

**PORTSMOUTH-KITTERY
16189B**

October 20, 2020

SPECIAL PROVISION**SECTION 677 – INTELLIGENT TRANSPORTATION SYSTEMS (ITS) EQUIPMENT****LANE USE SIGNAL****Description**

- 1.1.** This work shall consist of furnishing, installing, and testing Lane Use Signals (LUS), mounting hardware, and control equipment as shown on the Plans.
- 1.2.** The LUS control equipment is specified in this Special Provision, but shall be installed in the ITS Field Cabinet. The ITS Field cabinet is specified elsewhere in the Contract Documents and is not included in this item.
- 1.3.** The LUS shall be a dual color sign, capable of displaying a red “X”, and amber “X”, and a green “down arrow”, in eighteen (18) inch nominal character height. The LUS shall be powered by 120 VAC nominal, and the characters shall be activated by contact closure in the control equipment.
- 1.4.** The LUS shall include the sign, mounting hardware, control equipment, and all wiring, cabling, connectorizing and ancillary equipment necessary to provide a complete, operational system.
- 1.5. Manufacturer Qualifications.**
 - 1.5.1.** The LUS manufacturer for this contract shall have been in the business of manufacturing outdoor permanently mounted LUS for a minimum period of ten (10) years prior to the contract bid date.
 - 1.5.2.** The LUS manufacturer shall have in operation, as of the contract bid date, a minimum of ten (10) different project-specific LUS systems within the continental United States.

Materials

2.1 Technical Submittal. The Contractor shall provide a complete technical submittal as outlined below, and shall not proceed with manufacture, fabrication, or construction until the Owners have approved the submittals.

2.1.1 The Contractor shall provide drawings, manufacturer's specifications, and applicable catalog cuts for all materials and components for this work.

2.1.2 The Contractor shall provide documentation on the qualifications of personnel involved and responsible for the installation of the LUS.

2.2 General Standards Compliance.

2.2.1 The LUS shall be designed in accordance with the applicable portions of NEMA Standards Publication TS 4, Hardware Standards for Dynamic Message Signs (DMS), with NTCIP Requirements. Note that the LUS shall be controlled by contact closures, as described herein, and therefore shall not be required to meet the NTCIP portions of the NEMA Standards Publication TS 4.

2.2.2 The LUS shall comply with the applicable portions of the Institute of Transportation Engineers (ITE) standards for LED message panels.

2.2.3 Aluminum Welding – The LUS housing shall be fabricated, welded, and inspected in accordance with current ANSI/AWS D1.2 Structural Welding Code Aluminum including Part E Workmanship Class I Structures and NHDOT Standard Specifications for Road and Bridge Construction (NHDOT Standard Specifications), Section 716.

2.2.4 Electrical Components – High-voltage components and circuits (120 VAC and greater) shall be designed, wired, and color-coded per the National Electric Code (NEC).

2.2.5 Environmental Resistance – The LUS housing shall be designed to protect components from rain, ice, dust and corrosion in accordance with NEMA enclosure Type 3R standards, as described in NEMA Standards Publication 250, Enclosures for Electrical Equipment (1000 Volts Maximum).

2.2.6 Product Electrical Safety – All LUS and associated equipment and enclosures shall be listed by the Underwriters Laboratories (UL®) and shall bear the UL mark. The LUS shall be listed as conformant to UL 48 Standard for Electric Signs and UL 50 Enclosures for Electrical Equipment. Control equipment and enclosures shall be listed as conformant to UL 1433 Standard for Control Centers for Changing Message Type Electric Signs.

2.2.7 Radio Frequency Emissions – All equipment shall be designed in accordance with Federal Communications Commission (FCC) Part 15, Subpart B as a “Class A” digital device.

2.2.8 Structural Integrity – The LUS housing and structure shall be designed and constructed to comply with all applicable sections of the current AASHTO LRFD Specifications

for Structural Supports for Highway Signs, Luminaries and Traffic Signals (LRFD Specifications).

