DUAL 360 DEGREE VIEW CAMERA VIDEO DETECTION AND DATA COLLECTION SYSTEM

I. DESCRIPTION

This work shall consist of furnishing and installing system hardware that consist of three components:

A. Two (2) 360 degree view camera detection cameras.

B. A stand-alone video detection processing unit for communication with two 360 degree view camera. The processing unit shall include an internal pedestrian detection module. The real-time performance shall be observed by viewing the video output from the sensor with overlaid detection zones that indicate the current detection state (on/off). The sensors shall detect both pedestrians and vehicles.

The video detection camera shall communicate to a stand-alone video detection unit via a burial grade Cat5e cable via a software application using the industry standard TCP/IP network protocol. The video detection camera shall be powered through industry standard Power over Ethernet (PoE). The video detection unit shall be capable to be programmed with a static IP address and have two built-in, Ethernet ports and shall be addressable with no plug in devices or converters required. The stand-alone video detection unit shall provide standard MPEG-4, motion J-PEG or H.264 streaming digital video. Achievable frame rates shall provide a minimum of 5 frames per second or higher as a function of video quality and available bandwidth.

The stand-alone video detection unit shall communicate directly with video detection cameras providing up to thirty-two (32) inputs and sixty-four (64) outputs or a 170 input file rack providing up to sixteen (16) contact closure inputs and twenty-four (24) contact closure outputs to a traffic signal controller. The stand-alone video detection unit shall be equipped with two serial connections to allow for input/output to a TS-1 or 170/2070 cabinet and a SDLC port to allow connection to a TS-2 cabinet. A TS-1/170/2070 cabinet harness shall be available and shall include a input and output cable for installation in TS-1, 170 or 2070 cabinets. The stand-alone video detection unit shall accept connection to the video detection cameras and also be equipped with two USB ports to allow for stored data and program retrieval or USB mouse connection. The unit shall be equipped with two fully functional Ethernet ports one labeled "Network" and the other "Local". The stand-alone video detection unit shall also be equipped with a VGA port for local viewing or programming in conjunction with a USB mouse. The stand-alone video detection unit shall be fully programmable by connection to a standard laptop computer utilizing software provided with each unit or through a mouse and monitor operation. Video images shall be recorded when the external data collection storage module is connected to the unit via one of the USB ports and shall be limited only by the available memory of the storage module. When the formatted external data collection storage module is connected the video detection unit shall immediately recognize the connection and begin recording the video and upload the configuration.

II. FUNCTIONAL REQUIREMENTS

A. Video Detection System Software

The stand-alone video detection unit shall have embedded software to incorporate multiple applications that perform a variety of diagnostic, installation, fault tolerant operations, data communications and storage, 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 view video streaming services. The software shall have the ability to mask areas or objects in the field of view that will allow the video detection unit to ignore areas that are not within the travel way or occlude areas within the travel way. This feature will increase available processing power for real time detection and ensure that vehicles remain detected when occluded by objects within the field of view.

The software shall provide the following applications that and shall execute under Microsoft Windows 2000, XP or 7. Available applications shall include:

- Configuration setup: Create and modify detector configurations to be executed on the stand-alone video detection cabinet interface unit.
- Operation log: Retrieve, display, and save field hardware run-time operation logs of events that have occurred.
- Software install: Reconfigure the stand-alone video detection cabinet interface unit with a newer release of embedded system software.
- Streaming video player: Play and record streaming video with flashing detector overlay.
- Data retrieval: Fetch traffic data and alarms and store on PC or other storage media.
- Provide fault-tolerant, real-time TCP/IP communications to/from all devices and client applications with full logging capability for systems integration.

B. Video Detection Camera

The video detection camera shall produce a useable video image of the bodies of vehicles. The minimum range of scene luminance over which the camera shall produce a useable video image shall be the minimum range from nighttime to daytime, but not less than the range 1.0 lux to 10,000 lux.

The camera shall use a CMOS sensing element and shall output color video with resolution of not less than 1920 lines horizontal.

