SP-090182
(New)

Iowa Department of Transportation

SPECIAL PROVISIONS

for

TEMPORARY TRAFFIC SIGNALIZATION

Woodbury County
IM-NHS-029-6(223)143--03-97

Effective Date
February 21, 2012

THE STANDARD SPECIFICATIONS, SERIES 2009, ARE AMENDED BY THE FOLLOWING MODIFICATIONS AND ADDITIONS. THESE ARE SPECIAL PROVISIONS AND SHALL PREVAIL OVER THOSE PUBLISHED IN THE STANDARD SPECIFICATIONS

PART I - GENERAL REQUIREMENTS

This part of the Special Provisions consists of the general requirements necessary when furnishing a temporary traffic signal installation complete, in place and operative as described in the project plans and these Special Provisions.

1.01 SCOPE OF WORK.

A. The work shall consist of furnishing labor, materials and performing all work necessary to install, maintain, operate and remove (at Floyd Boulevard) temporary traffic control signals in the City of Sioux City, Iowa, as shown on the plans and as specified in these Special Provisions and contract documents, as directed by the Engineer, and in those sections of the Standard Specifications that are either directly or by reference included herewith to result in a complete and finished job.

1.02 EQUIPMENT AND MATERIALS.

A. Equipment and materials shall be of new stock unless the plans provide for the relocation or the use of fixtures furnished by others. New equipment and materials shall be the product of reputable manufacturers of electrical equipment, and shall meet the approval of the Engineer.

1.03 STANDARD SPECIFICATIONS.

A. The Standard Specifications for Highway and Bridge Construction, Series 2009, Iowa Department of Transportation, as modified by these Special Provisions or other appropriate special provisions shall apply to this project.

B. The installation of the temporary traffic signals and appurtenances shall be in conformance with the Manual on Uniform Traffic Control Devices, latest edition.

1.04 TEMPORARY TRAFFIC SIGNAL OPERATION AND MAINTENANCE.

A. At Floyd Blvd and I-29, the Contractor shall be solely responsible for the operation, maintenance and repair (if necessary) of the temporary traffic signal installation during the time period the temporary traffic signal is activated and is operating. This shall include the temporary traffic signal's controller programming and all costs to maintain, operate and repair (if necessary) the temporary traffic signal installation, with the exception of power costs. The Contractor's responsibilities to operate, maintain and repair (if necessary) the temporary traffic signals, shall cease at such time the temporary traffic signals are deactivated and removed from the intersection. After notice is given by the Engineer, the temporary traffic signal shall be deactivated by the Contractor for further use and it shall be promptly removed by the Contractor from the intersection. The equipment will remain the property of the contractor.

B. At Singing Hills and I-29, the Contractor shall be solely responsible for the operation, maintenance and repair (if necessary) of the temporary traffic signal installation during the operation and maintenance period. This shall include the temporary traffic signal's controller programming and all costs to maintain, operate and repair (if necessary) the temporary traffic signal installation, with the exception of power costs. The operation and maintenance period will begin with the initial signal activation and continue until May 30, 2013 or earlier if notified by the Iowa DOT. The installation will become the property of the Iowa DOT at the completion of the Contractor's operation and maintenance period.

C. The Contractor's traffic engineer or applicable manufacturer's representative shall be responsible for initial traffic signal controller programming and for performing turn-ons of each temporary traffic signal. The Contractor shall provide at least 5 working days notice to the Engineer that a new signal will be ready for turn-on. At initial signal turn-on, the Contractor's traffic engineer or applicable manufacturer's representative shall utilize the recommended timings as shown on the plans. The Engineer will be available at the site during the initial signal turn-on to observe traffic flow during this time.

D. After initial signal activation and turn-on and during the operation of the temporary traffic signal, if it's determined by the Engineer that subsequent signal timing modifications are necessary; the

Engineer will provide to the Contractor a signal timing report with modified signal timings. The Contractor shall program the controller to modify the existing signal timings based on this report. The Engineer will be available onsite during controller programming to observe traffic during the implementation of the new signal timings.

E. During the operation of the temporary traffic signals, any failures or malfunctions of the temporary traffic signal materials or equipment that occur, regardless of cause, shall be immediately corrected at the Contractor's expense, including all labor, materials and associated cost.

