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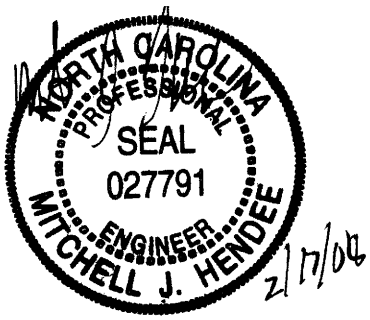


## PORTABLE TRAFFIC SIGNAL SYSTEM

DESCRIPTION:

Furnish, install, place in operation, repair, maintain, relocate, and remove portable traffic signal systems. Comply with the provisions of Section 1700 of the 2002 Standard Specifications for Roads and Structures.

MATERIALS:

Provide complete portable traffic signal system that is totally mobile and capable of being relocated as traffic conditions demand. Design the system for operation both with and without an external power source. Furnish two signal control trailers with two vehicle signal heads per trailer and one operator unit for each portable traffic signal system. Furnish transmitters, generators, batteries, controls, back-up systems and all other components necessary to operate the system.

Ensure each system meets the physical display and operational requirements of conventional traffic signals as specified in PART IV of the *Manual on Uniform Traffic Control Devices (MUTCD)* and the *North Carolina Supplement to the MUTCD* in effect on the date of advertisement.

Provide trailers that have electrostatically-applied, fused-polyester paint in highway yellow (Federal Standard Orange) with a minimum paint thickness of 2.5 mils (64 μm.).

Provide 12-inch vehicle signal heads painted yellow with 10-inch tunnel visors and Light Emitting Diode (LED) modules per Standard Specification 1098.

When provided, locate generators, fuel tanks, batteries and electronic controls in protective housings that are provided with locks to restrict access.

During manual operation, ensure the system provides a means of informing the operator of signal indications, such as a light on the back of each signal head that illuminates when the signal displays a red indication.

Design the portable traffic signal system to perform without interruption during the time it is in operation.

Where a traffic actuated system is required, provide a system control unit that is capable of pre-timed operation, traffic actuated operation, a variable green time interval dependent upon vehicle actuations, and programmable yellow change and red clearance intervals. Furnish all sensors to monitor vehicle demands for vehicle actuation per Standard Specification 1098.

Design the systems to be fail-safe. Ensure the system monitors the following conditions: lack of green, yellow, and red signal indication voltage, total loss of indication on any approach, presence of multiple signal indications on any approach, conflicting green/yellow signal indications, and low power condition. In the event any of these conditions are detected, immediately begin flashing operation of red indications in all directions.

Provide hard-wired, microwave, or radio controlled type communication for pre-timed and traffic actuated portable traffic signal systems.

Ensure systems that utilize wireless communication links continuously monitor and verify proper transmission and reception of data used to monitor and control each signal head. Ensure ambient mobile or other radio transmissions or adverse weather conditions do not affect the system. Encode signal transmissions digitally to protect radio transmissions from interference. Do not violate FCC regulations and ensure radio frequencies are appropriate for portable signal equipment applications. In the event a loss of communication is detected, immediately begin flashing operation of red indications in all directions.

Upon detecting a malfunction, ensure all signals go to a flashing red condition and the warning horn sounds. Provide a battery back-up system for generator and direct current powered signal systems to power the warning horn and "flashing red" condition. Provide a back-up system with a 72-hour minimum reserve. Ensure the horn is audible over heavy equipment noise from a distance of at least 750 feet away from the work area and can be heard by the unaided ear. Ensure the audible signal is distinct from standard warning signals used at construction sites so as to identify the source as a portable traffic signal malfunction.

Ensure the system meets the Environmental Standards for traffic signals in accordance with NEMA TS-1, Section 2.

CONSTRUCTION METHODS:

Do not install portable traffic signal within 300 feet of at-grade railroad crossing.