- 2.2.9** Material Certification – All materials and products shall be manufactured in the United States of America, and comply with applicable ASTM, AASHTO and NHDOT Standard Specifications (Sections 550 and 615). Mill test reports and certificates of compliance shall be supplied in compliance with the material specifications.
- 2.2.10** Fabricator Qualification – The Fabricator shall have ample experience and shall be qualified and certified in accordance with Section 550.3 of NHDOT Standard Specifications. Proof of qualification will be required.
- 2.2.11** Steel Welding – All steel welding shall be in accordance with the current AASHTO Specifications, AWS D1.1 and Section 550.3 of the NHDOT Standard Specifications.
- 2.2.12** Quality Management System. The LUS manufacturer shall maintain a Quality Management System (QMS) ISO-9000 or equivalent as a means of ensuring product conformance to specified requirements through quality planning. This manufacturer's QMS shall have been in place for a minimum of five (5) years prior to the bid date for this project. The scope of the QMS shall include design, manufacture, installation, maintenance, and sales of LUS.

2.3 Customer Service Department.

- 2.3.1** The LUS manufacturer shall have a customer service department that provides technical support and help desk services for the manufacturer's LUS systems. The manufacturer's customer service department shall have a technical support help desk that may be contacted via telephone, e-mail, and fax.
- 2.3.2** The LUS manufacturer shall have an on-site specialist, who is skilled in the operation of the LUS equipment locally available to maintain the system components and to respond to emergency situations within 8 hours. The LUS manufacturer shall ensure that this specialist is equipped with sufficient resources to make needed corrections of deficiencies within 24 hours of notification.

2.4 Lane Use Sign

- 2.4.1** The LUS shall be capable of displaying a red "X", an amber "X", and a green "down arrow", or be blank.
- 2.4.2** The LUS character height shall be eighteen (18) inches, nominal.
- 2.4.3** The LUS shall be specifically designed for operation on limited access highways.
- 2.4.4** The LUS front face shall provide high contrast with the displayed characters.

- 2.4.5** The LUS shall use light emitting diode (LED) technology only. The LEDs in the LUS shall be capable of having a thirty (30) degree viewing angle. The pixel pitch of the LEDs in the LUS shall not exceed 20mm. Each pixel shall contain the quantity of discrete LEDs needed to output a minimum luminous intensity of 9,200 candelas per square meter when operated within the forward current limits defined by the manufacturer.
- 2.4.6** The LEDs in the LUS shall have a lifetime in actual operation of 80,000 hours, minimum.
- 2.4.7** The LUS enclosure shall be constructed of 0.125 inch thick aluminum, minimum, and shall be NEMA 3R rated.
- 2.4.8** The front face of the LUS shall be constructed of polycarbonate, shall have a matte, non-reflective finish, and shall be UV resistant.
- 2.4.9** The LUS enclosure shall include a sun visor.
- 2.4.10** All printed circuit boards within the LUS shall be conformally coated for environmental protection.
- 2.4.11** The LUS enclosure shall include an integral photo sensor and associated electronics that automatically adjust the brightness of the LEDs based on ambient illumination levels, in a manner that compensates for the variations in the ambient illumination levels.
- 2.4.12** The LUS shall be designed for reliable 24/7/365 operation in the locations shown in the contract documents.
- 2.4.13** The LUS shall be designed to operate on 120 VAC, nominal, and shall be powered by utility power.
- 2.4.14** The LUS shall be designed to operate correctly and reliably in an ambient temperature range of -34⁰C to +74⁰C, 0-99% humidity, non-condensing.
- 2.4.15** The LUS shall be legible from a distance of 1200 feet or less.
- 2.4.16** The power required to operate the LUS shall not exceed forty (40) watts.
- 2.4.17** The LUS enclosure shall be a front access type device. The internal components of the LUS shall be accessible using simple hand tools only.

2.5 Lane Use Sign Control Equipment.

- 2.5.1** The LUS shall be controlled by an IP based wireless communications system. This system shall consist of radios, antennas, Ethernet switches, and IP-to-contact closure devices to turn the sign characters on and off. The radios, antennas, and Ethernet

switches are not included in this item. The IP-to-contact closure devices are included in this item.