F. While the temporary traffic signals are installed, any damages to signal equipment or materials that occur regardless of cause, shall be immediately repaired, corrected, or removed and replaced with materials and equipment of like kind at the Contractor's expense, including all labor, materials and associated cost. Typical damages that might be expected include damage from storms or weather events, or impacts that might result from moving vehicles. The Engineer shall approve the repair of all damaged equipment or materials. If deemed necessary by the Engineer, damaged equipment and materials will be replaced by the Contractor with new stock. All approved repairs to damaged equipment or materials must restore the temporary traffic signal to a like new condition.

G. At all times during the operation of the temporary traffic signal, the Contractor shall be able to provide at least one qualified service technician to respond to signal complaints received from the Engineer, the City, the Iowa DOT, or emergency service providers. This shall include, but not be limited to, the following complaints: signal timing phasing and coordination, equipment or material failures or malfunctions, and equipment or material damage. Response time shall be 1 hour for complaints received between 6 AM and 7 PM on non-holiday weekdays, and 2 hours for all other times. For some cases (due to travel times or other extenuating circumstances) additional time may be acceptable within reason, but must be approved by the Engineer.

1.05 DESIGN OF TEMPORARY TRAFFIC SIGNAL POLES AND STRUCTURAL SUPPORTS AT SINGING HILLS.

A. The temporary traffic signal typical details shown in the plans were designed for a maximum span length of 100 feet for one or two spans off a signal post, with one 5-section head signal, two 3-section head signals and two signs per span. Because the actual span lengths for the temporary signals at Singing Hills and the I-29 ramps exceed 100 feet, the Contractor shall propose a modified temporary traffic signal design in which the signal poles and structural supports are designed to support the actual number of signal heads (use weight and projected areas of polycarbonate signal heads) and aluminum signs with actual span lengths. Design of poles and structural supports shall comply with AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals, 2001 and current interims. The contractor shall submit shop drawings of the proposed temporary traffic signal design for Singing Hills to the Engineer for review. The Contractor shall not order materials or equipment, nor begin construction of the temporary traffic signal until the shop drawings have been reviewed and approved by the Engineer.

1.06 METHOD OF MEASUREMENT.

A. Each Temporary Traffic Signal Installation as indicated on the plans, complete-in-place, will be measured as a unit lump sum quantity for all work necessary.

1.07 BASIS OF PAYMENT.

A. The Temporary Traffic Signal Installation(s) measured as provided above will be paid for at the contract lump sum price bid, which price shall be full compensation for furnishing all equipment, materials, labor and all other work necessary or incidental to the construction of the complete temporary traffic signal installation, and for all materials, equipment, and labor necessary to maintain, operate and remove (Floyd Blvd only) the temporary traffic signal installation.

PART II - INSTALLATION REQUIREMENTS

Section 2525 of the Standard Specifications, is hereby modified by the following Special Provisions, which consists of installation details and requirements necessary for the construction of temporary traffic signal installation(s) complete, in place and operative.

A. The temporary traffic Signal at Floyd Avenue and the I-29 ramps will be removed by the Contractor on this project, with the exception of underground conduits, which will be abandoned. All materials and equipment that are removed by the Contractor shall become the property of the Contractor and shall be hauled off the project.

B. The temporary traffic signal at Singing Hills and the I-29 ramps will remain fully operational at the completion of this project.

PART III - MATERIAL REQUIREMENTS

Section 2525 of the Standard Specifications, is hereby modified by the following Special Provisions, which consists of the material requirements necessary for the construction of temporary traffic signal installation(s) complete, in place, and operative.

3.01 GENERAL MATERIAL REQUIREMENTS.

A. Video Detection Cable.

1. The video detection cable required to power and transmit the signal from the Machine Vision Processor (MVP) to the controller cabinet shall be as recommended by the video detection equipment manufacturer and supplied by the video detection equipment supplier as part of a complete video detection system.

B. Opticom Cable.

1. Model 739 Detector Cable or equivalent for Global Traffic Technologies Opticom Priority Control Systems shall be used for Priority Detectors. Detector cable shall meet the requirements of IPCEA-S.61-402 / NEMA WC 5, Section 7.4, 600-volt control cable, 75°C, Type B. The cable shall contain three conductors, each of which shall be #20 stranded, tinned copper with 25 mil minimum average thickness low-density polyethylene insulation. Insulation shall be color-coded: 1-yellow, 1-blue, and 1-orange. The shield shall be either tinned copper braid or aluminized polyester film with a nominal 20% overlap. Where the film is used, a #20 stranded, tinned, bare drain wire shall be placed between the insulated conductors and the shield and in contact with the conductive surface of the shield. The jacket shall be black polyvinyl chloride with minimum ratings of 600 volts and 80°C and a minimum thickness of 45 mils. The jacket shall be marked as required by IPCEA / NEMA.

