ROAD COMMISSION FOR OAKLAND COUNTY

SPECIAL PROVISION
FOR
TRAFFIC MONITORING CAMERA

a. Description

This work consists of the furnishing, installing, integrating, testing, and providing manufacturer warranty of a Traffic Monitoring Camera (CCTV) with an integrated Digital Video Encoder (DVE) and associated appurtenances.

This work performed according to the plans and sections 818, 819, 820, 918 and 921 of the Standard Specifications for Construction except as herein provided.

b. Materials

1. General

All materials furnished, assembled, fabricated, or installed under this section must be new, corrosion resistant, and in accordance with the details shown on the plans and in this special provision.

The camera and all materials must meet the requirements of this specification or engineer approved equal.

Requirements of regulatory agencies. Comply with the following codes or standards:

A. *National Transportation Communications for ITS Protocol (NTCIP)*

(1) *NTCIP 1201*

(2) *NTCIP 1205*

(3) *NTCIP 1208*

(4) *NTCIP 2104*

(5) *NTCIP 2202*

(6) *NTCIP 2301*, as it applies to the Simple Network Management Protocol (SNMP)

B. *National Television Systems Committee (NTSC)*

C. Moving Picture Experts Group (MPEG)

D. *Institute of Electrical and Electronics Engineers (IEEE) 802.3*

E. *National Electrical Manufacturers Association (NEMA)*
All electrical components must operate on 120 Volt Alternating Current (VAC) (±10 percent) 50/60 Hertz (Hz) electricity. Provide appropriate Direct Current (DC) conversion for any equipment requiring DC power. Provide appropriate DC to DC and Alternating Current (AC) to DC conversion as necessary. Solar power is only permissible when approved by the Engineer. If the site is solar powered, the Contractor will be allowed to power the devices using DC equipment.

All field equipment must operate in all weather conditions. Use identical and completely interchangeable equipment at each location. Use equipment designed to protect personnel from exposure to high voltage during equipment operation, adjustments, and maintenance.

All equipment required for the configuration and testing of devices and subsystems contained within this project will be supplied by the Contractor as an appurtenance to the equipment included within the project and at no additional cost.

2. Traffic Monitoring Camera (CCTV)

A. Functional Specifications

(1) Provide an IP video camera system located as identified on the plans. Power the CCTV camera by a single outdoor rated Power over Ethernet (POE) cable from a POE injector. The CCTV camera must have an integrated DVE for the transmission of MPEG-4, H.264, or MJPEG encoded video streams.

(2) Ensure the camera provides a resolution of 1080p/720p High-Definition video.

(3) Ensure the camera includes an environmentally rugged housing suitable for harsh environments that is compatible with the temperature, power, vibration, shock requirements, and show requirements of NEMA TS-2, as well as the environmental dust and water resistance requirements of IEC 60529 IP66 and IP68 ratings.

(4) Ensure the camera has a side-mounted lens configuration for continuous 360-degree pan and tilt rotation on both axes and automatic image flip.

(5) Ensure the camera has a minimum of 30x optical zoom.

(6) Ensure the camera has an image sensor capable of providing full color images at low levels of light and black/white images in the dark.

(7) Ensure the camera can provide both full motion video and still images.

(8) Ensure the camera is configurable for up to 20 user definable camera presets, stored on-board.

(9) Ensure the camera can set continuous tours for the preset locations and that presets are selectable between 2 seconds and 5 seconds for 180-degree motion in both axes.

(10) Ensure the camera can set privacy zones to black out areas.

(11) Ensure the camera supports both NTSC and Phase Alternating Line (PAL).

(12) Control Data protocol support must include Cohu, Pelco D and Pelco P codes without the use of additional protocol convertor hardware.

(13) Ensure the camera is low maintenance, hydrophilic coated, energy saving, directly heated, non-fogging camera faceplate window.

(14) Moisture Detection

(a.) High Humidity Warning Indicator: Provide high humidity warning indicator on video display.
(b.) The camera tube housing shall be provided with humidity and temperature sensors to allow remote monitoring of these parameters.
(c.) A high humidity warning shall be displayed on the video image when the camera housing humidity exceeds a preset limit.

(15) Two levels of transient protection shall be included using gas discharge tubes followed by 40A 300W transient voltage suppressors.

(16) Data Rate: Adjustable from 32k to 12Mbps in VBR mode and 32k to 16Mbps in CBR mode.

(17) Brake

(a.) Electrically operated pan and tilt motor brakes with a minimum holding torque of 300 oz./in shall be provided to maintain the camera position when power is removed from the camera or when the unit is not being directed to change its pan or tilt position.

