MICHIGAN
DEPARTMENT OF TRANSPORTATION

SPECIAL PROVISION
FOR
SURVEILLANCE SYSTEM, REMOTE SITE

a. Description. This work consists of furnishing and installing items and subsystems for a remote site surveillance system. System components include but are not limited to an Internet Protocol (IP) Closed Circuit Television (CCTV) cameras with an integrated Digital Video Encoder (DVE), single and dual camera mounts, and camera lowering devices.

1. 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 2104*;

(4) *NTCIP 2202*; and

(5) *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. *IEEE 802.3*;

E. *NEMA TS2*; and

F. *Open Network Video Interface Forum (ONVIF).*

b. Materials.

1. Camera Assembly. Furnish one (Type A) or two (Type B and Type C) domed camera assemblies at the mounting heights shown on the plans (see Surveillance System Details Typical Plan Sheet).

A. Image Sensor Specifications. Ensure image sensor is at least 1/3 inch in size and of the color progressive scan complementary metal oxide semiconductor (CMOS) type.

(1) Ensure the maximum resolution of the image sensor is at least 1920x1080.

(2) Furnish a day/night (color/monochrome) image sensor. Ensure day/night switchover and iris control have both manual and automatic control capabilities. The device must produce an illuminated and useable black and white image with the infra-red (IR) filter removed with low light sensitivity down to 0.04 lux in standard mode and 0.0025 lux in digital slow shutter mode.

(3) Ensure automatic color balance that references the white areas of the scene through the lens and automatic gamma correction is a function of the sensor. Ensure manual electronic shutter of the sensor is selectable from 1/2 second to 1/10,000 second.

(4) Furnish a camera with electronic image stabilization (EIS) algorithms integrated within the camera assembly system. The EIS algorithms are to be based on those particular movement wavelengths associated with vibration present at the roadside or pole movement.

(5) Furnish camera assemblies with azimuth positioning capabilities.

B. Lens Specifications. Ensure a minimum of 30x optical zoom and a minimum 12x digital zoom are provided. Ensure the device has the ability to be automatically and manually focused remotely.

C. Dome-Type Environmental Housing Enclosure Specification. Furnish a dome-type environmental housing enclosure with an ambient operating temperature from -29 °F to 165 °F with 95 percent relative humidity, condensing. Ensure the dome outer finish is off-white or white.

(1) Ensure the dome-type environmental housing enclosure is able to withstand a 3 second gust wind speed of 120 mph as required by LRFD Structural Supports for Highway Signs, Luminaires, and Traffic Signals, First Edition.

(2) Ensure the dome enclosure has a thermostat-controlled, 24-volt heater and meets *NEMA 250 Enclosure Type 4X* requirements and *International Electrotechnical Commission (IEC) 60529 IP-66* rating.

(3) Ensure dome to be free of defects, scratches, and moisture.

D. Positioner Specifications. Ensure the positioner is capable of a minimum 360 degree continuous pan with a 90 degree tilt. Ensure positioner is capable of at least 60 presets. Ensure the pan-and-tilt unit (PTU) is capable of at least 8 tours (sequences), each with a minimum of 16 stops. Ensure the camera has at least 8 programmable blackout (privacy) zones.

E. Digital Video Encoder (DVE). Furnish an integrated DVE meeting the following minimum requirements:

(1) Furnish a minimum of two independently configurable video streams with the following configurable properties.

(a) Codec. H.265, H.264 Base Profile, H.264 Main Profile, H.264 High Profile and Motion Joint Photographic Experts Group (MJPEG).

(b) Resolutions. 1920x1080, 1280x720, 720x480, 640x480, and 320x240.

(c) Frame Rates. Ensure the frame rate is adjustable with a range of at least 30 frames per second (fps) to 1 fps.

(d) Bit Rate Control. Capable of both variable bit rate and constant bit rate with a minimum selectable rate of at most 256 kilobits per second.

(e) Adjustable key frame intervals.

(2) Furnish an integrated DVE that supports availability of the following streaming protocols at all times for H.265, H.264, and MJPEG encoded streams:

(a) Real Time Streaming Protocol (RTSP)/Real Time Transport Protocol (RTP). Furnish RTSP communications over a Transmission Control Protocol (TCP) socket. Provide RTP video packets over User Datagram Protocol (UDP).

(b) RTSP Interleaved. Ensure the RTSP commands and the RTP video packets are transmitted of a single TCP connection.

(c) RTP Multicast. Ensure the RTP video packets are sent to the user defined multicast destinations

(d) Hypertext Transfer Protocol (HTTP) Tunneling. Ensure two separate TCP connections, one for send and one for receive.

F. Ensure video feed text overlay, and black-out or privacy zone position text overlay is included.

G. Furnish a minimum of two on-screen messages displayed by each camera assembly plus directional display of camera assembly.

2. Furnish a camera lowering device (CLD) for all cameras unless otherwise indicated on the plans.

A. Furnish a watertight suspension contact unit with a gasket to seal the interior from dust and moisture without the use of pressurization.

B. The suspension contact unit is to have a rated capacity of 200 pounds with a 4:1 safety factor. Ensure a locking mechanism exists between the fixed and moveable components of the CLD. The moveable assembly must have two mechanical latches and, when latched, all weight removed from the lowering cable. Ensure the fixed unit has a tracking guide that enables latching in the same position each time.

C. Furnish connectors that are resistant to UV light degradation. Male and female matched body parts must mate together to make a weatherproof, non-corrosive electrical connection between the composite cable and the camera housing when the camera is fully raised and locked.

