MICHIGAN
DEPARTMENT OF TRANSPORTATION

SPECIAL PROVISION
FOR
VIDEO TRAFFIC DETECTION SYSTEM (MINI)

a. Description. This work consists of installing or removing a single integrated video detection system and/or camera (mini) which detects vehicles on one roadway approach at an intersection using only video images of vehicle traffic and is compatible with solid state pretimed or actuated traffic signal control equipment and cabinet environments.

b. Material. Provide materials in accordance with sections 918 and 921 of the Standard Specifications of Construction and this special provision.

1. System Requirements.

A. System Hardware. Provide a video detection system that consists of a single integrated camera with a video detection processor (VDP) and a cabinet Interface Communications Controller (ICC) which mounts in a standard detector rack or as stand-alone shelf mount unit, and a pointing device.

B. System Software. Provide a system that includes software, which detects vehicles in multiple lanes (one or two traffic lanes) using only the video image. Ensure the detection zones are defined using only a video menu and a pointing device to place the zones on a video image. Ensure up to eight detection zones, per system, are available. Ensure a separate computer is not required to program the detection zones.

2. Functional Capabilities.

A. Provide a VDP that processes video from the integrated camera. Ensure the video is input to the VDP in *National Transmission Standards Committee (NTSC)* composite video format and is digitized and analyzed in real time.

B. Provide a VDP that detects the presence of vehicles in up to eight detection zones per system. Ensure the detection zone is approximately the width and length of one car.

C. Ensure the detection zones are capable of being programmed via a menu displayed on a video monitor with a pointing device connected to the ICC. Provide a menu that facilitates detection zone placement, setting of zone parameters or view system parameters. Ensure a separate computer is not required for programming detection zones or to view system operation.

D. Provide a VDP that stores up to three different detector zone patterns. Ensure the VDP can switch to any of the three different detector patterns within 1 second of user request via menu selection with the pointing device. Ensure that each configuration has the capability of being uniquely labeled for identification and the current configuration

identifier is displayed on the monitor.

E. Provide an ICC that has a recommended standard (RS)-232 port for programming the system for diagnostic and remote management applications with an external computer.

F. Provide a VDP that detects vehicles in real time as they travel across each detector zone.

G. Provide a VDP that accepts new detector patterns from an external computer through the RS-232 port when that computer uses the correct communication protocol for downloading detector patterns. Equip the system with a “Windows” based software designed for local or remote connection, provide video capture, and has a real-time detection indication and detection zone modification capability.

H. Provide a VDP that sends its detection patterns to an external computer through the RS-232 port on the ICC upon request when the external computer uses the appropriate communications protocol for uploading detector patterns.

I. Provide a VDP that is able to transmit the composite video signal, with minimal signal degradation, up to 1,000 feet under ideal conditions.

J. Provide VDP and ICC communications that are accommodated by methods using differential signals to reject electrically coupled noise.

K. In the event of loss of video signal, ensure the associated VDP defaults to a safe condition, such as a constant call on each active detection channel.

L. Provide a system that is capable of automatically detecting a low-visibility condition, such as fog, and respond by placing all defined detection zones in a constant call mode. Provide a system that automatically reverts to normal detection mode when the low-visibility condition no longer exists.

M. Ensure a shelf mount version of the ICC is available to avoid the need of rewiring the detector rack for high voltage input, by enabling the user to plug power into the front of the module from a standard plug arrangement. Ensure the shelf mount ICC module’s output is connected to the cabinet circuitry with an 8-wire cable.

3. Vehicle Detection.

A. Ensure that up to eight detection zones are supported and each detection zone has the capability of being sized to suit the site and desired vehicle detection region.

B. Ensure that a single detection zone has the capability to replace multiple inductive loops and the detection zones may be OR’ed as the default or may be AND’ed together to indicate vehicle presence on a single phase of traffic movement.

C. Ensure the placement of detection zones are done using a pointing device, with a graphical interface built into the VDP and displayed on a video monitor, to draw the detection zones on the video image from the video camera. Ensure the detection zones have the capability of being drawn on live video from the video camera.

D. Ensure a minimum of three detection zone patterns are saved within the VDP memory. Ensure the VDP's memory is non-volatile to prevent data loss during power outages. Ensure the VDP continues to operate (e.g. detect vehicles) using the existing zone configurations even when the operator is defining/modifying a zone pattern. Ensure the new zone configuration does not go into effect until the configuration is saved by the operator.

