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REVISION OF SECTION 614

BLANK OUT SIGN (LED) (SPEED RADAR)

Section 614 of the Standard Specifications is hereby revised for this project to include the following:

# DESCRIPTION

This work consists of constructing a Light Emitting Diode (LED) Blank Out Sign (Double Faced) equipped with an externally mounted directional radar unit at locations as shown on the plans.

The blank out signs shall be able to alternately display two fixed sign messages from a single housing. The primary message shall be a static message illuminated when a radar indication is triggered. The primary message shall turn on and once a speed threshold is reached a secondary message shall be illuminated intermittently. The intermittent display of the secondary message shall illuminate the message for a period of two seconds on, and then one second off repeating for a set period of time, as approved. Once the set period of time has been reached the display shall return to the static primary message being illuminated for a set period of time before being turned off completely. The messages shall be as shown on the plans.

Both messages shall be able to be switched on or off. When turned on, the blank out sign shall show the appropriate message and when turned off the sign shall be completely blank. No phantom words or legends shall be seen under any ambient light conditions when turned off.

The sign shall include a lockable power shut off mounted to the sign structure within six feet of ground level.

# The contractor shall provide final message layouts to the Engineer for review and approval prior to fabrication of the blank out sign.

# MATERIALS

All materials furnished, assembled, fabricated or installed shall be new, corrosion resistant shall conform to the plans and specifications described in the Contract.

Sign dimensions and lettering dimensions shall be as shown on the Plans.

The blank out signs shall be capable of dimming during low ambient light/night conditions.

The blank out sign shall be fully functional while operating over an ambient temperature range of –30 to +165 degrees Fahrenheit including a relative humidity of 0% to 100%, condensing; and it shall be capable of withstanding wind pressures of up to 74 psf (AASHTO – 120 mph).

1. *Certifications.* Prior to start of the installation of the LED Blank Out Sign the Contractor shall provide certification from the manufacturer confirming that LEDs were tested and binned in accordance with CIE Test Method A.
2. *Submittals.* Prior to start of the installation of the LED Blank Out Sign, the Contractor shall submit the following:
3. Working drawings showing the sign housing and mounting brackets shall be submitted to CDOT for review and approval prior to fabrication. Working drawings shall be submitted in accordance with subsection 105.02.
4. Documentation and information on sign software and hardware.

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1. *Sign Housing:* All component parts shall be easily and readily accessible by a single person for inspection and maintenance. Access shall be from the front by lifting the face of the sign. The housing shall be weather tight, and compliant to the NEMA 3R Standard. The sign housing shall be capable of withstanding a wind loading of 74 psf (AASHTO – 120 mph) without permanent deformation or other damages. The performance of the sign, including the *visibility* and legibility of the display, shall not be impaired due to continuous vibration caused by wind, traffic or other factors. The housing shall be designed to accommodate mounting on the rear vertical plane and shall be structurally sufficient to be mounted to the sign support structure. The sign housing and structural components for the tilting system including bolts and welds, shall be structurally sufficient to perform under all applicable loading conditions including gravity, wind, traffic, weather, roadway deicers, maintenance, and other environmental factors.

Painted steel is not acceptable. Self-tapping screws shall not be used. The exterior front face surfaces shall be finish coated by a system that meets or exceeds the AAMA Specification No. 2605. The finish shall be matte black. The main body of the sign housing shall be constructed of aluminum (minimum thickness of 0.1 inches) with a natural mill finish. All exterior seams shall be continuously welded, except for the coated fascia material.

The glazing shall be constructed of 0.2 inch to 0.25 inch thick clear polycarbonate sheets with surfaces that resist hazing from UV light, abrasion, and graffiti.

The glazing shall be protected by a coated aluminum mask with apertures punched directly in front of each pixel.

The external front face panels shall be thermally insulated from the rest of the sign housing. The glazing, aluminum mask, and the external front face panels shall be easily replaceable from within the sign housing.

The bottom panel of the housing shall have a minimum of four drain holes, with snap-in, drain filter plug inserts. The housing shall be rated for NEMA 3R with the door fitted with a gasket to provide the necessary seal. All corners shall be welded for stability and water tightness. Silicone or other sealant will not be allowed to seal joints.

The sign housing shall come equipped with slotted aluminum extrusions mounted horizontally across the back of the sign. Each extrusion shall accept manufacturer supplied 1/2 inch stainless steel mounting hardware with bolts that slide within the extrusion for complete adjustability in the horizontal direction. This configuration shall allow the sign to be mounted to round vertical steel post members.

The angular alignment of the sign housing shall be adjustable to optimize the viewing angle.

The ventilation system shall be natural convection or forced air. The system shall be designed to adequately cool the LED pixels along with the front and rear of the display module and all other internal components

1. *Equipment:* The equipment shall be modular in design such that major portions may be readily replaced in the field. Modules of unlike functions shall be mechanically keyed to prevent insertion into the wrong socket or connector.

All modules and assemblies shall be clearly identified with name, model number, serial number and any other pertinent information required to facilitate equipment maintenance and replacement.

All external connections shall be made by means of connectors. The connectors shall be keyed to preclude improper hookups. All wires to and from the connectors shall be color-coded and/or appropriately marked.

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1. *Electronics:* All electronic *components*, except printed circuit boards, shall be commercially available, easily accessible, and replaceable e using conventional electronics repair methods.

All Printed Circuit Boards (PCBs) shall be completely conformal coated with a silicone resin conformal coat. The exception for this coating shall be the pixels on the front of the PCB of the LED motherboards and any components in sockets.