2. The finished outside diameter of the cable shall not exceed 0.35 inches.

3. The capacitance as measured between any conductor and the other conductors and the shield shall not exceed 48 picofarads per foot at 1,000 Hz.

PART IV - EQUIPMENT REQUIREMENTS

Section 2525 of the Standard Specifications, is hereby modified by the following Special Provisions, which consists of the equipment requirements necessary for the construction of traffic signal installation(s) complete, in place, and operative.

4.01 GENERAL EQUIPMENT REQUIREMENTS.

A. Video Detection System.

1. General.

This specification sets forth the minimum requirements for a system that monitors vehicles on a roadway via processing of video images. The detection of vehicles passing through the field-of-view of an image sensor shall be made available to a large variety of end user applications as simple contact closure outputs that reflect the current real-time detector or alarm states (on/off) or as summary traffic statistics that are reported locally or remotely. The contact closure outputs shall be provided to a traffic signal controller and comply with the National Electrical Manufacturers Association (NEMA) type C or D detector rack or 170 input file rack standards.

The system architecture shall fully support Ethernet networking of system components through a variety of industry standard and commercially available infrastructures that are used in the traffic industry. The data communications shall support direct connect, [modem,] and multi-drop interconnects. Simple, standard Ethernet wiring shall be supported to minimize overall system cost and improve reliability, utilizing existing infrastructure and ease of system installation and maintenance. Both streaming video and data communications shall optionally be interconnected over long distances through fiber optic, microwave, or other commonly used digital communications transport configurations.

On the software application side of the network, the system shall be integrated through a client-server relationship. A communications server application shall provide the data communications interface between as few as one to as many as hundreds of Machine Vision Processor (MVP) sensors and a number of client applications. The client applications shall either be hosted on the same PC as the communications server or may be distributed over a local area network of PC's using the industry standard TCP/IP network protocol. Multiple client applications shall execute simultaneously on the same host or multiple hosts, depending on the network configuration. Additionally, a web-browser interface shall allow use of industry standard Internet web browsers to connect to MVP sensors for setup, maintenance, and playing digital streaming video.

2. System Hardware.

The machine vision system hardware shall consist of three components: 1) a color, 22x zoom, MVP sensor 2) a modular cabinet interface unit 3) a communication interface panel. Additionally, a laptop computer shall host the server and client applications that are used to program and monitor the system components. The real-time performance shall be observed by viewing the video output from the sensor with overlaid flashing detectors to indicate the current detection state (on/off). The MVP sensor shall optionally store cumulative traffic statistics internally in non-volatile memory for later retrieval and analysis.

The MVP shall communicate to the modular cabinet interface unit via the communications interface panel and the software applications using the industry standard TCP/IP network protocol. The MVP shall have a built-in, Ethernet-ready, Internet Protocol (IP) address and shall be addressable with no plug in devices or converters required. The MVP shall provide standard MPEG-4 streaming digital video. Achievable frame rates shall vary from 5 to 30 frames per second as a function of video quality and available bandwidth.

The modular cabinet interface unit shall communicate directly with up to eight MVP sensors and shall comply with the form factor and electrical characteristics to plug directly into a NEMA type C or D detector rack providing up to 32 inputs and 64 outputs or a 170 input file rack providing up to 16 contact closure inputs and 24 contact closure outputs to a traffic signal controller.

The communication interface panel shall provide four sets of three electrical terminations for three-wire power cables for up to eight MVP sensors that may be mounted on a pole or mast arm with a traffic signal cabinet or junction box. The communication interface panel shall provide high-energy transient protection to electrically protect the modular cabinet interface unit and connected MVP sensors. The communications interface panel shall provide single-

point Ethernet connectivity via RJ45 connector for communication to and between the modular cabinet interface module and the MVP sensors.

A laptop is to be provided to program the detection zones based on the following specifications: Intel Core 2 Duo Processor 2.4GHz, 4GB DDR2, 320GB SATA HDD, 3 USB ports, built-in Ethernet, wireless and graphics accelerator, 15 inch LED display, DC-RW/DVD (8x min.) DC-ROM, Windows 7 Professional operating system and a 2 year parts and labor warranty.

