# X1400483 VIDEO AND RADAR HYBRID DETECTION SYSTEM

# Updated: 12/01/2023

Description

The detection system shall furnished with the specified number of sensors as needed to meet the performance and detection coverage requirements of the specification and as called for in the plans.

The vehicle detection system shall include all necessary electric cable, electrical junction boxes, electrical and communications surge suppression, hardware, software, programming, and any sensor brackets that are required for installation, configuration, and optimal mounting height or lateral placement. Should ideal placement (horizontal and vertical) require riser mounts, those shall be included and installed to manufacturer specifications. These items should be taken into consideration and shall be included in the bid price for the detection system.

The following detection technologies are pre-approved for use in this specification; however, alternate technologies may be submitted for consideration for approval by the engineer:

* Color Video Image Processor (Not a Thermal processor based solution)
* Microwave Radar (Frequency Modulated Continuous Wave required for presence detection)

One 12” – 15” color LCD video monitor and 4-video input selector (if required to switch camera videos) shall be included for each installation. This monitor shall be capable of local review of video and microwave detector zones and detector channel activation status. Where a local tablet is required for local viewing, it shall be provided as part of this system. Where a personal computer / laptop connection is required to meet this requirement, a cover letter shall be provided indicating the technical limitations preventing a local video monitor from being provided.

All vehicle detection systems shall be equipped with the latest software or firmware revisions. The system shall be configured and installed to NEMA TS2 Standards (use of the SDLC port and BIU). Installation conforming to NEMA TS1 standards will not be allowed and Contractor shall be required to modify existing TS1 signal cabinets and controllers to operate under TS2 mode to allow for up to 64 detector inputs if installation is specified in a NEMA TS1 cabinet.

The minimum requirements for a vehicle detection system are listed below:

1.0 General

This Specification sets forth the minimum requirements for a system that monitors vehicles on a roadway and provides detector outputs to a traffic controller or similar device. A system may be of a single or mixed technology solutions; provided by a single or multiple manufacturers, so long as those systems are compatible in sharing NEMA Detector BIU channels in a controller such that both detector technologies can configure outputs controlled under the same Detector BIU channel.

* 1. System Hardware

The system shall generally consist of one or two sensors per intersection approach and one or two processing units to provide various outputs to a traffic signal controller and other systems if specified.

* 1. Functional Capabilities
  2. The system shall be able to detect the presence of vehicles in a minimum of 96 detection zones within the combined field of view of the video image sensors.
  3. The system shall record turning movement counts for each movement group (Left turn, through, right turn) for each approach of an intersection. This data shall be stored locally on the processor or interface module for a period of not less than 14 days in data bins no larger than 15 minutes. Counts shall be automatic or zones setup by Contractor if needed to provide this function.
  4. Detection system shall have wired network connectivity through a RJ45 Local Area Network Port. The detection system shall have the capability to review system function, status, detection configuration, and detection configuration modification over the network connection.
  5. Vehicle Detection
  6. Detection Zone Placement

The video detection system shall provide flexible detection zone placement anywhere and at any orientation within the combined field of view of the image or radar sensors. In addition, detection zones shall have the capability of implementing logical functions including AND and OR.

* 1. Optimal Detection

The detection system shall reliably detect vehicle presence when the image sensor is mounted at manufacturer recommended height; usually 10m (30 ft.) or higher above the roadway,

The sensors shall not be required to be mounted directly over the roadway. A single image sensor, placed at the proper mounting height with the proper lens, shall be able to monitor six (6) to eight (8) traffic lanes simultaneously. A single microwave radar sensor shall be able to monitor up to four (4) traffic lanes simultaneously and have a range of 600 feet from sensor. When possible, image sensors should be installed in such a way as to minimize occlusion between detection zones calling different vehicular phases.

* 1. Detection Performance

The system shall be able to detect vehicle presence with 98% accuracy under normal conditions, (days & night) and 96% accuracy under adverse conditions (fog, rain, snow). The processor shall output a constant call for each enabled detector output channel if a loss of video signal occurs in any camera. Microwave radar detection shall utilize Frequency-Modulated Continuous Wave (FMCW) technology as to be capable of recording volume (counts), speed, and direction of travel of vehicles per travel lane.