During automatic operation, ensure the motorist has an unobstructed view of opposing traffic.

Install stop bars, warning signs and operate portable traffic signal accordance with Roadway Standard Drawing 1101.02 sheet 1 of 7 (Temporary Lane Closures Using Portable Traffic Signals) unless otherwise shown on the plans or directed by the engineer.

Ensure the distance between signal units does not exceed 500 feet unless otherwise shown on the Traffic Control plans or directed by the Engineer. If modification to the distance between signal units is required after the units are positioned, relocate the signals or the system and make the necessary timing revisions only as directed by the Engineer.

Submit a traffic signal timing plan to the engineer for approval a minimum of two weeks prior to installation. Plan shall consist of the following: distance between stop bars, speed limit to be posted during operation, grade of each approach, recommended yellow clearance interval, recommended red change interval, recommended minimum and maximum green intervals. Make timing changes to approved signal timing plan only as authorized by the Engineer. Keep a written record of all timing changes.

The bottom of the signal head suspended over the roadway shall be a minimum of 17 feet but not more than 19 feet above the highest point of the lane directly under the signal head. The arm supporting the signal head shall be a minimum of 17 feet above the roadway at any point it extends over the roadway. The bottom of the signal head mounted on the side of the roadway shall be a minimum of 8 feet but no not more than 15 feet above the highest point of the lane directly adjacent to the signal head.

Allow only trained operators to set up and operate the system. Provide for an experienced operator at all times for each portable traffic signal system during periods of manual operation. Do not violate yellow change and red clearance intervals during periods of manual operation. During manual operation, ensure the operator has an unobstructed view of the motorists and all signal head units. Locate the operator as close to the center of the operation as possible.

Perform all maintenance operations required by the system manufacturer including periodic cleaning of the systems. Have properly skilled and trained maintenance personnel available to maintain the system in good working order and to perform all emergency and preventive maintenance as recommended by the system manufacturer.

Furnish the Engineer with the name, office telephone number, cellular (mobile) telephone number, and pager number of the supervisory employee who will be responsible for maintenance and repair of equipment during all hours.

For all failures, malfunctions, or damage to this equipment, begin necessary repairs within four hours of notification. Complete repairs within eight hours of notification. Comply with Section 150 for maintenance of traffic flow. The inability to contact the supervisory employee or prearranged alternate will not extend repair time requirements.

In the event that the system becomes inoperative be prepared at all times to revert to a flagging operations or suspend all construction activities requiring the use of the portable traffic signal system until the system is restored to proper operation. Implement flagging operation as shown on Roadway Standard Drawing No. 1101.02 Sheet 1 of 7 (Closure of one lane of a Two-lane, Two-way Highway).

When not in operation, signal heads shall be removed from the view of traffic or bag signal heads with burlap bags or bags made of non-ripping material specifically designed for covering signal heads. All inappropriate signs shall also be removed, covered, folded or turned so that they are not readable by oncoming traffic.

METHOD_OF_MEASUREMENT:

Actual number of portable traffic signal systems furnished, installed, operated, removed, and accepted.

No measurement will be made for operation, relocation, maintenance, removal of each system, or use of flaggers during repair periods as these will be considered incidental to furnishing, installing, and operating the portable traffic signal systems.

No measurement will be made for signal controller, communication cable, messenger cable, wireless communication, inductive loop sawcut, loop emulator detection system, machine vision detection system, microwave detection system, detector channel/unit, detector lead-in cable, trenching, vehicle signal heads, signal head support assemblies, signal cable, and traffic signal software as these will be considered incidental to furnishing, installing, and operating the portable traffic signal systems.

BASIS_OF_PAYMENT:

The quantity of portable traffic signal systems, measured as provided above, will be paid for at the contract unit price each as " Portable Traffic Signal System."

Payment will be made under:

Portable Traffic Signal System (actuated).....Each

Portable Traffic Signal System (pre-timed).....Each