

**SECTION 265670**  
**Exterior Solar Powered Lighting**

**PART 1- GENERAL**

1.1 SUMMARY

- A. Section Includes:
  - 1. Solar Powered Outdoor Lighting
- B. Related Sections:
  - 1. Section [260130 – Operating and Maintenance of Electrical Storing Devices]
  - 2. Section [260913 – Electrical Power Monitoring and Control]

1.2 REFERENCES

- A. American National Standards Institute / Institute of Electrical and Electronic Engineers (ANSI/IEEE)
  - 1. ANSI/ESD S20.20-2007 Development of an Electrostatic Discharge Control Program
- B. International Electrotechnical Commission .
  - 1. (IEC) 801-2 Electrostatic Discharge Testing Standard.
- C. International Organization for Standardization (ISO)
  - 1. 9001 (2001) – Quality Management Systems.
- D. National Electrical Manufacturers Association (NEMA)
  - 1. PE 5-1997 (R2003) – Utility Type Battery Chargers
  - 2. NEMA 250-2003 – Enclosures for Electrical Equipment
  - 3. ANSI/IEC 60529-2004 – Degrees of Protection Provided by Enclosures
- E. Underwriters Laboratories, Inc. (UL):
  - 1. UL 1598 Luminaries
  - 2. UL 2108 Low Voltage Lighting Systems

1.3 DESCRIPTION

Solar Powered Outdoor Lighting System

1.4 SUBMITTALS

- A. Submit under provisions of Section [013300]
- B. Specification Conformance Document: Indicate whether the submitted equipment:
  - 1. Meets specification exactly as stated.
  - 2. Meets specification via an alternate means and indicate the specific methodology used.
- C. Product Data: Catalog cut sheets with performance specifications demonstrating compliance with specified requirements.
- D. IES electronic files of lamp output or Photometric Plots on a surface from a defined lamp height
- E. Calculation of Effective Projected Area (EPA) of the solar lighting system, with associated AASHTO reference for design wind speed for the area and EPA rating of the pole (if provided)

1.5 QUALITY ASSURANCE

- A. Manufacturer: Minimum [15] [10] years experience in manufacture of solar powered lighting systems
- B. Manufacturer's Quality System: Registered to ISO 9001:2001 Quality Standards, including in-house engineering for product design activities.
- C. Photo Voltaic panels shall be [IEC61215] [IEEE1262] listed [and/or] [UL1703 listed]
- D. Battery shall be rated "non-spillable" by ICAO/IATA/DOT

1.6 PROJECT CONDITIONS

- A. Do not install equipment until following conditions can be maintained in spaces to receive equipment:
  - 1. Ambient temperature: 0° to 50° C
  - 2. Relative humidity: 0 to 100%
  - 3. All electrical components rated from -10° to 100°C
  - 4. Pole, base, footing and all coupling components exceed maximum specified EPA ratings

required for local wind loading conditions.

5. Photo Voltaic Panel rated to withstand hailstone impact described in ASTM E1038-93 and surface Cut Susceptibility tests (UL 1703-24)

#### 1.7 WARRANTY

- A. Provide manufacturer's warranty covering [5 years] [7 years with extended service plan] on solar lighting system from date of purchase.
- B. Solar Voltaic Panel warranty covers [15 years] [20 years].

#### 1.8 REGULATORY REQUIREMENTS

- A. Solar lighting system meets or exceeds NEC 2005 code requirements
- B. [Local regulatory requirement]

#### 1.9 COMMISSIONING

- A. Provide factory-certified field service engineer to a site visit to ensure proper installation and operation under following parameters:
  1. Qualifications for factory-certified field service engineer:
    - a. Minimum experience of [2] years training in the electrical/electronic field.
    - b. Certified by the equipment manufacturer on the system installed.
  2. Make a visit upon completion of installation to:
    - a. Verify connection of system components
    - b. Check performance
    - c. User to be trained on system operation and support

#### 1.10 STORAGE AND HANDLING

- A. Battery(ies) approved for shipping via ground, air, or sea
- B. Battery(ies) retains 80% charge or higher from 2 months of shipment

#### 1.11 MAINTENANCE

- A. Make ordering of new equipment for expansions, replacements, and spare parts available to end user twenty-four hours a day, seven days a week.
- B. Make replacements available for minimum of ten years from date of manufacture.
- C. Provide factory direct technical support hotline 24 hours per day, 7 days per week.
- D. Provide on-site service support within 3 days anywhere in continental United States and within 5 days worldwide except where special visas are required.

