SP-150118
(New)

SPECIAL PROVISIONS
FOR
TRAFFIC SIGNALIZATION

Woodbury County
IMN-029-6(268)141--0E-97

Effective Date
July 19, 2016

THE STANDARD SPECIFICATIONS, SERIES 2015, ARE AMENDED BY THE FOLLOWING MODIFICATIONS AND ADDITIONS. THESE ARE SPECIAL PROVISIONS AND THEY SHALL PREVAIL OVER THOSE PUBLISHED IN THE STANDARD SPECIFICATIONS.

150118.01 GENERAL.

A. These Special Provisions consists of the general requirements necessary when furnishing a NEMA controller system installation, video traffic detection system installation, and LED luminaire fixture, in place, and operative as described in the project plans and these specifications.

B. The Standard Specifications, as modified by these specifications, shall apply to this project. The installation of the traffic control signals and appurtenances shall be in conformance with the MUTCD, as adopted by the Department per 761 of the Iowa Administrative Code (IAC), Chapter 130.

150118.02 CONTROLLER.

The controller shall be a McCain Traffic NEMA ATC eX utilizing Omni eX local intersection control software to be compatible with City of Sergeant Bluff equipment and shall provide the following features.

A. Controller Interfaces.

1. Communication Interfaces.

- SDLC ports (two) including SP3 routed to NEMA TS 2 Port 1
- Serial (asynchronous) on front panel (three)
- Serial (asynchronous) on 2070 compatible modem slot (two)
- ENET 1: 100 Base-T Ethernet switch, one uplink, and three additional ports
- ENET 2: 100 Base-T Ethernet port dedicated for local communications (i.e. laptop or similar)
- USB ports (four)

2. Front panel interface.
- Display: 16 lines by 40 characters
- Keyboard: seven by four keypad (28 key)

3. Cabinet interfaces.
- NEMA TS 2 Type 1 Port 1 (SDLC)
- NEMA TS 2 Type 1 A connector
- NEMA TS 2 Type 2 A, B, C and D connectors

4. General Specifications.
- Style: TS 2 Type 1, TS 2 Type 2
- Dimensions: TS 2 Type 1: 7inches H by 10 inches W by 10.5 inches D
- TS 2 Type 2: 10 inches H by 10 inches W by 10.5 inches D (rounded to the nearest 0.1 inch)
- Form Factor: Shelf mount configuration
- Power: 89 VAC to 135 VAC, 60 Hz (± 3 Hz)
- Environment: Operating Temperature: -37 °C to +74°C
- Humidity: 0 to 95% (non-condensing)
- Weight: TS 2 Type 1: 7 pounds
- TS 2 Type 2: 10 pounds

B. Hardware Features.

1. Operating system.
- Linux

2. Microprocessor.
- Freescale PowerQUICC II Pro microprocessor

3. Memory.
- 16MB Flash memory
- 128MB DDR RAM (expandable)
- 2MB Non-volatile SRAM

4. Backup Real-Time Clock (RTC) Applicable standards.
- NEMA TS 2-2003 v2.06
- ATC 5.2b
- All applicable NTCIP base standards

150118.03 VIDEO DETECTION SYSTEM.

Video detection system shall be Peek Videotrak IQ to be compatible with existing City of Sergeant Bluff equipment and shall provide the following features.

A. General.

This specification sets forth the minimum requirements for a Video Imaging Vehicle Detection System (VIVDS) that monitors and provides vehicle stop bar detection at a roadway intersection via processing of video images and provides detector outputs to a traffic controller or similar device.

1. A VIVDS configuration for a single intersection will consist of sufficient cameras, the field communications link, VIVDS processor card rack or shelf mounted detector rack, and all associated equipment required to setup and operate in a field environment including a video monitor, mouse, and camera mounting hardware.

2. The system is composed of these principal items: the camera(s), the field communications link between the camera and the VIVDS processor unit, a VIVDS video processor, and a video monitor & mouse to configure the VIVDS. No additional hardware shall be needed to remotely configure and stream the video to a central control location. Software to communicate to the VIVDS processor shall also be at no additional cost. A computer shall not be required to configure the VIVDS.

3. The VIVDS processor unit(s) must be compatible with NEMA TS1, NEMA TS2 TYPE 1, TYPE 2 and Type 170/2070 equipment. The VIVDS processor shall be compatible with a NEMA detector rack, a CALTRANS file sharing detector rack, or a shelf mount unit that functions as direct replacement for the detector rack assembly.