- 2.5.2** The IP-to-contact closure equipment shall be furnished and installed in the ITS Field Cabinet.
- 2.5.3** The IP-to-contact closure equipment shall interface with the IP based communications system, and shall provide contact closures to the LUS to activate/deactivate the LUS red “X”, amber “X”, and green “down arrow” as required by the LUS manufacturer. All LUS control equipment shall be designed and furnished in strict compliance with the requirements of the LUS manufacturer.
- 2.5.4** The IP-to-contact closure equipment shall be designed for reliable 24/7/365 operation in the locations shown in the contract documents.
- 2.5.5** The IP-to-contact closure equipment shall be designed to operate on 120 VAC, nominal, and shall be powered by utility power.
- 2.5.6** The IP-to-contact closure equipment shall be designed to operate correctly and reliably in an ambient temperature range of -34⁰C to +74⁰C, 0-99% humidity, non-condensing.
- 2.5.7** The IP-to-contact closure equipment shall consist of either two single channel units to control the two LUS characters, or one dual channel unit.
- 2.5.8** The IP-to-contact closure equipment shall include Windows™ based software for controlling the IP-to-contact closure equipment remotely across the communications system. The Contractor shall furnish this software and have it installed on computers as directed by the Owners. The software shall be supplied with a perpetual operating license or licenses as required.

Construction Requirements

3.1. LUS Mounting

- 3.1.1.** The LUS shall be mounted on devices as shown in the Contract Documents. The LUS shall be mounted on devices including, but not limited to, bridge truss members, bridge fascia, and overhead sign structure trusses.
- 3.1.2.** The Contractor shall furnish and install all necessary mounting hardware as required in the Contract Documents.
- 3.1.3.** Mounting hardware for LUS mounted to a bridge structural element shall be non-destructive.

3.2. General Requirements

- 3.2.1. The Contractor shall provide all the materials, software, and services necessary to install the LUS and associated equipment that fully comply with the functional requirements specified herein. All LUS material, methods and workmanship shall conform to current AASHTO Specifications as well as applicable OSHA regulations.
- 3.2.2. All LUS equipment, systems and electrical installations shall comply with the requirements specified herein, local codes, utility codes, and the National Electric Code (NEC).
- 3.2.3. The LUS shall operate from a 120 VAC, 60Hz, single-phase power source, including neutral and earth ground.
- 3.2.4. The LUS power inputs shall be protected from electrical spikes and transients as follows:
 - 3.2.4.1. Sign AC Power. The AC power feed for all equipment in the sign cabinet shall be protected by a parallel-connection surge suppresser rated for a minimum surge of 40 kA. This device shall conform to the following requirements:
 - 3.2.4.1.1. Withstand a peak 80,000-ampere surge current, 40kA Line-Neutral, 40kA Line-Ground.
 - 3.2.4.1.2. Designed, manufactured, & tested consistent with: IEEE C6.41.1-2002, C62.41.2-2002, C2.45-2002, ANSI/IEEE C62.41-1991, C62.45-1992, NEMA LS-1, and NEC 285.
 - 3.2.4.1.3. Less than 0.5 nanosecond response time.
 - 3.2.4.1.4. UL listed to: UL 1449 200kA SCCR, UL 1283 4th Edition.
 - 3.2.4.2. Transient voltage surge suppressors shall protect all copper communication lines used to pass data between the LUS and the LUS control equipment.

3.3. Testing

- 3.3.1. The Contractor shall perform testing in accordance with the requirements contained in the RFP.

3.4. Training

- 3.4.1. The Contractor shall provide training for all LUS System equipment as described in the Technical Provisions and Special Provision 677 Base. Such training program shall consist of furnishing educational training in the operation and maintenance of the LUS and LUS control equipment, including hardware and software.

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3.4.2. The Contractor shall, as a minimum, establish a training session lasting four hours. The training session shall accommodate up to twelve (12) people. As a minimum, the training session shall completely cover the following topics:

3.4.2.1. Operational Overview Element - The emphasis in this portion of the training program shall be placed on familiarizing those individuals not accustomed to message sign technology with the operation and abilities of the system.

3.4.2.2. Maintenance – The emphasis in this portion of the training shall be placed on the manufacturer’s recommended maintenance procedures and preventative maintenance schedules.

3.4.2.3. Communications System - This element shall consist of training on the operation and maintenance of the communication system that links the LUS field equipment to the PTSU system, including the LUS control equipment control software. This training shall complement any other required training for ITS equipment.