than one test shall be made for each 150 cu. m. of structural concrete, but there shall be at least one test for each days concreting.

The Engineer may require a reasonable number of additional tests during the progress of the work. Samples from which compression test specimens are molded shall be secured in accordance with ASTM C 172. Specimens made to check the adequacy of the proportions for strength of concrete or as basis for acceptance of concrete shall be made and laboratory-cured in accordance with ASTM C 31. Additional test specimens cured entirely under field conditions may be required by the Engineer to check the adequacy of curing and protection of the concrete. Strength tests shall be made in accordance with ASTM C 39.

The age for strength tests shall be 28 days or, where specified, the earlier age at which the concrete is to receive its full load or maximum stress. Additional test may be made at earlier ages to obtain advance information on the adequacy of strength development where age-strength relationships have been established for the materials and proportions used.

To conform to the requirements of this Item:

1. For structures designed in accordance with the Working Stress Design (WSD) method of this chapter, the average of any five consecutive strength tests of the laboratory-cured specimens representing each class of concrete shall be equal on or greater than the specified strength, fc', and not more than 20 percent of the strength test shall have values less than that specified.

2. For structures designed in accordance with the Ultimate Strength Design (USD) method of this chapter, and for prestressed structures the average of any three consecutive strength test of the laboratory cured specimens

representing each class of concrete shall be equal to or greater than the specified strength, fc' and not more than 10 percent of the strength tests shall have values less than the specified strength.

When it appears that the laboratory-cured specimens will fail to conform to the requirements for strength, the Engineer shall have the right to order changes in the concrete sufficient to increase the strength to meet these requirements. The strengths of the specimens cured on the job are intended to indicate the adequacy of protection and curing of the concrete and may be used to determine when the forms may be stripped, shoring removed, or the structure placed in service. When, in the opinion of the Engineer, the strengths of the job-cured specimens, the Contractor may be required to improve the procedures for protecting and curing the concrete, or when test of field-cured cylinders indicate deficiencies in protection and curing, the Engineer may require test in accordance with ASTM Specification C 42 or order load test as outlined in the load tests of structures for that portion of the structure where the questionable concrete has been placed.

2.3.7 Splitting Tensile Test of Concrete

To determine the splitting ration, Fsp, for a particular aggregate, test of concrete shall be made as follows:

1. Twenty four (24) 15 cm. diameter by 30 cm. long (6 in. dia. by 12 in. long) cylinders shall be made in accordance with ASTM C 192, twelve at compressive strength level of approximately 210 kilograms per square centimeter (3000 psi) and twelve at approximately 280 kilograms per square centimeter (4000 psi) or 350 kilograms per square centimeter (5000 psi). After 7 days moist curing followed by 21 days at 23 ºC (73 ºF) and 50% relative humidity, eight of the test cylinders at each of the two strength levels shall be tested for splitting strength and four for compressive strength.

2. The splitting tensile strength shall be determine in accordance with ASTM C 496, and compressive strength in accordance with ASTM C 39.

The ration, Fsp, of splitting tensile strength to the square root of compressive strength shall be obtained by using the average of all 16 splitting tensile test and all 8 compressive tests.

Minimum Strength, Concrete other than fill, shall have a minimum compressive strength at
28 days of 140 kilograms per square centimeter (2000 psi).

2.3.8 Batching

Batching shall conform to the requirements of ITEM 405, Structural Concrete.

2.3.9 Mixing and Delivery

Mixing and delivery shall conform to the requirements of ITEM 405, Structural Concrete.

2.3.9.1 Concrete Surface Finishing : General

This shall be in accordance with ITEM 407, Concrete Structures.

2.3.9.2 Curing Concrete

This shall be in accordance with ITEM 407, Concrete Structures

2.3.9.3 Acceptance of Concrete

The strength of concrete shall be deemed acceptable if the average of three (3) consecutive strength test results is equal to or exceed the specified strength and no individual test result falls below the specified strength by more than 15%.

Concrete deemed to be not acceptable using the above criteria may be rejected unless Contractor can provide evidence, by means of core tests, that the quality of concrete represented by the failed test result is acceptable in place. Three (3) cores shall be obtained from the affected area, cured and tested in accordance with AASHTO T24. Concrete in the area represented by the cores will be deemed acceptable if the average of cores is equal to or at least 85% and no sample core is less than 75% of the specified strength otherwise it shall be rejected.

2.4 Method of Measurement

The quantity of concrete to be paid shall be the quantity shown in the Bill of Quantities schedule, unless changes in design are made in which case the quantity shown in the Bill of Quantities will be adjusted by the amount of the change for the purpose of payment. No deduction will be made for the volume occupied by the pipe less than 101 mm. (4") in diameter nor for reinforcing steel, anchors, weep holes or expansion materials.