The color of the pixels shall be amber and shall be 40 candelas at 20mA. The brightness and color of each pixel shall be uniform over the entire face of the sign within the 15-degree cone of vision from 1,100 feet to 200 feet in all lighting conditions. Each pixel shall contain two strings of LEDs. The pixel strings shall be powered from a regulated DC power source and the LED current shall be maintained at 25 plus or minus three milliamperes per string to maximize life of the pixel. The failure of an LED in one string within a pixel shall not affect the operation of any other string or pixel. The LEDs shall be constructed of aluminum, indium, gallium or phosphide, or a combination thereof.

Pixel power drawn from the DC supplies shall not exceed 1.5 watts per pixel, including the driving circuitry.

A photocell shall be installed on the sign. This device shall permit automatic light intensity measurement of light conditions and adjust the brightness to synchronize with site conditions. The photocell shall be mounted in a manner to measure ambient light conditions.

Provisions shall be made to prevent perceivable brightening of the sign due to stray headlights shining upon the photo sensors at night.

The power supplies shall be paralleled in a diode or configuration such that one supply may completely fail and the sign will still be supplied with enough power to run 40 percent of all pixels.

All cables shall be securely clamped or tied in the sign housing. No adhesive attachments will be allowed.

The Contractor shall locate the nearest approved electrical power source and connect the source the blank out sign. The Contractor shall cooperate with the local electrical utility to establish a service account, as approved.

1. *Communication:* The controller software shall be capable of displaying the following types of messages:
2. Static messages capable of displaying one of two fixed messages
3. Flashing messages with the following ranges of adjustable timing:
4. Message time on from 0.5 to 60 seconds in 0.5 second increments.
5. Message time off from 0.5 to 60 seconds in 0.5 second increments.
6. Alternating messages capable with the following ranges of adjustable timing:
7. Primary message time on from 0.5 to 60 seconds in 0.5 second increments.
8. Primary message time off from 0 to 60 seconds in 0.5 second increments.
9. Alternate message time on from 0.5 to 60 seconds in 0.5 second increments.
10. Alternate message time off from 0 to 60 seconds in 0.5 second increments.

It shall also be capable of the sign showing no messages (fully blank) until a radar trigger is registered by the system.

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1. *Radar:*  The blank out sign shall be equipped with an externally mounted directional radar unit for sensing and determining the speeds of oncoming traffic only. The radar unit shall be capable of detecting speeds from 5 to 99 MPH. The radar shall be capable of detecting a vehicle from a distance of 2500 feet. The radar shall be compatible with remote programming requirements.  The radar shall operate in a Radar Trip Mode.

In the Radar Trip Mode, the blank out sign shall remain blank until a trigger is received and then display one of two messages under control of the radar: one when the radar indicates a vehicle is traveling above a configurable “trigger speed” and a second message when the radar indicates no vehicle traveling over the trigger speed.   To prevent flickering of the message if a vehicle is near the trigger speed, a message dwell time shall keep the message displayed for a configurable number of seconds after the vehicle has dropped below the trigger speed.  The dwell time shall default to two seconds.

The radar unit shall be waterproof and shall be mounted on the outside of the sign. The radar gun shall be mounted on an adjustable bracket, allowing for minor adjustment of both azimuth and elevation.

1. The Contractor shall perform these tests at a location acceptable to the Engineer or via visual documentation that is deemed satisfactory by the Engineer. The Contractor shall conduct all tests described here, which include the following:
2. *Operational Tests*: Operational tests for each blank out sign shall take place only after successful completion of the prototype tests. The following blank out sign functions shall be shown to operate properly:
3. Turning on and off in daytime mode.
4. Turning on and off in nighttime mode.
5. Demonstration of the radar trip to change from the primary message to the secondary message.
6. Demonstration of the dwell and flashing adjustments.
7. Demonstration of the dimming features for the sign.
8. *Warranty:* The contractor shall submit documentation confirming that the manufacturer will warranty the product for a minimum of one year from the date of shipment. During the warranty period, the manufacturer or his designated representative shall repair or replace, at no charge to the Department all defective components.
9. *Maintenance and Support:* The Contractor shall make arrangements with the manufacturer to have a qualified representative provide a complete training course on maintenance and operation of the system.

During the warranty period, technical support shall be available from the manufacturer via telephone within 8 hours of the time a call is made by the Department, and this support shall be available from a factory-certified personnel or factory-certified installer at no additional charge to the Department.

Two complete bound sets of operation and maintenance manuals shall be provided. The manuals shall, as a minimum, include the following:

1. Complete and accurate schematic diagrams
2. Complete installation procedures
3. Complete performance specifications (functional, electrical, mechanical and environmental) on the unit
4. Complete parts list including names of vendors for parts not identified by universal part numbers such as JEDEC, RETMA or EIA
5. Pictorial of component layout on circuit board.
6. Pin-out and pin-in of connectors.
7. Complete maintenance and troubleshooting procedures.

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1. Complete stage-by-stage explanation of circuit theory and operation.
2. In-cabinet wiring diagram of the blank out sign shall be provided in each sign enclosure.

# METHOD OF MEASUREMENT

Blank Out Sign (LED)(Speed Radar) will be measured by the actual number of signs that are furnished, installed and accepted, and will include all labor, materials and equipment necessary to complete the work, including, but not limited to the directional radar gun, sign controller, controller interface box, sign housing, electronics, communications, and standard warranty.

# BASIS OF PAYMENT

Payment will be made under:

### **Pay Item Pay Unit**

Blank Out Sign (LED) (Speed Radar) Each

All costs associated with training and the purchasing of manuals will not be measured and paid for separately, but shall be included in the work.

Electrical service connections from the power source to the appropriate terminations with the Blank Out Signs will be paid for by Force Account in accordance with subsection 109.04.

All labor and materials to manufacture and factory test a working sign prior to delivery will not be measured and paid for separately but shall be included in the work.