



## Iowa Department of Transportation

### SPECIAL PROVISIONS FOR CONTINUOUS OPERATING SINGLE HEAD SOLAR BEACON ON WARNING SIGN POST

Polk County  
HRRR-C077(165)--5R-77

Effective Date  
February 19, 2013

THE STANDARD SPECIFICATIONS, SERIES 2012, ARE AMENDED BY THE FOLLOWING MODIFICATIONS AND ADDITIONS. THESE ARE SPECIAL PROVISIONS AND THEY SHALL PREVAIL OVER THOSE PUBLISHED IN THE STANDARD SPECIFICATIONS.

#### 121005.01 DESCRIPTION.

##### A. Summary.

This work includes the supply and installation of a Continuous Operating Single Head Solar Powered Flashing Beacon on a Warning Sign Post, including providing the post. Each unit shall consist of a self-contained solar engine, LED signal module and signal housing, and mounting hardware such that the entire assembly mounts to the top of the post. The solar engine shall contain all electronics, batteries and solar panels. No additional cabinet is required. The system shall conform to all provisions of the MUTCD, Chapter 4L, Flashing Beacons.

##### B. Quality Assurance.

The product must be Federal Communication Commission (FCC) certified to comply with all of 47 Code of Federal Regulations (CFR) FCC Part 15 Subpart B Emission requirements. The system, including battery packs, solar panel, LED modules and all components, shall be guaranteed for a minimum of three years. Manufacturer must be International Organization for Standardization (ISO) 9001 certified.

#### 121005.02 MATERIALS.

##### A. Mechanical Specifications.

The solar engine shall be constructed from powder coated aluminum, and shall be no greater in size than 4.75 inches by 15 inches by 32 inches. The Solar panels shall be integrated to the solar engine. All batteries and electronics shall be mounted in the solar engine, with no external control cabinet or battery cabinet required. The solar engine shall be vented to provide cooling of the battery and electronic system. Venting shall be covered by wire mesh to prevent intrusion of insects.

1. The solar engine shall have the provision to mount an external device for remote activation. System must have capability to power such device. Solar engine must contain sufficient space to house third party device inside a sealed enclosure located inside the solar engine.

2. The overall weight of the assembly, including mounting hardware, signal housings, LED modules, and solar engine shall not exceed 75 pounds.
3. The solar engine shall have the provision to be tilted and oriented south with additional mounting hardware, or mounted completely flat to the ground such that mounting in any orientation will keep the solar engine level.

**B. Mounting.**

The entire assembly, including solar engine, signal housing and LED module, and bracket shall be provided with hardware for mounting on to the top of a post designed to meet the minimum requirements to withstand 110 mph wind loads in conformance with the requirements of the AASHTO publication, "Standard Specifications for Structural Supports of Highway Signs, Luminaries and Traffic Signals", 5th Edition 2009, including latest revisions and errata in affect at time of letting. Mounting hardware shall be standard traffic signal mounting hardware.

**C. Solar / Battery System.**

1. The solar engine shall include two 10-watt solar panels no larger than the footprint of the housing. The solar engine shall house two, field replaceable sealed lead acid batteries no greater than 24 Ah each. The solar panel and battery system shall be 12 Volt DC.
2. The solar panel shall meet the design qualification and type approval of photovoltaic modules in accordance with International Electrotechnical Commission (IEC) 61215. This specification includes radiation testing, thermal testing, and mechanical testing for environmental conditions such as UV-exposure, thermal cycling, as well as degradation of maximum power output.
3. The solar panel shall consist of no more than two solar panels, mounted to the solar engine with an aluminum flashing.
4. The batteries shall be mechanically secured into the housing. A battery bracket shall enclose each battery in a manner to restrict the thermal expansion of the battery.
5. System shall have an auxiliary 12 Volt DC power output to power third party devices such as wireless radios or sensing equipment.

**D. Signal Housing.**

The solar engine shall not overhang the signal head, so as not to restrict mounting a signal head back plate. The signal head shall be easily removable from the assembly. The bracket assembly shall be constructed such that the signal heads can be removed easily in the field without removing the solar engine. The bracket assembly shall be designed to take the torsion and bending load of the solar engine. The signal head shall not be subjected to the torsional or bending load of the solar engine.

**E. Posts.**

The post used to support the entire assembly, including solar engine, signal housing, LED module, and bracket shall be breakaway type design and meet the requirements to withstand 110 mph wind loads and be in conformance with the requirements of the AASHTO publication, "Standard Specifications for Structural Supports of Highway Signs, Luminaries and Traffic Signals", 5th Edition, including latest revisions and errata in affect at time of letting. Contractor shall submit shop drawings of post design to the Engineer for approval prior to ordering posts. Cost for preparation of shop drawings shall be considered incidental to price bid for each unit installed.

**121005.03 OPERATIONAL SPECIFICATIONS.**

- A. The system shall conform to all standards for flashing beacons as required in the accepted Manual of Uniform Traffic Control Devices and current versions.

- B. The beacon shall flash at a rate of not less than 50 or more than 60 times per minute. The illuminated period of each flash shall not be less than one-half and not more than two-thirds of the total cycle.
- C. The beacon shall have a night dimming feature.
- D. The beacon shall have a minimum operating autonomy of 30 days.
- E. The beacon shall automatically reduce light output in case of low battery situations, reducing risk that the beacons will fail entirely under conditions of poor solar insulation.

**121005.04 ACTIVATION.**

The beacon shall operate continuously when the battery is connected. The beacon shall have the option to be turned on by a third party switch or third party device with a compatible contact closure output.

**121005.05 ENVIRONMENTAL SPECIFICATIONS.**

- A. The system shall be able to withstand and operate at temperature extremes of -40°F to +122°F.
- B. The system shall be designed and constructed to withstand 110 mph wind loads in conformance with the requirements of the AASHTO publication, "Standard Specifications for Structural Supports of Highway Signs, Luminaries and Traffic Signals", 5th Edition 2009, including latest revisions and errata in affect at time of letting.
- C. The electronic circuit board housing, wire harnessing and connectors shall be designed and tested in accordance to IEC International Standard 60529, Ingress Protection IP67 requiring that the enclosure be dust tight and remain completely sealed when immersed in water to a depth of 1 meter for 1 hour.

**121005.06 ELECTRICAL STANDARDS.**

Integrated solar charger shall be approved to Underwriters Laboratories, Inc. (UL) standards.

**121005.07 METHOD OF MEASUREMENT.**

The quantity of red or yellow CONTINUOUS OPERATING, SINGLE HEAD SOLAR BEACON ON WARNING SIGN POST will be measured by each beacon assembly and post installed in accordance with the contract documents. Warning signs to be installed on post to be paid under other items.

**121005.08 BASIS OF PAYMENT.**

The Contractor will be paid the contract unit price for each red or yellow CONTINUOUS OPERATING, SINGLE HEAD SOLAR BEACON ON WARNING SIGN POST, measured as described above.