2.5 Basis of Payment

The accepted quantities measured as prescribed in Sub-Section 900.7 shall be paid for at the appropriate contract unit price for the pay item listed below as shown in the Bill of Quantities, which price and payment shall be full compensation for furnishing all materials, including metal water stops, joints, joint fillers, weep holes, and rock backing and timber bumpers; for all form and false work; for mixing, placing, furnishing, and curing the concrete; and for all labor, materials, equipment, tools and incidentals to complete the item, except that reinforcing steel shall be paid for at the contract unit price per kilogram for reinforcing steel metal pipes and drains, metal conduits and ducts, and metal expansion angles shall be paid for as structural steel that when the proposal does not include an item for Structural Steel these miscellaneous metal parts shall be paid for as reinforcing steel.

Pay Item No.	Description	Unit of Measurement
900 (1)	Reinforced Concrete	cubic meter (cu.m.)

ITEM 3 - LED SOLAR STREET LIGHTS WITH POLE ERECTION, INSTALLATION, TESTING AND COMMISSIONING

3.1 DESCRIPTION

White Light Emitting Diode (W-LED) is a solid state device which emits light when forward electric current passes through it. A LED based solar street lighting system consists of a PV module (Solar Panel), control electronics, battery and W-LED based luminaire all suitably mounted individually/standalone units or with a centralized power supply. The battery is charged by electricity generated through the PV module during day time and the luminaire provides light from dusk to dawn.

Centralized LED Solar Street Lights - is a system where two or more sets of LED street lights are connected in one power source that is run by Stand Alone or Grid Tied Photovoltaic system located in unshaded place like rooftops. The centralized solar street lights is being recommended in heavy forested areas where obstruction from a vegetation or trees are most likely to affect the performance of the individual solar system.

3.2 MATERIALS REQUIREMENT

40 Watts High Quality Model LED Solar Street Lights	
Material	Aluminum Alloy or Equivalent, Heavy Duty, Rust Proof
LED Lights / Lamp	12 Volts, 40 Watts, 4,000 to 4,300 LM, High Power, High Brightness, White Color
Solar Panel / PV Module	100 to 120 Watts, High Efficiency, Aluminum Frame, Tempered Glass
Battery	Lithium or Equivalent Type, 120 AH Capacity, Sealed Type, Maintenance Free
Intelligent Solar Controller	15 Amps., 12 Volts, Automatic Light and Control, Over Charging/Discharging Protection, Reverse Connection Protection, Automatic Switch On/Switch Off
Duty Cycle	Dusk to Dawn
Mounting of Light	Minimum seven (7) meter Pole Mounted

3.3 OTHER DETAILS

3.3.1 Duty Cycle

The LED solar street lighting system should be designed to automatically switch ON at dusk, operate throughout the night and automatically switch OFF at dawn.

3.3.2 PV Module / Solar Panel

The PV module/s shall contain mono/multi crystalline silicon or thin film solar cells. In case of crystalline silicon solar cell module, it is required to have a certificate for the supplied PV module as per IEC 61215 specifications or equivalent National or International standards. Where in case of thin film solar cell module, it is required to have a certificate for the supplied PV module as per IEC 61646 specifications or equivalent National or International Standards

The open circuit voltage of the PV modules under STC should be at least 21.0 Volts.

The terminal box on the module should have a provision for opening for replacing the cable, if required.

Identification and Traceability : Each PV module used in any solar power project must use a RF identification tag. The following information must be mentioned in the RFID used on each module (This can be inside or outside the laminate, but must be able to withstand harsh environmental conditions.)

a) Name of the Manufacturer or distinctive Logo
b) Model or Type No.
c) Serial No.
d) Year of make

3.3.3 Light Source

The light source will be a white LED type. Single lamp or multiple lamps can be used. The color temperature of white LED used in the system should be in the range of 5500^{o}K–6500^{o}K. Use of LEDs which emits ultraviolet light is not permitted.
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^{o}C above ambient temperature even after 48 hours of continuous operation. This condition should be complied for the dusk to dawn operation of the lamp while battery operating at any voltage between the load disconnect and the charge regulation set point.

The make, model number, country of origin and technical characteristics (including IESNA LM-80 report) of white LEDs used in the lighting system must be furnished to the Test Centers and to the buyers. In absence of this data the solar street lights may not be tested by the Test Center.

3.3.4 Battery

Lithium or Equivalent Type, 120 AH Capacity, Sealed Type, Maintenance Free or Lead Acid, Tubular Positive Plate Flooded or Tubular GEL / AGM VRLA, 12 V- 40 AH @ C/10 discharge rate. Battery should conform to latest BIS standards. In view of non-availability of adequate test facilities for testing as per BIS standard in the country,

existing facilities of battery manufacturers will be utilized by way of periodic quality audit by MNRE/BIS or their representative to ensure conformance of BIS standards.