4. Definitions.

- **a.** VIVDS Processor Unit: The electronic unit that converts the video image provided by the cameras and generates vehicle detections for defined zones.
- **b.** VIVDS Processor System: Must contain the option of 1, 2, 3, and 4 camera inputs to the VIVDS processor modular unit.
- **c.** Remote Software: Windows based software, which communicates with the VIVDS. The VIVDS operator at the central control shall have the ability to monitor the operation and modify detector placement and configuration parameters.
- **d.** Field Setup hardware: Field Setup hardware shall consist of only a mouse and monitor, which is used to configure and monitor the operation of the VIVDS processor unit, shall be supplied as part of the VIVDS.
- **e.** Field Communications Link: The communications connection between the camera and the VIVDS processor unit.
- **f.** Remote Communications Link: The communications connection between the VIVDS processor unit and the central control software.
- **g.** Camera Assembly: The complete camera or optical device assembly used to collect the visual image. The camera assembly consists of a charged coupled device (CCD), environmental enclosure, sun shield, temperature control mechanism, and all necessary mounting hardware.
- **h.** Occlusion: The phenomenon when a vehicle passes through the detection zone but the view from the sensor is obstructed by another vehicle. This type of occlusion results in the vehicle not being detected by the sensor; or when a vehicle in one lane passes through the detection zone of an adjacent lane. This type of occlusion can result in the same vehicle being counted in more than one lane.
- **i.** Detection zone: The detection zone is a line or area selected through the VIVDS processor unit, when occupied by a vehicle, sends vehicle detection to the traffic controller or freeway management system.
- **j.** Detection Accuracy: The measure of the basic operation of a detection system (shows detection when a vehicle is in the detection zone AND shows no detection when there is not a vehicle in the detection zone).
- **k.** Live Video: Video being viewed and/or processed at 30 to 60 frames per second.
- **l.** Lux: The unit of light intensity used to determine the minimum and maximum values of light in which a camera may operate.
- **m.** Video Monitor: As a minimum must be a 9 inch color monitor with suitable connectors (RCA or other as needed) for video input.

B. Functional Capabilities.

1. The system software must be able to detect either approaching or departing vehicles in multiple traffic lanes. Each zone and output must be user definable through interactive graphics by placing lines and/or boxes in an image on a video monitor.

2. Detection zones must be provided that are specific to the direction of vehicle travel. The direction to be detected by each detection zone must be user programmable. The vehicle detection zone should not activate if a vehicle traveling any direction other than the one specified for detection occupies the detection zone. Cross-street and wrong way traffic should not cause detection.

3. The VIVDS processor unit must compensate for minor camera movement without falsely detecting vehicles.

4. Once the detector configuration has been set up or uploaded into the VIVDS processor unit, the video detection system must operate without the monitoring equipment (monitor and/or mouse) connected.

5. When the monitoring equipment is directly connected to the VIVDS processor unit, it must be possible to view vehicle detections in real time as they occur on the field video monitor.

6. For systems that utilize video processor module card(s) a minimum of four detector outputs per module is required and each module card must have a minimum of 26 detection zones.

7. The VIVDS processor unit must include direct connectivity to Port 1 communication (SDLC) without any additional hardware. The processor must be capable of providing up to 64 detector outputs in a NEMA TS2 cabinet. For a NEMA TS1 cabinet the VIVDS processor must provide a minimum of four detector output through the card edge and minimum of eight detector outputs through a port via input/output cables.

8. The VIVDS processor unit must be capable of simultaneously sending outputs from all available outputs including the four card edge outputs, eight front I/O Aux. outputs, and the 64 SDLC outputs, for a total of 76 available outputs.

9. The system must make available a minimum of 26 detection zones within the combined field of view of each camera.

C. Vehicle Detection.

1. Detection Zone Placement.
The video detection system shall provide flexible detection zone placement anywhere within the combined field of view of the image sensors. Preferred presence detector configurations shall be boxes placed in the lanes, or boxes placed in-line with lanes of traffic. A single detector shall be able to replace one or more conventional detector loops. In addition, detection zones should have the capability of implementing “AND” and “OR” logical functions including presence, extension and delay timing. These logical functions may be excluded if provisions are made to bring each detector separately into the controller and the controller can provide these functions.

