**REVISION OF SECTION 614**

**VEHICLE DETECTION SYSTEM (SINGLE CAMERA)**

**Subsection 614 of the Standard Specifications is hereby revised for this project to include the following:**

**Subsection 614.01 is hereby revised to include the following:**

This specification sets forth the minimum requirements for a system that detects vehicles on a roadway using only video images of vehicle traffic.

**Subsection 614.02 is hereby revised to include the following:**

**Vehicle Detection System (Single Camera)**

#### *(a) System Hardware:* The Intersection Detection System (Camera) shall consist of one video camera, a video detection processor (VDP) which mounts in a standard detector rack, and a detector rack mounted extension module (EM). Each System shall be installed as shown on the plans.

#### *(b) System Software:* The system shall include software that detects vehicles in multiple lanes using only the video image. Detection zones shall be defined using only a video menu and a pointing device to place the zones on a video image. Up to 24 detection zones per camera shall be available.

*(c) Functional Capabilities:* The VDP shall process video from one source. The source can be a video camera or video tape player. The video shall be input to the VDP in RS170 format and shall be digitized and analyzed in real time.

The VDP shall detect the presence of vehicles in up to 24 detection zones per camera. A detection zone shall be approximately the width and length of one car.

Detector zones shall be programmed via a menu displayed on a video monitor and a pointing device connected to the VDP. The menu shall facilitate placement of the detection zones. A separate computer will not be required for programming detection zones.

The VDP shall store up to three different detector zone patterns. The VDP shall be able to switch to any one of the three different detector patterns within one second of user request via menu selection with the pointing device.

The VDP shall detect vehicles in real time as they travel across each detector zone.

The VDP shall have an RS232 port for communications with an external computer.

The VDP shall accept new detector patterns from an external computer through the RS-232 port.

The VDP shall send its detector patterns to an external computer through the RS-232 port when requested.

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The extension module (EM) shall be available to avoid the need to rewire the detector rack, by enabling the user to plug an extension module into the appropriate slot in the detector rack. The extension module shall be connected to the VDP by a 10-wire cable with modular connectors, and shall output contact closures in accordance with user selectable channel assignments.

*(e) Vehicle Detection:* A minimum of 24 detection zones shall be supported and each detection zone can be sized to suit the site and the desired vehicle detection region.

A single detection zone shall be capable of replacing multiple loops. The detection zones shall be capable of being ANDed or ORed together to indicate vehicle presence on a single phase of traffic movement.

Placement of detection zones shall be done by using only a pointing device and a graphical interface built into the VDP to draw the detection zones on the video image from each video camera.

Up to three detection zone patterns shall be saved within the VDP memory and this memory shall prevent loss during power outages.

The selection of the detection zone pattern for current use shall be done through a menu. It shall be possible to activate a detection zone pattern for a camera from VDP memory and have that detection zone pattern displayed within one second of activation.

When a vehicle is detected crossing a detection zone, the detection zone will flash a symbol on the screen to confirm the detection of the vehicle.

Detection shall be at least 98% accurate in good weather conditions and at least 96% accurate under adverse weather conditions (rain, snow, or fog). Detection accuracy is dependent upon: site geometry, camera placement, camera quality and detection zone location, and these accuracy levels do not include allowances for occlusion or poor video due to camera location or quality.

Detector placement shall not be more distant from the camera than a distance of ten times the mounting height of the camera.

The VDP shall provide up to eight channels of vehicle presence detection through a standard detector rack edge connector and one or more extension modules.

The VDP shall provide Dynamic Zone Reconfiguration (DZR) to enable normal detector operation of existing zones except the one being added or modified during the setup process. The VDP shall output a constant call on any detection channel corresponding to a zone being modified.

*(f) VDP and EM Hardware:* The VDP and extension module shall be specifically designed to mount in a standard detector rack, using the edge connector to obtain power and provide contact closure outputs. No adapters shall be required to mount the VDP in a standard detector rack. No detector rack rewiring shall be required.

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The VDP and extension module shall operate satisfactorily in a temperature range from -34C to +60C and a humidity range from 0%RH to 95%RH, non-condensing.

The VDP and extension module shall be powered by 24 volts dc.

VDP power consumption shall not exceed 450 milliamps. The EM power consumption shall not exceed 100 milliamps.

The VDP shall include an RS232 port for serial communications with a remote computer. This port shall be a "D" subminiature connector on the front of the VDP.

The VDP shall utilize flash memory technology to enable the loading of modified or enhanced software through the RS232 port and without modifying the VDP hardware.

