**REVISION OF SECTION 614**

**BLANKOUT SIGN**

**(FIBER OPTIC) (VARIABLE SPEED LIMIT)**

**Section 614 of the Standard Specifications is hereby revised for this project as follows:**

**Subsection 614.01 shall include the following:**

This work consists of the installation of Blankout Signs including the Blankout Sign, steel sign posts, footings, mounting hardware, power cable, control wiring, flexible conduit and connections to the power source to facilitate a fully functioning Blankout Sign at each location listed in the plans.

**Subsection 614.05 shall include the following:**

*(a) Blankout Sign (Fiber Optic)*

1. **General Description:** The Contractor shall furnish and install Blankout signs as indicated in the contract. Sign messages shall be as shown in the plans.

All materials furnished, assembled, fabricated or installed shall be new, corrosion resistant and in strict accordance with the details shown.

2. **Functional Characteristics:** The BOS signs shall be able to display three fixed numerical “messages” from a single housing, (three speed limits). The numerical speed sets shall be specified in the mechanical print(s), and the quantities of each set specified.

The BOS default display mode shall be the first or highest speed of the individual set (Speed A).

The second speed display shall be the intermediate speed specified in the set (Speed B).

The third speed display shall be the lowest speed specified in the set (Speed C).

A fourth mode of operation shall blank or disable the illuminated numeric display (Blank).

Upon application of power to the BOS, the default display shall activate.

The speed indications A, B, C, And Blank shall be activated by two methods, a four position Local Control selector switch or three external contact closure switch type inputs from a distance of approximately 1,700 feet of copper cable. The activation circuit design shall be robust and not be sensitive to transient or induced voltages. If desired, a 4 pole Local/Remote Control Switch may be used to provide electrical isolation of these control functions.

If the BOS design utilizes a common numeric digit, such as a “0” or “5”, in multiple speed indications, passive circuit protection shall be employed to protect other circuitry from backfeed voltages.

Feedback or indication of all speed indications, Blank and Remote Control Mode shall be

**-2-**

**REVISION OF SECTION 614**

**BLANKOUT SIGN**

**(FIBER OPTIC) (VARIABLE SPEED LIMIT)**

accomplished by providing individual 120VAC signals to the control cable. This signal shall be of sufficient ampacity to drive an electromechanical relay at a distance of 1,700 feet, 150 milliampheres, minimum. The feedback indications shall not be dependent upon Local or Remote Control Modes of operation.

An internal or external disconnect of the sign power shall be provided. If specified, a local external electrical disconnect switch for a voltage step-down transformer is acceptable.

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

The Blankout sign shall operate without any decrease in performance over an ambient temperature range of –30 to +165 degrees Fahrenheit with a relative humidity of up to 95%; and it shall be capable of withstanding wind pressures of up to 74 pounds per square foot (AASHTO – 120 mph).

3. **Physical Characteristics:** The Blankout sign shall have minimum dimensions as shown on the plans. The enclosure shall be sheet aluminum with a minimum thickness of 0.1 inch, primed with an epoxy type paint. The interior shall be painted with dull black enamel to eliminate internal reflection. All exposed metal surfaces of the sign shall be given two coats of high-grade black enamel, each of which shall be separately baked.

All visors shall be painted on the outside with two coats of high grade black enamel and on the inside with two coats of high-grade dull black paint.

The sign enclosure shall be dust and moisture proof. The enclosure and door, visor, back-plate, fittings and accessories shall be of non-corrosive, rust resistant materials capable of withstanding constant exposure to sunlight and corrosive atmospheres, and shall provide adequate strength for the purpose of which it is utilized.

Access to the interior of the housing for routine maintenance or inspection shall be by access doors mounted on the front of the sign. Each door shall open from the bottom to help prevent the elements from entering, and shall have two locking mechanisms. In addition, each door shall open and close, and be retained in the open position by rigid telescoping self-locking retention devices.

The housing shall be rated for NEMA 3 with the door internally gasketed 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. One screened vent shall be installed on either side of the Blankout sign for ventilation.

The front of the Blankout sign shall be completely finished in a black non-reflective color. To eliminate any distractions to the illuminated messages, shiny reflective or non-black areas shall not be visible from the front of the Blankout sign (including door locks).