### **PART 2- PRODUCTS**

#### 2.1 MANUFACTURERS

- A. Acceptable Manufacturer: Sol Inc.
- B. [Basis of design product: Sol Inc. or subject to compliance and prior approval with specified requirements of this section, one of the following:]
  1. Sol Inc.
- C. Substitutions: [Not permitted.] [Under provisions of Division 012500.]
  1. All proposed substitutions (clearly delineated as such) must be submitted in writing for approval by the design professional a minimum of 10 working days prior to the bid date and must be made available to all bidders.
  2. Proposed substitutes must be accompanied by a review of the specification noting compliance on a line-by-line basis.
  3. Any substitutions provided by the contractor shall be reviewed at the contractor's expense by the electrical engineer at a rate of [\$200.00] per hour.
  4. By using pre-approved substitutions, the contractor accepts responsibility and associated costs for all required modifications to circuitry, devices, and wiring.
  5. Provide complete engineered shop drawings with deviations for the original design highlighted in an alternate color to the engineer for review and approval prior to installation.

#### 2.2 GENERAL – Solar Powered Light Fixtures

- A. Solar Powered Light System consists of six (6) components and assemblies: Photovoltaic (PV) Modules, Solar Light Controllers, Light Fittings, LED lamps, Batteries, Battery Enclosures, Mounting and Support Hardware.

1. Photovoltaic (PV) Module
  - a. Construction:
    - 1) Crystalline silicon solar cells
    - 2) Framed in an all-aluminum structure
    - 3) Sealed behind UV stabilized tempered glass
    - 4) Covered by a [20] [25] year power warranty
    - 5) Meet or exceed [IEC61215] [IEEE1262] listed [and/or] [UL1703] standard
    - 6) RoHS compliant
    - 7) Harnessing and cabling is 12 AWG THHN stranded wire with over molded insulated rated for exterior usage
  - b. Performance: PV power rating generates adequate power to fully recharge system batteries within two (2) days at the installation location's expected minimum insolation as defined by NREL.
2. Light Fixture Assembly
  - a. Construction:
    - 1) [Cobrahead] [Shoebox] [Greenway™] style
    - 2) UV stabilized powder coated [gray] [black] [bronze] [silver] [green]
    - 3) [Glass][Polycarbonate] with [clear sag] [prismatic refraction] lens finish
    - 4) Sealed and rain-proof
    - 5) Dark Sky Certified
    - 6) Tilt from 0 to 15 degrees above horizontal for better light dispersion
    - 7) Designed and factory-installed LED light source only
  - b. Performance:
    - 1) LED source designed for a minimum of 100,000 hour performance with over 70% initial lumen maintenance
    - 2) LED junction temperature does not exceed 120° C in worst-case site temperature conditions
    - 3) High brightness LEDs only (>80 lumens/Watt) per LED. 5 mm type LEDs are not acceptable
    - 4) Bright white LEDs with a color temperature greater than 5000 K (> 5000 K)
    - 5) Manufacturer provides relevant .ies files to indicate light dispersion and intensity of LED source
3. System Electronics – consist of battery charge controller and LED driver
  - a. Construction:
    - 1) Enclosed within the light system with touch-proof covers to prevent damage
    - 2) Conformal coated to prevent corrosion and failure due to water
    - 3) Charge controller and LED driver are designed without electrolytic capacitors. All other capacitor devices are de-rated by at least 20° C below the capacitor's maximum temperature rating under fully-loaded conditions and ambient temperature of 30° C
    - 4) Minimum 10 year operational life when operating at minimum or maximum rated system environmental specifications (10° C to 50° C at 0 – 100% relative humidity, non condensing)
    - 5) Designed and tested to withstand electrostatic discharges up to 15,000 V without impairment per IEC 801-2.
    - 6) Withstand up to a 6,000 Volt surge without impairment of performance as defined by ANSI C62.41 Category A.
    - 7) Manufactured in a facility that employ ESD reduction practices in compliance with ANSI/ESD S20.20.
  - b. Performance
    - 1) Operates in the following mode [Dusk to Dawn] [Programmed Run – Light operates for [10] [8] [6] [4] hours after dusk] [Split night with dimming – Light operates at [10] [8] [6] [4] [2] hours, dims to 25% then returns to full light for [1] [2] hours before dawn] [Split night - Light operates at [10] [8] [6] [4] [2] hours, turns off then returns to full light