The VDP and extension module shall include detector output pin out compatibility with industry standard detector racks.

The front of the VDP shall include detection indications for each channel of detection that display detector outputs in real time when the system is operational.

The front of the VDP shall include one BNC video input connection suitable for RS170 video inputs. The video input shall include a switch selectable 75 ohm or high impedance termination to allow camera video to be routed to other devices, as well as input to the VDP for vehicle detection.

The front of the VDP shall include one BNC video output providing real time video output which can be routed to other devices.

*(g) Camera:* The video camera used for traffic detection shall be furnished by the VDP supplier and shall be qualified by the supplier to ensure proper video detection system operation.

The camera shall produce a useable video image of the bodies of vehicles under all roadway lighting conditions, regardless of time of day. The minimum range of scene luminance over which the camera shall produce a useable video image shall be the minimum range from night time to day time, but not less than the range 0.5 lux to 10,000 lux.

The camera shall use a CCD sensing element and shall output monochrome video with resolution of not less than 350 lines vertical and 380 lines horizontal.

The camera shall include auto-iris control or automatic electronic shutter control based upon average scene luminance.

The camera shall include a variable focal length lens with variable focus and zoom that can be adjusted, without opening up the camera housing, to suit the site geometry.

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The camera electronics shall include AGC to produce a satisfactory image at night.

The camera shall be housed in an environmentally sealed enclosure.

The camera enclosure shall be equipped with a sun shield that prevents sunlight from directly entering the lens. The sunshield shall include a provision for water diversion to prevent water from flowing in the camera’s field of view. The camera enclosure with sunshield shall be less than 6" diameter, less than 26" long, and shall weigh less than 12 pounds when the camera and lens are mounted inside the enclosure.

The camera enclosure shall include a thermostatically controlled heater to assure proper operation of the lens iris at low temperatures and prevent moisture condensation on the optical faceplate of the enclosure.

When mounted outdoors in the enclosure, the camera shall operate satisfactorily in a temperature range from –34o to +60oC and a humidity range from 0% RH to 100% RH.

The camera shall be powered by 120 VAC 60 Hz. Power consumption shall be less than 40 watts under all conditions.

Recommended camera placement should be 33 feet (or 10 meters) above the roadway, and over the traveled way on which vehicles are to be detected. The camera shall view approaching vehicles at a maximum distance of 350 feet for reliable detection.

The camera enclosure shall be equipped with separate, weather-tight connections for power and video cables at the rear of the enclosure to allow diagnostic testing and viewing of video at the camera while the camera is installed on a mast arm or pole. . Video and power shall not be connected with the same connector.

The video signal output by the camera shall be in RS170 format.

The video signal shall be fully isolated from the camera enclosure and power cabling.

*(h) Installation:* Coaxial cable for transmission of video signals shall be Belden #8281 or equivalent. This cable shall be suitable for installation in conduit or overhead with appropriate span wire. BNC plug connectors should be used at both the Camera and Cabinet ends. The coaxial cable, BNC connector and crimping tool shall be approved by the supplier of the video detection system and the manufacturer's instructions must be followed to ensure proper connection.

The power cabling shall be 16 AWG three conductor cables. The cabling shall comply with the National Electric Code, as well as local electrical codes.

The video detection system shall be installed as recommended by the supplier and as documented in installation materials provided by the supplier.

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##### *(i) Warranty:* The Contractor shall ensure that the video detection system shall have a warranty with the following minimum requirements:

(1) The video detection system shall be warranted to be free of defects in material and workmanship for a period of two 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. Products repaired or replaced under warranty by the supplier shall be returned with transportation prepaid. This warranty does not apply to products damaged by accident, misuse, abuse, improper operation, service by unauthorized personnel, or unauthorized modification.

(2) 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.

(3) During the warranty period, updates to VDP software shall be available from the supplier without charge.

*(j) Maintenance and Support:* The Contractor shall be required to purchase the video detection system from a supplier that will maintain an adequate inventory of parts to support maintenance and repair of the video detection system. In addition, these parts shall be available for delivery within 30 days of placement of an acceptable order.

All product documentation shall be written in the English language.

**Subsection 614.13 of the Standard Specifications shall include the following:**

Vehicle Detection System (Single Camera) will be measured as each and shall include the camera, cables, connections, intersection control cards, and software, mounting hardware, and all other material or work necessary to complete the intersection system.

**Subsection 614.14 of the Standard Specifications shall include the following:**

Pay Item Pay Unit

Vehicle Detection System (Single Camera) Each

Costs associated with obtaining the warranty will not be measured and paid for separately, but shall be include in the work.