B. Environmental Specifications

(1) The CCTV camera must operate within an ambient temperature of -29 degrees Fahrenheit (F) to 140 degrees Fahrenheit with 100 percent relative humidity, condensing.

(2) The environmental housing enclosure must be able to sustain a minimum of 3 second winds gusts from any direction of 120 miles per hour (MPH) as required by ASCE 7.

(3) The pressurized housing assembly must include a thermostat-controlled, heater and follows NEMA 4X/IP-67.

(4) The POE injector must operate within an ambient temperature of -29 degrees Fahrenheit to 140 degrees Fahrenheit with 5 to 90 percent relative humidity, non-condensing.

The POE injector shall be grounded.

(5) The CCTV camera must provide a clear, focused image in all weather conditions.

(6) The outside surface of camera housing window must be provided with high temperature vacuum deposited hydrophilic coating to reduce window cleaning maintenance.

(7) The inside surface of camera housing window must be provided with electrically conductive thermostatically controlled ITO (Indium Tinoxide) glass window coating to allow energy saving, directly heating of window glass to prevent fogging.

C. DVE Functional Specifications

(1) The integrated DVE must provide MJPEG encoding, as well as either MPEG-4 or H.264 encoding. The DVE must be capable of providing both full motion video and still images.

(2) The DVE must support 1 to 30 frames per second (fps) frame rate at resolutions. The Contractor is responsible for integrating the optimal resolution, bit rate, and frame rate that will deliver the best video into the Advanced Traffic Management Software (ATMS) or web server.

(3) The DVE must encapsulate and pass through PTZ and control data, compliant with NTCIP.

(4) The DVE must not exceed 250 milliseconds of latency for PTZ controls.

D. Equipment and Port Specifications.

(1) The data sub-channels must be software programmable, directly or over the Network, as defined by the Electronic Industries Association (EIA) for the recommended standard (RS) 232/422/485 data format, data rate, and data structure (e.g., the number of bits, parity, stop bits, etc.) and be IP addressable.

(2) The network connection must be Ethernet-compliant IEEE 802.3, 802.3u, and 802.3x; 10/100 Megabits per second (Mbps), static or dynamic host configuration protocol (DHCP), auto sensing full/half-duplex and compatible by way of a Registered Jacks (RJ)-45 connector, allowing transmissions over a Category 5E or 6A Class E_A Enhanced (CAT5E or 6A) cable to an attached fiber optic media converter, an Ethernet switch, or an IP wireless device.

(3) The video input performance measures must comply with NTSC and EIA requirements, including the EIA-170 standard, with a composite video of 1.0 to 1.2 volts peak-to-peak (Vp-p). Ensure the equipment has an electrical resistance of 75 Ohms at 60 Hertz (Hz).

E. Network Parameter Specifications.

(1) Use the 10/100BASE-TX with Type RJ-45 connectors, as required in the IEEE 802.3 standards and amendments, as the connection to the network devices.

(2) Conform to version 4 of the user datagram protocol (UDP), version 2 of the internet group management protocol (IGMP), and transmission control protocol (TCP)/IP Version 4.

(3) Must be compatible with the following network protocols: Unicast/Multicast, UDP, TCP, IP, HyperText Transfer Protocol (HTTP), Real Time Streaming Protocol (RTSP), Telnet, IGMP 2.0, Internet Control Message Protocol (ICMP), DHCP, Simple Network Management Protocol (SNMP) and Real-time Transport Protocol (RTP).

F. Bracketry, accessories, or custom modifications for mounting shall be as per manufacturer recommendations and approved by the engineer.

3. Communication and Power Conductors

   Category 5E (CAT5E) Cable shall have the following properties:

   A. Certified CAT5E ANSI/TIA-568.2-D standards
   B. With weatherproof Registered Jacks RJ-45 connector(s) rated for CAT5E cabling
   C. 600V, 24 AWG, drain wire, solid core, shielded, industrial grade sunlight and oil-resistant PVC jacket, outdoor, burial grade, UV rated.
   D. Shielded plugs per manufacturers recommendations.

   Category 6A (CAT6A) Cable may be substituted and have the above listed properties if requested in writing to the Engineer for approval.

   If requested by the Engineer, the contractor shall provide documentation from the camera supplier that the cable is compatible with the camera.

4. 6 foot CAT5E shielded patch cable

   Provide the RCOC inspector with three (3) additional cables

5. POE repeater/extender

Provide an in-line POE repeater/extender for each run of CAT5E or CAT6A cable greater than 200 feet in length. The ethernet interfaces must be two independently auto-configuring 10/100 ports. The POE repeater/extender must not require an external power supply.