3. System Software.

The MVP sensor embedded software shall incorporate multiple applications that perform a variety of diagnostic, installation, fault tolerant operations, data communications, digital video streaming, and vehicle detection processing. The detection shall be reliable, consistent, and perform under all weather, lighting, and traffic congestion levels. An embedded web server shall permit standard internet browsers to connect and perform basic configuration, maintenance, and video streaming services.

There shall be a suite of client applications that reside on the host client / server PC. The applications shall execute under Microsoft Windows XP or Vista. Available client applications shall include:

- Master network browser: Learn a network of connected modular cabinet interface units and MVP sensors, display basic information, and launch applications software to perform operations within that system of sensors.
- Configuration setup: Create and modify detector configurations to be executed on the MVP sensor and the modular cabinet interface unit.
- Operation log: Retrieve, display, and save field hardware run-time operation logs of special events that have occurred.
- Software install: Reconfigure one or more MVP sensors with a newer release of embedded system software.
- Streaming video player: Play and record streaming video with flashing detector overlay.
- Data retrieval: Fetch once or poll for traffic data and alarms and store on PC storage media.
- Communications server: Provide fault-tolerant, real-time TCP/IP communications to / from all devices and client applications with full logging capability for systems integration.

4. Functional Capabilities.

a. MVP Sensor.

The MVP sensor shall be an integrated imaging color CCD array with zoom lens optics, high-speed, dual-core image processing hardware bundled into a sealed enclosure. The CCD array shall be directly controlled by the dual-core processor, thus providing high-quality video for detection that has virtually no noise to degrade detection performance. It shall be possible to zoom the lens as required for setup and operation. It shall provide JPEG video compression as well as standard MPEG-4 digital streaming video with flashing detector overlay. The MVP shall provide direct real-time iris and shutter speed control. The MVP image sensor shall be equipped with an integrated 22x zoom lens that can be changed using either configuration computer software. The digital streaming video output and all data communications shall be transmitted over the three-wire power cable.

1) Power.

The MVP sensor shall operate on 110/220 VAC, 50/60Hz at a maximum of 25 watts. The camera and processor electronics shall consume a maximum of 10 watts and the remaining 15 watts shall support an enclosure heater.

2) Detection Zone Programming.

Placement of detection zones shall be by means of a PC with a Windows XP or Vista operating system, a keyboard, and a mouse. The PC monitor shall be able to show the detection zones superimposed on images of traffic scenes.

The detection zones shall be created by using a mouse to draw detection zones on the PC monitor. Using the mouse and keyboard it shall be possible to place, size, and orient detection zones to provide optimal road coverage for vehicle detection. It shall be possible to download detector configurations from the PC to the MVP sensor and cabinet interface module, to retrieve the detector configuration that is currently running in the MVP sensor, and to back up detector configurations by saving them to the PC fixed disks or other removable storage media.

The supervisor computer's mouse and keyboard shall be used to edit previously defined detector configurations to permit adjustment of the detection zone size and placement, to add detectors for additional traffic applications, or to reprogram the MVP sensor for different traffic applications or changes in installation site geometry or traffic rerouting.

3) Optimal Detection.

The video detection system shall optimally detect vehicle passage and presence when the MVP sensor is mounted 30 feet or higher above the roadway, when the image sensor is adjacent to the desired coverage area, and when the distance to the farthest detection zone locations are not greater than ten times the mounting height of the MVP. The recommended deployment geometry for optimal detection also requires that there be an unobstructed view of each traveled lane where detection is required. Although optimal detection may be obtained when the MVP is mounted directly above the traveled lanes, the MVP shall not be required to be directly over the roadway. The MVP shall be able to view either approaching or receding traffic or both in the same field of view. The preferred MVP sensor orientation shall be to view approaching traffic since there are more high contrast features on vehicles as viewed from the front rather than the rear. The MVP sensor placed at a mounting height that minimizes vehicle image occlusion shall be able to simultaneously monitor a maximum of six traffic lanes when mounted at the road-side or up to eight traffic lanes when mounted in the center with four lanes on each side.

b. Modular Cabinet Interface Unit.

The modular cabinet interface unit shall provide the hardware and software means for up to eight MVP sensors to communicate real-time detection states and alarms to a local traffic signal controller. It shall comply with the electrical and protocol specifications of the detector rack standards. The card shall have 1500 Vrms isolation between rack logic ground and street wiring. The modular cabinet interface unit shall be a simple interface card that plugs directly into a 170 input file rack or a NEMA type C or D detector rack. The modular cabinet interface unit shall occupy only two slots of the detector rack. The modular cabinet interface unit shall accept up to 16 phase inputs and shall provide up to 24 detector outputs.

c. Communications Interface Panel.