The video detection software shall control the exposure and gain of the camera(s). The wide-angle camera(s) shall not need adjustment to suit the site geometry. The horizontal field of view shall be 360 degrees. A 360 degree camera shall be capable of providing detection coverage of all approaches of an average size intersection. Two wide-angle cameras shall provide detection coverage on large intersections. The camera shall be housed in a weather-tight sealed enclosure. The housing on the 360 degree camera shall be field rotatable to allow proper alignment between the camera and the traveled road surface. The camera enclosure shall be equipped with an integrated sunshield. The sunshield shall include a provision for water diversion to prevent water from flowing in the camera's field of view. The camera enclosure shall include a thermostatically controlled heater to assure proper operation of the lens

shutter at low temperatures and prevent moisture condensation and ice buildup on the optical faceplate of the enclosure. When mounted outdoors in the enclosure, the camera shall operate satisfactorily in a temperature range from -35 °C to +74 °C and a humidity range from 0% RH to 100% RH. The camera shall be powered via Power over Ethernet (PoE) from the stand-alone video detection unit. Power consumption shall be 55 watts or less under normal conditions. The camera shall provide reliable detection within the height to distance ratio of 10:100. The camera enclosure shall be equipped with weather-tight cable connections. Video and power shall be transmitted via the Cat5e burial grade cable and connected within the same connector to the stand-alone video detection unit.

C. Power

The video detection cameras shall be powered via Power over Ethernet (PoE) from the stand-alone video detection unit. Power consumption shall be 55 watts or less under normal conditions.110/220 VAC, 50/60Hz.

D. Detection Zone Programming

Placement of detection zones shall be by means of a laptop with a Windows XP or 7 operating system or with a monitor and a mouse. The laptop or monitor shall be able to show the detection zones superimposed on images of traffic scenes.

The detection zones shall be created by using a laptop or mouse and monitor to draw detection zones. Using the mouse and monitor 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 laptop to the stand-alone video detection unit or to retrieve the configuration that is currently operating the intersection, and to back up detector configurations by saving them to the laptop or other removable storage media.

It shall be possible 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 video detection unit for different traffic applications or changes in installation site geometry or traffic rerouting. The video detection unit shall store previously loaded configurations on board and shall be able to revert to older programming when the command is sent to the unit.

E. Detection

The video detection system shall reliably detect vehicle passage and presence in the camera field of view when the video detection camera(s) is mounted 30 feet (10 m) or higher above the roadway and as close to the center of the intersection as possible or when the camera is adjacent (within 15 feet) to the edge of the nearest vehicle travel lane. If there are obstructions within the field of view the stand alone video detection unit shall be equipped with a software function that allows for an object mask to be drawn so vehicles calls are not placed by the obstruction and vehicles are still detected. The preferred video detection camera 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 video detection camera placed at a mounting height that minimizes vehicle image occlusion shall be able to detect at least five (5) traffic lanes on each approach. Mounting heights as low as 24 feet shall be possible and provide reliable vehicle detection, vehicle passage and presence within the camera field of view for average size

intersections provided the camera(s) have a reliable head-on view of all approaches. Pedestrian detection shall also be accurate and reliable when mounted in this configuration.

F. Data Collection

A properly installed system shall accurately count vehicles with at least 95% accuracy under normal operating conditions (day and night). The system shall collect data per direction, per detection zone or phase number.

A properly installed system shall accurately measure average speed of multiple vehicles with at least 95% accuracy under all operating conditions for approaching and receding traffic.

A properly installed system shall accurately classify vehicles. Vehicle collection shall be accurate and programmable by the user to bin data into three different data categories.

All collected data shall be able to be collected remotely or on site via USB or other storage media. All collected data shall be output to a .csv file for user manipulation.

Video recording shall be accomplished with the connection of a portable external USB hard drive connection to either of the USB ports on the video detection unit. The video shall be recorded only when the external hard drive is connected. The amount of video recorded shall be limited only to the size of the storage device. The laptop software shall provide the interface to playback the video to analyze operations or to collect turning movement information.
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III. WARRANTY, SERVICE AND SUPPORT

For a minimum of three (3) years, the supplier shall warrant the video detection system. Ongoing software support by the supplier shall include software updates of the video detection unit and video detection camera. 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.

IV. DOCUMENTATION
One wiring diagram of the system and installation manual shall be provided with each video traffic detection system.

If required by the Engineer, a sample of the video vehicle detection system shall be supplied for testing and review before acceptance. After completion of the test, the sample shall be returned.

V. MEASUREMENT AND PAYMENT

Dual Camera Video Detection System will be measured as lump sum and will be paid for at the contract unit price of lump sum. Price shall include furnishing the video detection unit, data collection module, video detection camera cabling, video detection camera(s), a USB mouse, video monitor, rack mounted Ethernet switch, all accessories, all mounting brackets, mounting hardware, and all incidental items necessary to provide full video detection. Functional testing will also be included.