**-3-**

**REVISION OF SECTION 614**

**BLANKOUT SIGN**

**(FIBER OPTIC) (VARIABLE SPEED LIMIT)**

Front faces of any sort (plastic, Lexan, etc.) will not be allowed.

The sign housing shall come equipped with slotted aluminum extrusions mounted horizontally across the back of the sign. Each extrusion shall accept manufacturer supplied ½ 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 vertical sign post members.

The method of attachment of the sign to the post must be closely coordinated with the Blankout sign manufacturer before either the sign or post are manufactured.

The lamp socket shall be designed so as to preclude the formation of corrosion on either the lamp or socket contacts. The lamps shall not work loose from the socket when vibrated.

The lamps for the message indication shall be designed for operation with both lamps on during bright ambient light and with one lamp on during dim/no ambient light. A photosensor shall be provided for this purpose.

Burnout protection shall be provided during the dimming mode so as not to turn off the bulb when the other one is burned out.

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.

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.

4. **Optical Characteristics:** The Blankout sign shall be the fiber optic type with fixed dot matrix indications on a flat, black, non­reflective, rectangular face. Message indications shall be formed by a group of dots to which light is transmitted from a central light source through glass fiber optic bundle for increased intensity in the forward direction.

The color of the display shall be white. The display shall be illuminated by two quartz halogen lamps (50 watts nominal) with parabolic reflectors for each individual message. Lamps shall have an average life of not less than 6000 hours at the operating voltage and shall be mounted on vibration absorbing, rubber damping platforms. The replacement of the lamps shall be possible without the use of any tools.

To reduce the number of parts, each pair of lamps shall use only one transformer to

**-4-**

**REVISION OF SECTION 614**

**BLANKOUT SIGN**

**(FIBER OPTIC) (VARIABLE SPEED LIMIT)**

step-down the voltage from the nominal 120VAC line voltage, to the 10 volts required at the lamps.

The optical fiber that carries the light shall be manufactured from high quality step index glass-on-glass. It shall possess maximum light transmission characteristics and pixel to pixel uniformity for even and intense light distribution across any message. Each individual fiber bundle to each pixel shall not be more than 0.160” in diameter. In addition, each individual fiber bundle shall be sheathed with a PVC jacket to prevent damage from handling, vibration or small radius turns. All of the fiber used in the Blankout sign must be tested and any bundles not producing optimum results shall be clearly identified. In addition each Blankout sign, there shall be six spare fiber bundles from each harness, ready for insertion in lenses, which will be stored as spares, and neatly coiled, with the output ends covered securely.

The output or display end of the fiber bundle shall have a convergence cone to focus the light into the proper emission angle. This cone shall be precisely and securely fixed by ultrasonic welding to a fiber ferrule which in turn shall be securely mounted in resin to the front of the Blankout sign to prevent dislodging from vibration.

The message indications shall be clearly visible and legible for1/8 mile distance within a 20 degree cone centered about the optical axis under normal atmospheric conditions and under any lighting conditions. Visors or hoods shall not be necessary for legibility but they shall be added to the Blankout sign along with backplates to enhance legibility.

The use of the two lamps in combination with the distribution of the fibers used to form a message will be such that the loss of one lamp will still allow a completely readable message to be seen at all times and at all light levels.

The Blankout sign shall meet all of it specified requirements when operating from 115 + 20 VAC, 60 + 3 Hz single phase. The maximum power required shall not exceed 100 Watts. Transient voltages, surges and sags normally experienced on commercial power lines, shall not affect the equipment operation. It is the Contractor’s responsibility to check the local power service to determine if any special design needed for the equipment. Any cost associated with this provision shall be included in the bid price of this item.

The equipment shall meet all the requirements in Section 2.1.4 “Power Interruption” of NEMA - Standard TS-1-1988 for Traffic Control Systems.

The equipment shall meet the requirements of the National Electrical Code. All wires shall be cut to proper length before assembly. No wire shall be double-backed to take up slack. Wire shall be neatly laced into cable with nylon lacing or plastic straps. Cables shall be secured with clamps.