2. Detection Zone Programming.

a. Placement of detection zones shall be by means of a graphical interface using the video image of the roadway. The monitor shall show images of the detection zones superimposed on the video image of traffic while the VIVDS processor is running.

b. The detection zones shall be created by using only a standard USB mouse to draw detection zones on the monitor. The detection zones shall be capable of being sized, shaped and overlapped to provide optimal road coverage and detection. It shall be possible to save, upload and download the detector

configurations to and from the VIVDS processor unit and to retrieve the detector configuration that is currently running in the VIVDS processor unit.

c. A mouse must be used to edit previously defined detector configurations so as to fine-tune the detection zone placement size and shape. Once a detection configuration has been created, the system shall provide a graphic display of the new configuration on its monitor.

d. When a vehicle occupies a detection zone, the detection zone on the live video must indicate the presence of a vehicle, thereby verifying proper operation of the detection system.

e. Detection zones shall be specific to the direction of vehicle travel. The specific direction to be detected by each detection zone shall be user programmable. The vehicle detection zone shall not activate if a vehicle traveling any direction other than the one specified for detection occupies the detection zone. Cross-street and wrong way traffic shall not cause detection. Programming delay timings (controller or processors) will not be allowed to correct for cross-street or wrong way detection.

3. Design Field of View.

The video detection system shall reliably detect vehicle presence in the design field of view. The design field of view shall be defined as the sensor view when the image sensor is mounted 24 foot or higher above the roadway, when the camera is adjacent (within 15 foot) to the edge of the nearest vehicle travel lane, and when the distance to the detection area is not greater than ten times the mounting height of the image sensor. Within this design field of view, the VIVDS processor unit shall be capable of setting up a single detection zone for point detection (equivalent to the operation of a 6 foot by 6 foot inductive loop). A single camera, placed at the proper mounting height, shall be able to monitor up to and including five traffic lanes simultaneously.

4. Detection Performance.

Detection accuracy of the video detection system shall be comparable to properly operating inductive loops. Detection accuracy shall include the presence of any vehicle in the defined detection zone regardless of the lane, which the vehicle is occupying. Occlusion produced by vehicles in the same or adjacent lanes shall not be considered a failure of the VIVDS processor unit, but a limitation of the camera placement. A minimum of 95% detection accuracy shall be enforced for the entire design field of view on a lane by lane and on a time period basis. False detections shall not exceed 20 in an hour per approach. Missed or dropped calls not to exceed five in a 1 hour period per approach.

5. Equipment Failure.

Equipment failure of either the camera or VIVDS processor unit shall result in constant vehicle detection on all affected detection zones.

D. VIVDS Processor Unit.

1. Cabinet Mounting.

The VIVDS processor unit must be mountable in a NEMA TS2 detector rack or be a shelf mounted unit not to exceed 14 inch by 12 inch by 5.5 inch (W X D X H).

2. VIVDS Processor Unit - Environmental Requirements.

The VIVDS processor unit shall be designed to operate reliably in the adverse environment found in the typical roadside traffic cabinet. It shall meet the environmental requirements set forth by the latest National Electrical Manufacturers Association (NEMA) TS1 and TS2 standards as well as the environmental requirements for Type 170 and 2070 controllers. Operating temperature shall be from -30°F to +165°F at 0% to 95% relative humidity, non-condensing.

3. VIVDS Processor Unit - Electrical.

a. The VIVDS shall have a modular electrical design.

b. VIVDS processor units that utilize the detector rack must operate at 12V or 24V DC. Shelf mounted units must operate within a range of 89V to 135V AC, 60 Hz single phase. Power to the VIVDS must be from the transient protected side of the AC power distribution system in the traffic control cabinet in which the VIVDS is installed.

c. Field setup shall be through a USB mouse or Ethernet port. This port shall be able to download the real-time detection information needed to show detector actuations using remote windows software.

d. BNC connectors on the front of the VIVDS processor unit shall be used for all video inputs.

e. Video outputs from the processor units shall be capable of connecting to a traffic monitor using RCA, BNC type inputs and/or RJ45 Ethernet port on the front of the processor unit. Any other video formats used must have prior approval by City Operations Engineer.

f. Any deviation to hardware, software or accompanying elements without prior testing and approval from City, shall be grounds for automatic removal from the Cities Qualified Product List (QPL) for an undetermined time.

g. The VIVDS processor unit software shall include diagnostic software to allow testing the VIVDS functions. This shall include the capability to display camera video LED video status on the front faceplate of the VIVDS to enable setup and troubleshooting in the field. In addition, detector inputs/outputs LEDs shall be available on the Video Monitor using the user interface screen.