4.0 Camera

* 1. The video detection system shall use high resolution, color, cameras as the video source for real-time vehicle detection. As a minimum, each image sensor shall provide the following capabilities:
     1. MPEG-4, part 10 and H.264 video compression and transport
     2. Support video streaming with user definable attributes including resolution and frames per second
     3. Images shall be produced with a minimum resolution of 720 x480 pixels.
     4. Useable video and resolvable features in the video image shall be produced when those features have luminance levels as low as 0.1 lux at night.
     5. Useable video and resolvable features in the video image shall be produced when those features have luminance levels as high as 10,000 lux during the day.
     6. Automatic gain, automatic iris, and absolute black reference controls shall be furnished.
  2. The image sensor and lens assembly shall be housed in an environmental enclosure that provides the following capabilities:
     1. The enclosure shall be waterproof and dust-tight to NEMA-4 specifications. The camera shall be IP-67 rated.
     2. The enclosure shall allow the image sensor to operate satisfactorily over an ambient temperature range from -34C to +74C while exposed to precipitation as well as direct sunlight.
     3. The enclosure shall allow the image sensor horizon to be rotated in the field during installation.
     4. A heater shall be at the front of the enclosure to prevent the formation of ice and condensation in cold weather, as well as to assure proper operation of the lens' iris mechanism. The heater shall not interfere with the operation of the image sensor electronics, and it shall not cause interference with the video signal.
  3. The video output, communication, and power to the image sensor shall include transient protection to prevent damage to the sensor due to transient voltages occurring on the cable leading from the image sensor to other field locations.
  4. System Software

The user shall be able to add, modify, and delete detection zones. The software shall provide remote access operation and shall be the latest revision. The software shall be capable of remotely zooming and focusing each video camera. The software shall be able to view, filter, and export any turning movement count data stored on the system hardware. Software shall either be natively hosted within the field device, accessed over web browser navigation to a programmed IP address or to be installed as a separate application on a Windows 10/11 operating system computer. Software shall not require the use of cloud hosted software or accessibility to world wide web unless approved by the engineer.

* 1. License or Software as a Service (SaaS) Fees  
     None of the requirements listed in this specification shall be restricted or impaired dependent upon a need (or option) to purchase a license or SaaS contract to maintain functionality. Should there be any License or SaaS components to a system solution, Contractor shall submit a cover letter as part of a catalog cut / data sheet review outlining the features which may be restricted or impared if no future license or SaaS is purchased.
  2. Hybrid Sensor Functionality  
     The combined use of video and microwave radar detection sensors have no direct requirements for one sensor to aid in the function of another sensor. Both sensor technologies should have the ability to provide lane by lane stop bar presence and pulse detection as well as advanced presence and pulse detection lane by lane for at least 400 feet beyond the sensor mounting location. Optimal configuration of this solution will be to have stop bar detection configured using the video sensor and for advanced detection configuration to utilize the microwave radar sensor. Project specific requirements or project engineer may provide alternative configuration requirements. Contractor to consult the owner before selecting mounting locations and mounting hardware in order to optimize the detection performance of the final configuration between both sensor technologies.

1. Installation and Training
   1. The supplier of the detection system shall supervise the installation and testing of the video and microwave radar vehicle detection equipment. A factory certified representative from the supplier shall be on-site during installation.
2. Warranty, Maintenance, and Support
   1. The detection system shall be warranted by its supplier for a minimum of three (3) years from date of turn-on. This warranty shall cover all material defects and shall also provide all parts and labor as well as unlimited technical support.
   2. Ongoing software support by the supplier shall include updates of the processor and interface software. These updates shall be provided free of charge during the warranty period.
   3. 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 the contracting agency in the form of a separate agreement for continuing support.

Method of Measurement: This work will be measured for payment as each per hybrid vehicle detection system included in the plans per signalized intersection.

Basis of Payment: This work will not be paid for separately, but shall be included in the contract unit price each for VIDEO AND RADAR HYBRID DETECTION SYSTEM. Which price shall be payment in full for all labor, equipment, and materials required to furnish, install, and test the vehicle detection system described above, complete.