**-5-**

**REVISION OF SECTION 614**

**BLANKOUT SIGN**

**(FIBER OPTIC) (VARIABLE SPEED LIMIT)**

All DC relays, solenoids and holding coils shall have diodes across the coils for transient

suppression.

The equipment shall contain readily accessible, manually resettable or replaceable circuit protection devices (such as circuit breakers or fuses) for equipment and power source protection.

The equipment shall be designed such that the failures of the equipment shall not cause the failure or permanent damage of other components in the system.

5. **Warranty:** The Blankout signs shall be warranted to be free of defects in material and workmanship for a period of one year from date of shipment from the supplier's facility. During the warranty period, the supplier shall repair with new or refurbished materials, or replace at no charge, any product containing a warranty defect provided the product is returned FOB to the supplier's factory or authorized repair site. Product repaired or replaced under warranty by the supplier shall be returned with transportation prepaid.

During the warranty period, technical support shall be available from the supplier via telephone within 4 hours of the time a call is made by a user, and this support shall be available from factory-certified personnel or factory-certified installers.

6. **Maintenance and Support:** The supplier shall maintain an adequate inventory of parts to support maintenance and repair of the Blankout signs. These parts shall be available for delivery within 30 days of placement of an acceptable order at the supplier's then current pricing and terms of sale for said parts.

The supplier shall maintain an ongoing program of technical support for the Blankout signs. This technical support shall be available via telephone, or via personnel sent to the installation site upon placement of an acceptable order at the supplier's then current pricing and terms of sale for onsite technical support services.

Installation or training support shall be provided by a factory authorized representative. All product documentation shall be written in the English language.

Five complete 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

**-6-**

**REVISION OF SECTION 614**

**BLANKOUT SIGN**

**(FIBER OPTIC) (VARIABLE SPEED LIMIT)**

(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.

(8) Complete stage-by-stage explanation of circuit theory and operation

(9) In-cabinet wiring diagram of the Blankout sign shall be provided in each sign enclosure.

**Subsection 614.09 is hereby revised to include the following:**

Work shall include all labor and materials required factory testing, furnishing, installing and field testing the equipment to verify performance satisfactorily to the Engineer. Work includes all testing, furnishing fiber optic signs, sign posts, footings, mounting hardware, communication equipment and wiring, power cable, UV-resistant cable, connections to the power source, and all labor, wiring, tools and ancillary hardware necessary to complete the item.

The Contractor shall conduct all tests described here, which include the following:

(a) Prototype Tests: The Contractor shall fabricate and assemble one of the required Blankout signs as a prototype in order that the operation, workmanship and finish of the various parts of the sign can be closely examined by the Engineer and any corrective measures that may be found necessary can be introduced prior to the start of the fabrication of the Blankout signs. At the time the prototype sign is ready for inspection, the Engineer will have an opportunity to examine the prototype sign and to view the sign in operation during the day and night. When the sign brightness is determined and all corrections, if any, and changes are completed, the prototype Blankout sign will be accepted by the Engineer as the standard of operation, workmanship and finish for all blank-out signs to be furnished under this contract. The prototype may be used as a new sign on this project with the approval of the Engineer.

The Contractor shall perform these tests at a location acceptable to the Engineer. Operational tests shall not commence prior to successful completion of the factory prototype tests.

(b) Operational Tests:

The following Blankout sign functions shall be demonstrated as a minimum:

(1) Turning on and off in daytime mode.

(2) Turning on and off in nighttime mode.

**-7-**

**REVISION OF SECTION 614**

**BLANKOUT SIGN**

**(FIBER OPTIC) (VARIABLE SPEED LIMIT)**

(3) Demonstration of the lamp failure mode for each of the two lamps in the daytime and nighttime mode.

**Subsection 614.13 is hereby revised to include the following:**

Blankout signs will be measured by the number of signs complete in place, tested, functioning and accepted; and shall include all labor and materials required to provide a fully functioning Blankout sign at the locations described herein.

**Subsection 614.14 shall include the following:**

Pay Item Pay Unit

Blankout Sign (Fiber Optic) (Variable Speed Limit) Each