- for [1] [2] hours before dawn]
  - 2) Perform Power Management to increase a system's run-time even with inclement weather conditions
  - 3) Charge Controller operates with temperature compensated limits ensuring battery charging algorithm protects battery (ies) from over and under voltage stress
    - a) Charge controller adapts maximum (charged) voltage based on temperature (14V maximum at 21° C)
    - b) Charge controller prevents discharge below temperature compensated battery Low Voltage Disconnect (LVD) limit (11.5V at 21° C)
  - 4) Operate the light for [three (3)] [five (5)] [ten (10)] nights without adequate insolation during the day to charge the batteries
  - 5) Charge controller never discharges more than 20% depth of discharge per night
  - 6) Charge Controller differentiates between actual sunlight and solar panel illumination from the system's own LED light
4. Batteries
- a. Construction:
    - 1) Sealed valve regulated Gel cell type
    - 2) Maintenance free
    - 3) Air shippable
    - 4) 100% recyclable
  - b. Performance
    - 1) Capable of over 2000 cycles
    - 2) Deep cycle technology
    - 3) Maintains over 80% of charge after 2 months if left disconnected
5. Battery Enclosure
- a. Construction:
    - 1) All aluminum vented enclosure
    - 2) Aluminum doors with keyed notches for securing the door during service
    - 3) NEMA [3RX] [3R] rated
    - 4) Holds up to 2 large-size (100 Ah) batteries or 4 small-size (55 Ah) batteries to a maximum enclosure weight of 200 lbs.
    - 5) All battery wire terminals and harnessing connect via quick-connect type with keyed connections to prevent miswires
  - b. Performance:
    - 1) Access provided for battery service via four (4) bolts
    - 2) Wire harness is 12AWG THHN wire and finished to prevent accidental shorts
    - 3) Terminal covers, ring washers, terminals, etc. are non-corrosive non-rusting
    - 4) Warranted for a minimum of two (2) years, and an additional pro-rated warranty to cover five (5) years.
6. Mounting and Support Hardware
- a. Construction:
    - 1) All aluminum bracing and support struts
    - 2) Aluminum or stainless steel hardware for rust-proof and corrosion resistant mounting equipment
    - 3) All field serviceable cabling is quick connect plug-in type and designed to prevent miswires.
  - b. Performance:
    - 1) PV, Battery, and Fixture mounting hardware rated for [80] [100] [110] [135] mph wind conditions
    - 2) PV support structure adjustable to set angles of [5] [15] [30] [45] [60] degrees for ideal solar harvesting

- 3) PV support structure does not allow complete horizontal mounting to avoid soil, dust, dirt and debris collection that impedes solar harvesting

2.3 SOURCE QUALITY CONTROL

- A. Perform full-function testing on 100% of all lighting systems at the factory.
- B. Manufactured by an ISO 9001-2000 listed manufacturer

**PART 3- EXECUTION**

3.1 INSTALLATION

- A. Install equipment in accordance with manufacturer's installation instructions.
- B. Provide complete installation of system in accordance with Contract Documents.

END OF SECTION