E. Ensure the selection of the detection zone pattern for current use has the capability of being done through a local menu selection or remote computer via the RS-232 port on the ICC. Ensure it is possible to activate a detection zone pattern from VDP memory and has that detection zone pattern available within 1 second of activation.

F. Provide a VDP with two channels of vehicle presence detection per system through a standard detector rack edge connector or cable interface from the shelf mounted version of the ICC.

G. Provide up to eight detection zones that are capable to count the number of vehicles detected. Ensure the count value is internally stored for later retrieval through the RS-232 port on the ICC. Ensure the data collection interval is user definable in periods of 10 or 20 seconds or 1, 5, 15, 30 or 60 minutes.

H. When a vehicle is detected crossing a detection zone, ensure the detection zone is activated on the video overlay display to confirm vehicle detection.

I. Ensure that detection is at least 98 percent accurate in good weather conditions, and at least 96 percent accurate under adverse weather conditions (i.e., rain, snow, or fog), with optimal installation camera placement.

J. Provide a VDP with dynamic zone reconfiguration (DZR) to enable normal detector operation of existing zones (except the one being added or modified) during the setup process. Provide a VDP that outputs a constant call on any detection channel corresponding to the zone being modified.

K. Provide a VDP with two channels of vehicle presence detection per system through a standard detector rack edge connector or cable interface from the shelf mounted version of ICC.

4. ICC Module.

A. Provide an ICC that mounts in a standard *NEMA TS 1, TS 2, 2070 Advance Transportation Controller (ATC),* 170 type detector rack using the edge connector or AC power input on front to obtain power and provide contact closure outputs. Ensure that rewiring the detector rack is not required.

B. Provide an ICC that operates satisfactorily in a temperature range from -35 degrees Fahrenheit (F) to 165 degrees F (-37 degrees Celsius (C) to 74 degrees C) and a humidity range from 0 percent relative humidity (RH) to 95 percent RH, non-condensing as set forth in *NEMA* specifications.

C. Provide an ICC that is powered by 100 to 240 volts (V) 50 or 60 hertz (Hz). Ensure

these modules automatically compensate for the different input voltages/frequencies.

D. Ensure the system power consumption does not exceed 25 watts within the specified input voltage range.

E. Provide a VDP that utilizes non-volatile flash memory technology to enable loading modified or enhanced software through the RS-232 port on the ICC without modifying the VDP hardware.

F. Provide an ICC that includes detector output pin-out compatibility with industry standard detector racks.

G. Ensure the front of the ICC includes detection indications, such as light emitting diodes (LEDs), for each channel of detection which display detector outputs in real time when the system is operational.

H. Ensure the front of the ICC includes one Baynet Neil Concelman (BNC) video output providing real time video output that can be routed to other devices. A Radio Corporation of America (RCA) type connector/jack for video output is not acceptable.

I. Ensure the front panel of the ICC has a detector test switch which allows the user to place calls on each channel. Ensure the test switch has the capability to place either a constant call or a momentary call depending on the position of the switch.

J. Ensure the VDP enclosure is bonded to a good earth ground.

5. Video Detection Processor Module (Camera).

A. Ensure the video cameras used for traffic detection are furnished by the VDP supplier and are qualified by the supplier to ensure proper video detection system operation.

B. Provide a camera that produces a useable video image of the bodies of vehicles under all roadway lighting conditions, regardless of time of day. Ensure the minimum range of scene luminance over which the camera produces a useable video image is in the minimum range from night time to day time, but not less than the range 1.0 lux to 10,000 lux.

C. Ensure the imager luminance signal to noise ratio (S/N) is no more than 50 decibel (dB).

D. Ensure the camera electronics includes automatic gain control (AGC) to produce a satisfactory image at night.

E. Provide a camera that is housed in a weather tight sealed enclosure. Provide an enclosure that is made of 6061 anodized aluminum or approved equal. Ensure the housing has the capability of being rotated in the field to allow proper alignment between the camera and the traveled road surface.

F. Provide a camera enclosure that is equipped with a sun shield. Ensure the sun shield includes a provision for water diversion to prevent water from flowing in the

camera's field of view. Provide a camera enclosure with sun shield that is less than 5 inches in diameter, less than 18 inches long, and weighs less than 5 pounds when the camera and lens are mounted inside the enclosure.

G. Provide a camera enclosure that includes a proportionally controlled heater, where the output power of the heater varies with temperature, to assure proper operation of the lens iris functions at low temperatures and prevent moisture condensation on the optical faceplate of the enclosure.

H. When mounted outdoors in the enclosure, ensure the camera operates satisfactorily in a temperature range from -31 degrees F to 140 degrees F (-35 degrees C to 60 degrees C) and a humidity range from 0 percent RH to 100 percent RH.