The POE repeater/extender shall have the following properties:

A. POE++ compatible
B. Shielded enclosure and connectors
C. Surge protected
D. Type tested under NEMA-TS2 environmental standards for extended temperature operation between -40°C to +75°C.
E. Conforms to IP-67 standards with total dust and moisture protection

6. Connection from camera cable to CAT5E (or CAT6A) cable

   Connection from the camera cable to the CAT5E (or CAT6A) cable shall be waterproof and weathertight. The connection shall then be supplemented and enclosed in a weathertight housing/junction box.

Samples – If requested by the Engineer, provide a complete sample (connection and weatherproof box) must be delivered within seven (7) working days after the request is submitted. Special consideration shall be given to workmanship, materials and superior features demonstrated by the sample.

A. Military Waterproof/Weatherproof Coupler Assembly

The waterproof coupler assembly shall be supplied by the manufacturer.

The coupler shall be rated for IP-68.

The coupler shall be mounted horizontally under the camera at the top of the drip loop.

The assembly shall be included in the Camera Traffic Monitoring pay item.

B. Weathertight Housing/Junction Box

Provide an enclosure that is weather tight to seal out moisture from entering.

Ensure the bushing for cable entrance is liquid tight and sized properly based on manufacturer's recommendations and cable used.

The weatherproof splice box or weatherproof junction box is a supplement to the weatherproof coupler assembly.

Shall be designed to accommodate a #6 AWG ground wire

Provide mounting brackets to securely fasten weatherproof box to bracket truss, pipe extension, mast arm or other existing signal item.

All cables shall enter the bottom of the box/housing with a watertight fitting. The cables shall be toward the ground to prevent water from entering the box/housing.

The Weathertight Housing/Junction Box is a separate pay item.

7. Acceptance

Provide General Certification per the MDOT's *Materials Quality Assurance Procedures Manual* to the Engineer that the materials meet the requirements specified herein.

Camera shall be accepted when all of the following are completed:

- The connection is made to the RCOC TOC building
- The camera is fully functional
- Being operated by the RCOC Operations Engineer via the camera website
- The camera is viewable at the RCOC TOC building
- Can be programmed with the RCOC standard setup with tours

c. Construction

1. General

A. Submittals / Working Drawings

(1) Submit a detailed dimensional drawing of all equipment, material specification list which shows the materials to be used, equipment to be furnished, and assembly/installation method.

(2) If requested by the Engineer, the contractor must submit a detailed drawing to the Engineer showing the proposed location of the camera, cabling, and all POE repeaters / extenders. Drawing must indicate proposed cable routing and cable lengths between each component.

(3) Submit a complete detailed cut sheet showing all devices and their connectivity, for the Engineer's approval before procurement. All cut sheets must include device manuals, installation and operation guides and preventative maintenance schedules.

(4) Submit connection from camera cable to CAT5E or CAT6A cable. The submittal shall include:
Waterproof/Weatherproof Coupler Assembly
Weathertight Housing/Junction Box (if pay item is included in project)

B. Furnish, assemble, fabricate and/or install materials that are new, corrosion resistant, waterproof, weathertight, and in accordance with the details shown on the plans and the Standard Specifications for Construction.

C. Furnish, install, and integrate all available software upgrades through final acceptance.

D. Furnish, install, test, and qualify all components including patch cords and jumpers, as well as required power adapters, as an appurtenance to this special provision.

E. If the CCTV camera's regular maintenance schedule or calibration comes due prior to final system acceptance, the Contractor must recalibrate the device and perform routine maintenance at no additional cost to the Road Commission for Oakland County.

F. Comply with working clearances and dedicated spaces per *NEC Articles 110, 384 and 800-5*, as well as all current NEC articles, and Federal, State and Local regulations.

G. If requested by the Engineer, submit a detailed report or as-built drawings for each camera installation, listing all cable length(s) and qualification results to the Engineer in a .PDF format.

2. Traffic Monitoring Camera

A. Install the camera in conformance with the manufacturer's requirements and in accordance with this special provision.

B. For projects that do not include the Camera, Traf Monitoring, System Integration Support, RCOC (Each) pay item:

If the camera requires a user specific IP address designation to be performed by the RCOC Engineer, the camera shall be provided to the Engineer a minimum of 14 calendar days in advance of installation to be configured. The Engineer will notify the contractor if this is required. Any delays caused by configuration will not be grounds for an extension of time.

If requested by the Engineer, work with Engineer to determine the preferred configuration settings on the CCTV camera. This includes, but is not limited to, the privacy zones, presets and tours, on-screen labels or identifiers, azimuth display, and low-pressure warnings.