D. Ensure the interface and locking components are made of stainless steel and/or aluminum. Ensure the CLD external components are made of corrosion-resistant

materials that are powder-coated, galvanized or otherwise protected from the environment by industry-accepted coatings to withstand exposure to a corrosive environment.

E. Ensure the CLD's internal connectors are capable of supplying the appropriate voltage required by the camera through the connector without damage to the connector, while supplying full amperage draw of the camera assembly and operating with the heater and all electronics powered on.

F. Ensure the wire leads from both the male and female contacts are permanently and securely fastened into a weatherproof, non-corrosive body.

(1) Furnish a minimum of 8 electrical contacts to accommodate connections for performance of all required camera assembly functions. Furnish additional contacts as necessary based on the selected camera;

(2) Furnish eight contacts soldered to Category (CAT) 5e wire end terminated with an Registered Jack (RJ) 45-male connector;

(3) Furnish an Ethernet cable tested and certified to perform at 1000BASE-T. Provide test results to the Engineer for review and approval.

(4) Furnish at least three contacts soldered to #18/1 *UL* lead wire - bare and numbered sequentially; and

(5) Ensure all soldering is per Association Connecting Electronics Industries (IPC) J STD-001E.

G. Ensure the contacts are self-wiping or displace surface contaminants by other methods as approved by the Engineer.

H. Ensure any grease or lubricant used on moving parts of the CLD components is recommended by the manufacturer.

I. Furnish a portable lowering tool consisting of a lightweight metal frame and winch assembly with a cable, a quick release cable connector, and an adjustable safety clutch. Ensure the lowering tool is capable of being powered by a half-inch chuck, variable speed, and reversible, industrial duty drill. Do not exceed the CLD manufacturer's maximum rotations per minute.

J. CLD Cabling Specifications.

(1) Furnish a lowering cable constructed of stainless steel aircraft cable with a minimum breaking strength of 1,740 pounds. The diameter must be 0.125 inches or greater. Stranded cable must have a minimum of 7 strands with no strand less than 19-AWG wire.

(2) Ensure the only cable permitted to move within the pole or CLD during lowering or raising operations is the stainless steel lowering cable. All other cables must remain stable and secure during lowering and raising operations.

(3) Install a 1.25 inch PVC conduit to contain the CLD stainless steel lowering

cable for the full length of cable run inside the pole. The lowering device furnished must include a conduit-mount adapter that will be affixed inside the pole for each CLD and designed to accept the provided 1.25 inch PVC conduit.

3. Wiring Specifications.

A. Furnish the camera assembly with any and all outdoor rated CAT5e or CAT6 Ethernet Cables as defined by the manufacturer.

B. Furnish an environmentally hardened, operating temperature range of -29 °F to 149 °F, Power over Ethernet (PoE) injector. The power for cameras and PTUs will be housed inside the ITS Cabinet at the camera installation site.

C. Ensure the camera assembly consumes no more than 60 watts of power, including blower and heater, if equipped.

D. Furnish two data line, *UL 497B* compliant, PoE compatible, surge protection devices, one in the respective ITS device cabinet between the PoE injector and the CCTV camera and one in CLD bell housing.

4. *National Transportation Communications for ITS Protocol (NTCIP)* Specifications.

A. The system operator must have the ability to address each camera assembly contained within a camera site by way of an Ethernet communication network. All communications between the Transportation Operations Center(s) and the camera must comply with the requirements detailed in the *NTCIP 1205* standard.

c. Construction.

1. General requirements.

A. Assemble all the equipment on the ground and complete all wiring on the ground.

B. Ensure that no CLD is left in the un-latched position and exposed to the environment for more than 24-hours.

C. Wiring joints and splices will be permitted only at the CCTV control boxes (shown on the plans) or at access points shown on the detailed drawings for the pole.

D. Ensure the pan/tilt mechanism is electrically bonded to adapter.

E. Ensure the dome camera housing is electrically bonded to the PTU.

F. Ensure the appropriate surge protector is furnished for protection of Ethernet cable (PoE compatible).

G. Ensure the inside of the dome does not contain bugs or debris in order to maintain a clear view.

2. Documentation required.

A. Submit all documentation required herein to the Engineer in electronic format.

B. Furnish complete detail cut-sheets for all equipment under this special provision.

C. Highlight each individual item on each cut-sheet.

D. Include equipment/parts list, schematic diagrams, equipment rack layouts and device connection/protocol information.

E. Furnish a training and maintenance manual for the camera assembly and the CLD.

F. Furnish documentation detailing the technical and operational aspects of the completed system. Include: device manuals; system diagrams; cabling diagrams; wiring schematics; any and all field engineering notes specific to each installed camera assembly; and any other documentation as required by the Engineer.

3. Warranty. Furnish a surveillance system with a standard manufacturer's warranty, transferable to the MDOT. The surveillance system must carry a warranty (parts, software, and labor) of 3 years from the date of shipment with at least 2 years of warranty remaining at the start of burn-in. Furnish warranty and other applicable documents from the manufacturer, and a copy of the invoice showing the date of shipment, to the Engineer prior to final written acceptance.

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**
Surveillance System, Remote Site, Type __	Each
Portable Camera Lowering Device Tool	Each

Surveillance System, Remote Site, Type A (see Surveillance System Details Typical Plan Sheet); **Surveillance System, Remote Site, Type B** (see Surveillance System Details Typical Plan Sheet); **Surveillance System, Remote Site, Type C** (see Surveillance System Details Typical Plan Sheet) and **Portable Camera Lowering Device Tool** includes all labor, equipment, and materials to construct the item.