I. Provide a glass face on the front of the enclosure that has an anti-reflective coating to minimize light and image reflections. Ensure the face has a special coating to minimize the buildup of environmental debris such as dirt and water. Ensure the front of the enclosure is not made from any thermoplastic or synthetic polymer (e.g. PVC, Polythene or Acrylic).

J. Provide camera enclosures that are 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. Ensure the video and power cables are not connected with the same connector.

K. Ensure the video signal is fully isolated from the camera enclosure and power cabling.

6. Bus Interface Unit (BIU). Provide a BUI that meets the requirements of *Section 8 of the NEMA TS2-Specification*. Provide one 6 foot Port 1 communications cable to connect from the detector rack BIU to the controller unit.

7. Cabling. Ensure the cable between the camera (VDP) and the ICC in the traffic cabinet consists of three twisted pair 19 American Wire Gauge stranded *International Municipal Signal Association (IMSA) 39-2* or *40-2* type cable. Ensure this cable is suitable for installation in conduit or overhead with appropriate span wire. Ensure that pluggable connectors are used at both the camera (VDP) and cabinet (ICC) ends. Ensure that the cable and installation tools are approved by the supplier of the video detection system, and the Manufacturer instructions are followed to ensure proper connection.

8. Warranty. Provide materials with a manufacturer's warranty/guarantee, transferable to MDOT, that the supplied materials will be free from all defects in materials and workmanship for the stated time period from the date of shipment. Supply the Engineer with any warranty/guarantee documents from the manufacturer and a copy of the invoice showing date of shipment.

This warranty does not apply to products damaged by accident, misuse, abuse, improper operation, service by unauthorized personnel, or unauthorized modification.

A. During the warranty period, ensure that technical support is available from the manufacturer via telephone within 4 hours of the time a call is made by a user, and this support is available from factory certified personnel or factory certified installers at the

manufacturer's then current pricing and terms of sale for on-site technical support services.

B. Ensure during the warranty period, updates to VDP software are available from the manufacturer without charge.

C. During the warranty period, ensure that parts to support maintenance and repair of the video detection system are available for delivery within 30 days of placement of an acceptable order at the manufacturer's then current pricing and terms of sale for said parts.

c. Construction. Furnish, install and/or remove the Video Traffic Detection System (Mini) and/or Video Traffic Detection Camera (Mini) as indicated on the plans or as directed by the Engineer. All work must comply with sections 819 and 820 of the Standard Specifications for Construction, the applicable "typical" signal construction detail, and this special provision. Storage and/or disposal of the removed material is included and must comply with section 204 of the Standard Specifications for Construction or as directed by the Engineer.

1. Ensure the video detection system is installed by supplier factory certified installers in accordance with the manufacturer's installation materials and recommendations. Provide verification of factory certification as directed by the Engineer.

2. Ensure the camera equipment is not installed until all other signal equipment has been installed and inspected for correctness. Premature installations of camera equipment that need to be moved in order to make the system operate will be moved at the Contractor's cost. This movement will not be paid for as extra payment or in time extensions. Deliver the video processor to the MDOT Statewide Signal shop or the inspecting agency representing MDOT for setup and installation in the controller cabinet.

3. Place the camera a minimum of 33 feet above the roadway, or as indicated on the plans, and place over the traveled way on which vehicles are to be detected.

4. Install or remove of the Video Traffic Detection System (Mini) as indicated on the plans which includes the camera, the video system processor (VDP), interface communications controller (ICC), hardware, fittings, cable, connectors, grounding and all other material required to complete the work.

d. Measurement and Payment. The completed work, as described, will be measured and paid for at the contract unit price using the following pay items:

Pay Item	**Pay Unit**
Video Traf Detection Camera (Mini)	Each
Video Traf Detection System (Mini)	Each
Video Traf Detection System (Mini), Rem	Each
Video Traf Detection Camera (Mini), Rem	Each

1. **Video Traf Detection Camera (Mini)** includes everything necessary to ensure a complete and operating job, which detects vehicles on one roadway approach at an intersection, as shown on the plans or as directed by the Engineer.

2. **Video Traf Detection System (Mini)** includes everything necessary to ensure a

complete and operating job, as shown on the plans or as directed by the Engineer.

3. **Video Traf Detection System (Mini), Rem** includes removing, storing and disposing of removed material for video traffic detection system.

4. **Video Traf Detection Camera (Mini), Rem** includes removing, storing and disposing of removed material for video traffic detection camera.