C. Installation must meet local and state electrical requirements including grounding. Grounding shall not be paid for separately and is covered under the MDOT *Special Provision for Grounding, Bonding, Lightning Protection and Surge Protection for Electrical System Equipment* (20SP-826A or current version).

D. Ensure that a representative from the CCTV camera manufacturer or other certified company is in attendance during the installation of the first camera.

E. Do not damage any part or equipment during installation. Damaged parts or equipment must be replaced at no additional cost. Repair is not an acceptable means of addressing damage, replacement of the camera is the only acceptable resolution. All equipment is to be replaced with new parts. Any delays due to damaged equipment is not grounds for an extension of time.

F. Protect the power, control, and return conductors along with all site equipment as specified by CCTV camera manufacturers with the appropriate surge protector.

Indicator Light - The surge protector must have an indicator light that indicates the surge protector is functioning properly and/or the light is not illuminated, it indicates that the surge protector has received a catastrophic surge and will need to be replaced.

3. Communication Conductors

Install POE repeater/extender for each run of CAT5E or CAT6A cable greater than 200 feet in length per the manufacturer's directions. One repeater/extender must be installed for each 200 feet of communication cabling.

All cabling must be labeled on both ends, bundled, and stressed. All communication cabling must be field qualified at 100 Mbps full duplex after the installation of the RJ45 ends. If requested by the Engineer, provide a report listing lengths of all cabling runs and locations of any extenders/repeater as detailed above in C.1.H.

4. Warranty and Guarantee

Provide a manufacturer's warranty fully transferrable to the Road Commission for Oakland County.

A. Any defect in design, materials, or workmanship which may occur during proper and normal use prior to final system acceptance must be corrected, repaired, and/or replaced by the Contractor without cost to the Commission.

B. The camera system must carry a manufacturer's warranty (parts, software, and labor) of 3 years from the date of final acceptance.

C. Firmware and software upgrades/updates must be included for the life of the product without cost to the Road Commission for Oakland County.

If the camera has access to a web browser for access to all capabilities listed in this Special Provision, there must not be any fees, subscription, or maintenance charges for the access.

D. Warranty coverage must include expedited part supply to ensure replacement or repair of warrantied equipment within 10 calendar days of the notification of equipment failure from RCOC or their Maintenance Contractor.

E. Warranty coverage must include a determination, at no cost to the Road Commission for Oakland County, by the manufacturer of the defect.

F. If requested by the Engineer, supply manufacturer's warranty and guarantee documents from the manufacturer and a copy of the invoice showing date of shipment.

5. Technical Support

A. Local Support - There shall be a local distributor available to support the product.
B. If the product is not functioning in the TOC Office, provide office training to RCOC TOC Department for setup, operation, and maintenance of camera during the warranty period.
C. Troubleshooting – provide all coordination between contractor and supplier.

d. Measurement and Payment

The completed work, as described, will be measured and paid for at the contract unit price using the following pay item(s).

Pay Item	**Pay Unit**
Camera, Traf Monitoring, RCOC	Each
Camera, Traf Monitoring, Salv, RCOC	Each
Camera, Traf Monitoring, Rem, RCOC	Each
Camera, Traf Monitoring, Cable Junction Box, RCOC	Each

Camera, Traf Monitoring, RCOC (Ea) includes furnishing, installing, integrating, testing, providing manufacturer warranty, and make fully operational the CCTV camera including but not limited to camera, POE injector, patch cables, electrical components, data transmission cabling, CAT5E or CAT6A cable, mounting accessories, mounting brackets, pipe extensions, weatherproof connections, power, POE repeater/extender, surge protector/arrestor, grounding, ground wire, technical support, and communications connections. Includes coordination with installation of communications antenna.

Camera, Traf Monitoring, Salv, RCOC (Ea) includes removing, salvaging, and reinstalling the CCTV camera to make fully operational the salvaged CCTV camera including but not limited to POE injector, patch cables, electrical components, data transmission cabling, CAT5E or CAT6A cable, mounting accessories, power, and communications connections. If parts cannot be salvaged, the contractor shall supply new POE injector, patch cables, electrical components, data transmission cabling, mounting accessories, mounting brackets, pipe extensions, weatherproof connections, power, POE repeater/extender, surge protector/arrestor, grounding, ground wire, technical support, and communications connections. Includes coordination with installation of communications antenna.

Camera, Traf Monitoring, Rem, RCOC (Ea) includes removing the CCTV camera and associated appurtenances, returning the CCTV camera and any requested appurtenances to RCOC.

Camera, Traf Monitoring, Cable Junction Box, RCOC (Ea) shall include furnishing all labor, equipment, and materials necessary to install a new junction box enclosure, mounting brackets, hardware, fittings, and other material required to complete the work at locations shown on the plans.