(i) Also initially for a period of six months from the date of the issue of these guidelines capacity test, Ampere-Hour (Ah) & Watt-Hour (Wh) efficiency test and charge retention tests per BIS standards may be used to enable the program to continue.

(ii) It is also mandatory for the battery manufacturers/ bulk users to comply with batteries (Management and handling) Rules 2001 of MOEF, as amended.

(iii) The manufacturer is required to submit the test report on Ah efficiency Wh efficiency and charge retention test from an NABL accredited Lab whereas the capacity test of the battery will be conducted by the system testing lab. (iv) At least 75 % of the rated capacity of the battery should be available between fully charged & load cut off conditions.

3.3.4 Electronics

(i) The total electronic efficiency should be at least 85%.

(ii) Electronics should operate at 12 V and should have temperature compensation for proper charging of the battery throughout the year.

(iii) The light output should remain constant with variations in the battery voltages.

3.3.5 PV Module

1. The PV module (s) shall contain mono / multi crystalline silicon or thin film solar cells. In case of crystalline silicon solar cell module it is required to have certificate for the supplied PV module as per IEC 61215 specifications or equivalent National or International Standards whereas in case of thin film solar cell module it is required to have certificate for the supplied PV module as per IEC 61646 specifications or equivalent National or International Standards. In case of thin film modules for each model the modules should fulfill the wattage criterion after light soaking degradation.

   In case the supplied PV module is not a module of regular production of the manufacturer and does not have certificate as above then the manufacturer should have the required certification for at least one of the irregular modules. Further, the manufacturer should certify that the supplied module is also manufactured using same material design and process similar to that of certified PV module.

   In case of imported modules it is mandatory to provide a copy of the international product qualification certificate to the test center

2. The power output of the PV module must be reported under standard test conditions (STC) at 16.4 Volt loading voltage. I-V curve of the sample module should be submitted to the test center at the time of system qualification testing. The cell efficiency in the module should not be less than 15%.

3. The open circuit voltage of the PV modules under STC should be at least 21.0 Volts.

4. The terminal box on the module should have a provision for opening for replacing the cable, if required.

5. Identification and Traceability

Each PV module used in any solar power project must use a RF identification tag. The following information must be mentioned in the RFID used on each module (This can be inside or outside the laminate, but must be able to withstand harsh environmental conditions.) a) Name of the Manufacturer or distinctive Logo b) Model or Type No. c) Serial No. d) Year of make

3.3.6 Electronics Protection

1. The system should have protection against battery overcharge and deep discharge conditions. The numerical values of the cut off limits must be specified, while submitting the samples for the testing purposes.

2. Fuse should be provided to protect against short circuit conditions.

3. 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.

4. Electronics should operate at 12V and should have temperature compensation for proper charging of the battery throughout the year.

3.3.7 Mechanical Components

(i) Metallic frame structure (with corrosion resistance paint) to be fixed on the Pole to hold the SPV module. The frame structure should have provision to adjust its angle of inclination to the horizontal between 0 and 45 degrees, so that it can be installed at the specified tilt angle.

(ii) It should be possible to mount the light source on a metallic arm attached to the pole. The metallic arm for holding the light assembly should be extended at least 1.5 metres from the pole and set at a suitable angle to maximize uniform illumination of desired level over the specified area.

(iii) A vented metallic/ plastic box with acid proof corrosion resistance paint for housing the storage battery outdoors should be provided.

3.3.8 Other Features

(i) The system should be provided with two 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.

(ii) There will be a Name Plate on the system body, which will give:

(a) Name of the Manufacturer or Distinctive Logo.
(b) Model Number
(c) Serial Number
(d) Year of manufacture

(iii) Necessary lengths of wires / cables and fuse should be provided

3.4 QUALITY AND WARRANTY

(i) 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 to the Test Centre.

(ii) The PV module will be warranted for a minimum period of 20 years from the date of supply and the complete White LED solar street lighting system including the battery will be warranted for a period of at least 5 years from the date of supply.

(iii) The original manufacturers of W-LED based solar street lighting system are required to provide to the Test Center a detailed report on the tests performance by them and the actually measured values of PV module, electronics, LEDs, battery and other related parameters, as per MNRE specifications. Mere mention of compliance to MNRE specifications is not acceptable and such samples may not be tested by the Test center. The test center will refer to the measured values provided by the manufacturer in the test report issued by the Test Center.

3.5 DOCUMENTATION

(i) An Operation, Instruction and Maintenance Manual, in English and the local language, should be provided with the solar street lighting system. Besides othe information the Manual should contain the following minimum details:

(a) About Photovoltaics.

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

(c) 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

(d) Clear instructions about mounting of Pole, Grouting details, fixing of PV module, battery box and luminaire. Clear wiring instructions with line diagram

(e) About significance of indicators

(f) DO's and DONT's

(g) Clear instructions on regular maintenance and troubleshooting of the system

(h) Name and address of the person or service center to be contacted in case of failure or complaint.