E. Camera Assembly.

1. The cameras must be approved for use with the VIVDS processor unit by the supplier of the VIVDS. As a minimum, each camera shall provide the following capabilities:

a. Images must be produced in color with a Charge Coupled Device (CCD) and a minimum of 380,000 pixels.

b. The camera shall have a minimum 18X optical zoom capability with auto focus.

c. The camera's zoom and focus control shall be adjusted by commands from the user interface. Third party hardware and opening of the camera housing to adjust zoom and focus will not be permitted without prior approval from the city engineer.

d. The camera shall include an electronic shutter or auto-iris control based upon average scene luminance and shall be equipped with an electronic shutter or auto-iris lens with variable focal length and variable focus that can be adjusted without opening up the camera housing to suit the site geometry. The variable focal length shall be adjustable from 4.0 mm to 73 mm (telephoto).

2. The camera and lens assembly shall be housed in an environmental enclosure that provides the following capabilities:

a. The enclosure shall be waterproof and dust-tight to the latest NEMA-4 specifications.

b. The enclosure shall allow the camera to operate satisfactorily over an ambient temperature range from -35°F to +165°F while exposed to precipitation as well as direct sunlight.

c. The enclosure shall allow the camera horizon to be rotated in the field during installation.

d. The enclosure must include a provision at the rear of the enclosure for a signal connection for both power and video signal fabricated at the factory. Input power to the environmental enclosure must be nominally 115V AC 60 Hz.

e. A thermostatically controlled heater must be provided to prevent the formation of ice and condensation, as well as to assure proper operation of the lens's iris

mechanism. The heater must not interfere with the operation of the camera electronics, and it must not cause interference with the video signal.

f. The enclosure must be light colored or unfinished and must include a sun shield to minimize solar heating. The sunshield must protrude beyond the edges of the environmental enclosure and must include provision to divert water flow to the sides of the sunshield. The amount of overhang of the sun shield must be adjustable to block the view of the horizon to prevent direct sunlight from entering the lens.

g. The underside of the sunshield nearest the camera lens must be coated in black, to reduce glare from entering the camera lens

h. The total weight of the camera in the environmental enclosure with sunshield shall be less than 6 pounds.

i. When operating in the environmental enclosure with power and video signal cables connected, the image sensor shall meet FCC class B requirements for electromagnetic interference emissions.

3. The video output of the cameras shall be isolated from earth ground. All video connections for the cameras to the video interface panel shall also be isolated from earth ground.

4. Connections for both video and power shall be made to the camera using waterproof, quick disconnect connectors. Pigtails from the camera to a waterproof junction box (NEMA 4) or an approved waterproof connector shall be allowed for splicing. The pigtails shall not be longer than 10 foot unless splicing in call for inside the hand hole of the traffic pole.

5. A camera interface panel capable of being mounted to sidewalls of a controller cabinet shall be provided for protection of the VIVDS processor unit, camera video and power inputs/outputs. For cameras powered by utilizing 120V AC, the panel shall consist of a power terminal strip with a minimum of eight (8) 8/32 binder head screws for the cameras. The panel shall also have, as a minimum, four (4) coax surge protectors (EDCO CX06 or equivalent). Additional lightning and transient protection will be allowed.

6. The connection between the camera and the VIVDS processor unit shall be coaxial cable. The coaxial cable used shall be a low loss, 75 ohm, precision video cable suited for outdoor installation, such as Belden 8281 or equivalent.

7. Camera mounting hardware shall allow for vertical or horizontal mounting to the camera enclosure. Pelco AS-0166-4-62 or equivalent is acceptable.

8. Zoom and focus control will be made using only the VIVDS user interface and a USB mouse. External devices for zoom and focus control of each camera will not be allowed without prior approval from the Engineer.

F. Field Communications Link.

1. The field communications link shall be a one-way communications connection from the camera to the equipment cabinet. The primary communications link media must be coaxial cable accompanied by a three conductor minimum No. 18 AWG, 24V DC or 115V AC camera power cable.

2. The following requirements shall govern for the various types of field communications link media described on the plans:

a. Coaxial Cable - shall be of the Belden 8281 or Siamese type with a nominal impedance of 75 ohms. All cable shall have a polyethylene dielectric with copper

double braid shield having a minimum of 95% shield coverage and not greater than 0.90 dB attenuation per 100 foot at 10 MHz with a minimum No. 18 AWG external three conductor power cable or approved equivalent as directed by the engineer.

b. If approved by the city engineer, twisted wire pairs – Shall be Belden 9556 or equivalent No. 18 AWG TWP control cable.