The communications interface panel shall support up to eight MVPs. The communications interface panel shall accept 110/220 VAC, 50/60 Hz power and provide predefined wire termination blocks for MVP power connections, a Broadband-over-Power-Line (BPL) transceiver to support up to 10MB/s interdevice communications, electrical surge protectors to isolate the modular cabinet interface unit and MVP sensors,

and an interface connector to cable directly to the modular cabinet interface unit.

The interface panel shall provide power for up to eight MVP sensors, taking local line voltage 110/220 VAC, 50/60 Hz and producing 110/220 VAC, 50/60 Hz, at about 30 watts to each MVP sensor. Two 1/2 amp SLO-BLO fuses shall protect the communications interface panel.

5. System Installation and Training.

The supplier of the video detection system may supervise the installation and testing of the video detection system and computer equipment as required by the contracting agency.

The supplier of the video detection system shall make training available to personnel of the contractor and contracting agency in the operation, set up, and maintenance of the video detection system. The MVP sensor and its support hardware/software is a sophisticated leading-edge technology system. Proper instruction from certified instructors is recommended to ensure that the end user has complete competency in system operation. The User's Guide is not an adequate substitute for practical classroom training and formal certification by an approved agency.

6. Warranty, Service, and Support.

For a minimum of 2 years, the supplier shall warrant the video detection system. An option for additional year(s) warranty for up to 5 years shall be available. Ongoing software support by the supplier shall include software updates of the MVP sensor, modular cabinet interface unit, and supervisor computer applications. These updates shall be provided free of charge during the warranty period. The supplier shall maintain a program for technical support and software updates following expiration of the warranty period. This program shall be available to the contracting agency in the form of a separate agreement for continuing support.

7. Guarantee.

a. The equipment furnished under this specification shall be new, of the latest model, fabricated in a first-class quality manner from good quality material.

b. The entire controller unit shall be warranted to be free from defects in work quality and materials for a minimum of one year from date of acceptance. Any parts found to be defective shall, upon concurrence of the defect by the manufacturer, be replaced free of charge.

c. The Contracting Authority shall be furnished with a certification from the equipment manufacturer stating that the equipment furnished under this specification complies with all provisions of this specification. If there are any items that do not comply with this specification, then a list of those exceptions must be detailed on the certification.

B. Emergency Vehicle Traffic Signal Priority Control System.

1. The Contractor shall install the emergency vehicle traffic signal priority control system units that will enable fire emergency responders to activate pre-emption for all intersection approaches. Contractor shall install the Global Traffic Technologies Opticom brand emergency vehicle traffic signal priority control system (Preempt System) shall be installed in all traffic signal systems. Emergency vehicle traffic signal detector systems shall consist of a receiver and associated wire components. The receivers shall be mounted at or near the intersections to be controlled.

a. Opticom Detection.

Each optical detection / discriminator assembly shall consist of one or more detectors, connecting cable and a discriminator module. Each such assembly when used with

standard emitters shall have a range of at least 1800 feet. Standard emitters for both classes of signals shall be available from the manufacturer of the system.

The emergency vehicle preemption (EVPE) detector shall be mounted on the mast arm using an astro bracket with threaded nipples and lock washers.

The EVPE detector cable shall be a Global Traffic Technologies Opticom detector cable (or approved equal).

Field terminal T-9 in the cabinet shall be fully configured for proper preemption operation.

b. Optical Detector.

Each optical detector shall be a weatherproof unit capable of being easily mounted on a mast arm. The housing shall have at least one opening threaded for 3/4 inch conduit, through which all wiring shall enter. Each detector shall weigh not more than 2 pounds and shall present a maximum wind load area of 36 square inches. Each detector shall be capable of receiving optical energy from either one of both of two axially opposed directions. The reception angle shall be a maximum of ± 6 degrees (12 degrees total included angle) measured in the horizontal plane about the center axis of the light-sensing element. The reception angle in the vertical plane measured about the center axis of the light-sensing element shall be a maximum of 4 degrees above and 8 degrees below that center axis. Measurements are to be taken with emitter assembly at near maximum range.

All internal circuitry shall be solid-state and electric power shall be provided by the respective discriminator module.

All equipment and cabling necessary for the operation of the Preempt System shall be supplied and installed by the contractor to Global Traffic Technologies specifications.

Software configuration and system testing of the Preempt System shall be completed by the City Traffic Division personnel.