

# Special Specification 6059

## Solar-Powered Marine Navigational and Aircraft Obstruction Lighting System



### 1. DESCRIPTION

- **Installation.** Furnish and install solar-powered marine navigational or aircraft obstruction lighting system.
- **Removal.** Remove existing marine navigational or aircraft obstruction lighting system.

### 2. MATERIALS

Furnish new materials in accordance with this Item and the details shown on the plans.

- 2.1. **Marine Navigation Light Fixtures.** Ensure marine navigation light fixtures meet the requirements of the United States Coast Guard (USCG) regulations. Lamps may be incandescent or Light Emitting Diode (LED). Ensure fixtures are impervious to weather and corrosion resistant. Supply polyester resin housings and polycarbonate, acrylic, or pressed glass fresnel lenses that are protected against thrown objects, bullets, etc. by means of an acrylic shield 3/16 in. thick, shaped to fit the diameter of the lens. For incandescent fixtures, equip with an automatic lamp changer with sufficient lamps to have a minimum total rating of 15,000 hr. Provide automatic cut-off for rotating lamp changers so that rotation ceases when all lamps are burned out. Lamps are to operate at 12 VDC. Ensure channel center fixture shows green through a horizontal arc of 360° and channel margin fixture shows red through a horizontal arc of 180°. Orient channel margin fixtures as shown on plans or as directed.
- 2.2. **Aircraft Obstruction Light Fixtures.** Ensure aircraft obstruction light fixtures meet the requirements of the United States Federal Aviation Administration (FAA) regulations. Lamps may be incandescent or Light Emitting Diode (LED). Ensure fixtures are impervious to weather and corrosion resistant. Supply polyester resin housings and polycarbonate, acrylic, or pressed glass fresnel lenses that are protected against thrown objects, bullets, etc. by means of an acrylic shield 3/16 in. thick, shaped to fit diameter of the lens. For incandescent fixtures, equip with an automatic lamp changer with sufficient lamps to have a minimum total rating of 15,000 hr. Provide automatic cut-off for rotating lamp changers so that rotation ceases when all lamps are burned out. Lamps are to operate at 12 VDC. Equip aircraft obstruction light fixtures with a wireless flash synchronization system. Ensure Aircraft Obstruction Lights show red through a horizontal arc of 360°.
- 2.3. **Junction Boxes.** Provide non-corroding stainless steel or cast aluminum surface-mounted weatherproof junction boxes with drilled and tapped openings and mounting lugs. Supply liquidtight strain relief connector fittings to portable cord.
- 2.4. **Conduit.** Supply corrosion resistant and liquidtight flexible conduit as shown on plans. Attach the conduit as shown on the plans or as directed.
- 2.5. **Portable Cord.** Use 3 conductor 10 AWG extra hard usage portable thermoset CPE (chlorinated polyethylene) jacketed cord that is UV resistant, oil resistant, and rated for wet locations, designated with a suffix "W" after the code type, for connecting between junction boxes and fixtures. Use vinyl self-insulated locking fork terminals to connect the cord to fixture screw terminals. Provide properly sized fork terminals to lock on the stud.
- 2.6. **Swing Arm Assembly.** Construct the swing arm assembly using hot dipped galvanized steel with a hot dipped galvanized steel retrieval chain and locking pin to hold the assembly in a vertical position. Provide a

corrosion resistant anchor and bolt assembly sized to withstand the weight and wind loading for the navigation light assembly with a safety factor of 8. Submit shop drawings and calculations for approval.

- 2.7. **Attachment Hardware.** Use stainless steel for bolts, screws, nuts and washers for attaching junction boxes, cable, conduit, fixtures, and solar panel to structures. Anchor to fender structures as directed.
- 2.8. **Photocontrol.** Equip the fixture or lighting system with a self-contained, solid state photocontrol. Mount the photocontrol in a watertight housing, which will not be affected by vibration or shock. The photocontrol will automatically turn the lights on at dusk and off at dawn.
- 2.9. **Solar Panels.** Provide solar panels to power multiple fixtures, as shown on the plans. Size panels to give reliable trouble free service. Size the system solar generator to provide an array to load ratio of 1.1 or greater. Provide a system average state of charge 90% or greater throughout the entire year. The system loss of load probability shall remain 0% throughout the entire year.
- 2.10. **Battery.** Provide 12 V, 105 amp.-hr. deep cycle marine batteries. Supply enough batteries to allow 30 days autonomy.
- 2.11. **Battery Enclosure.** Provide corrosion resistant enclosure to house the batteries. Bolt the enclosure to the bridge or support structure. Properly vent the battery enclosure. Provide for padlocking of the enclosure.
- 2.12. **Acceptance.** Provide a copy of data sheets, specifications, and operating instructions for the materials and equipment proposed. Include model numbers, warranty information, and vendor contacts for all proposed components. Submit complete wiring and control diagrams, sealed, dated, and signed by an Engineer Registered in the State of Texas. Include wire sizes, switches, relays, and controls for complete system in these diagrams.

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### 3. CONSTRUCTION

Perform work as specified in this item, in accordance with the National Electrical Code (NEC), the USCG regulations and the FAA regulations. All work is subject to inspection by the USCG and the FAA, but does not make these agencies a party to this contract.

Maintain and operate the existing marine navigation lighting or aircraft obstruction lighting systems during phased construction. Install new solar-powered lighting system, wiring, and appurtenances as shown on the plans. Unless otherwise shown on the plans, place equipment in approximately the same position as the existing equipment. Fasten junction boxes, enclosures, solar panel, and other devices securely with stainless steel anchors.

Ensure circuits are clear of faults, grounds, and open circuits. Perform the electrical changeover during daylight hours and in one day. At no time will the structure be unlit during periods of darkness. Test the installation in accordance with Item 616, "Performance Testing of Lighting Systems."

Remove the existing lighting system when the new system is operational. Return salvageable materials to the Department as directed. Accept ownership of unsalvageable materials and dispose of in accordance with federal, state, and local regulations.

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### 4. ADMINISTRATIVE PROCEDURES

Notify the USCG and the FAA of the area, location, and time when construction is being done and comply with these agencies requirements. Provide copies of all USCG and FAA notices and acknowledgements to the Engineer.

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**5. MEASUREMENT**

This Item will be measured by lump sum.

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**6. PAYMENT**

The work performed and the materials furnished in accordance with this Item and measured as provided under "Measurement", will be paid for at the unit price bid for "Solar-Powered Marine Navigational Lighting System" or "Solar-Powered Aircraft Obstruction Lighting System." This price is full compensation for furnishing and installing marine navigation and aircraft obstruction light fixtures; structural steel; swing arm assembly; mounting hardware; solar panels; batteries; battery enclosures; portable cord; junction boxes; conduit; conductors; removal of the existing system; disposal of unsalvageable material; testing; and labor, tools, equipment, and incidentals.