3. All connection cables shall be permitted to have only one splice between the camera and the cabinet.

4. Lightning and transient surge suppression devices shall be installed on the processor side of the field communications link to protect the peripheral devices. The suppression devices shall be all solid state. The devices shall present high impedance to, and shall not interfere with, the communications lines during normal operation. The suppression devices shall not allow the peak voltage on any line to exceed 300% of the normal operating peak voltage at any time. The response time of the devices shall not exceed 5 nanoseconds.

G. VIVDS Set-up System.

1. The minimum VIVDS set-up system, as needed for detector setup and viewing of vehicle detections, shall consist of a video monitor, a USB mouse, and interface software built-in to the VIVDS processor unit. Live video (5 - 30 FPS) shall be available on the field monitor to determine proper operation of detectors.

2. The remote windows software shall include all necessary cabling to interface with the VIVDS processor unit. This software shall provide an easy to use graphical user interface to fully support both remote viewing and configuration setup of the VIVDS.

3. Live video with the detection overlaid is required for field verification of the system.

H. Central Control Software.

If required, the central control software shall transmit and receive all information needed for detector setup, monitor the vehicle detection, view the vehicle traffic flow at a rate of 2 FPS or greater for telephone, or 5 FPS or greater for ISDN lines and interrogate all required stored data. The remote communications link between the VIVDS processor unit and central control may be dial-up (telephone or ISDN lines) or dedicated twisted wire pair communications cable which may be accompanied with coaxial cable or fiber-optic cable. Communications with the central control shall not interfere with the on-street detection of the VIVDS processor. Quality of the video at 2 FPS rate must be such that the view with the traffic flow is clear and in focus.

I. Installation and Training.

1. The supplier of the video detection system shall supervise the installation and testing of the VIVDS equipment. A factory certified representative from the supplier shall be on-site during initial startup of the VIVDS system.

2. If requested, up to 2 days of training shall be provided to personnel in the operation, setup and maintenance of the video detection system. Instruction and materials shall be provided for a maximum of 12 persons and shall be conducted at a location selected by the City. The City shall be responsible for the cost of training beyond the initial training.

3. Instruction personnel are required to be certified by the equipment manufacturer. The User's Guide is not an adequate substitute for practical, classroom training and formal certification by an approved agency.

4. Formal levels of factory authorized training are required for installers, contractors and system operators. All training must be certified by the manufacturer.

5. An Operators Manual (in electronic form) shall be made available to the City and the City will be responsible for the cost of all paper copies of the Operators Manual.

J. Warranty, Maintenance and Support.

1. The video detection system shall be warranted to be free of defects in material and workmanship for a period of 2 years 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 repair or replaced under warranty by the supplier will be returned with transportation prepaid. This warranty does not apply to products damaged by accident, improper operation, abused, serviced by unauthorized personnel or unauthorized modification.

2. During the warranty period, technical support shall be available from the supplier via telephone within 24 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.

3. Ongoing software support by the supplier shall include updates of the VIVDS processor unit firmware and all remote windows software. These updates shall be provided free of charge during the warranty period. The update of the VIVDS software shall be tested and approved by City before installation.

4. The supplier shall maintain a program for technical support and software updates following expiration of the warranty period. This program shall be made available to City in the form of a separate agreement for continuing support.

5. The supplier shall maintain an adequate inventory of parts to support maintenance and repair of the camera system.

150118.04 LED LUMINAIRE FIXTURE.

The Contractor shall be responsible for supplying and installing Light Emitting Diode (LED) luminaires as described by the contract documents. LED Luminaires shall be Cooper Lighting (NVN NAVION 'NAV-AE-04-D-UNV-T2R-700'), American Electric Lighting (Autobahn 'ATB2 60BLEDE70 MVOLT R2 DM'), or Phillips Lumec (Roadfocus 'RFL 145W64LED4K-T-R2M-UNIV'). No substititues will be allowed. The previously listed model numbers are to be modified as necessary to provide 10 year performance warranties and to provide a LED luminaire output equivalent to 250 Watt HPS for the Iowa DOT roadside pole mounted luminaires and a LED luminaire output equivalent to 150 Watt HPS for the 35 foot mounting height luminaires mounted onto the traffic signal pole assemblies. All luminaires shall have a Type II-Med full cutoff distribution and be rated for connected for operation at 240 volts.