ITEM 683.9501 03 – MPEG-2/4 VIDEO ENCODER-DECODER

DESCRIPTION:
This work shall consist of the furnishing and installation of MPEG-2/MPEG-4 Video Encoder Unit and MPEG-2/MPEG 4 Video Decoder software in accordance with these Contract Documents. The Video Encoder is a hardware unit installed in the Closed Circuit Television (CCTV) field equipment cabinet to convert and compresses an analog NTSC video signal for transmission over the communications network to the Video Decoder software installed on workstations at the TMC in the State Office Building.

MATERIALS:
All materials furnished, assembled, fabricated or installed under this item shall be new, corrosion resistant and in strict accordance with the details shown on the plans and in the Special Specifications.

The Video Encoder shall be an iVDO Streamer M and the decoder software shall be an iVDO Viewer or latest equivalent manufactured by
Cornet Technology
6800 Vesar Center
Springfield, VA 22151

meeting the following requirements:

a- General
The Video Encoder shall be installed in the CCTV field equipment cabinet at each camera location, and shall provide communication and video compression capabilities between the Camera Interface and TMC over a wireless Ethernet network.

The equipment installation shall include pre-setting of the configuration of hardware and software components that shall allow automatic operation. The Contractor shall provide a fully operational assembly with all cabling and terminations matched to support the selected components.

b- Standards - Video Encoder
- Video Input:       NTSC
- Safety:           Underwriter Laboratory (UL).
- Network Protocols: Internet Streaming Media Alliance (ISMA) Internet Protocol (IP) stream, Unicast & Multi-cast transmission,
c- Requirements

The Contractor shall furnish and install the Video Encoder equipment and all necessary components required to form a completely functional full motion video communications subsystem. All Video Encoder equipment shall be of the same type and from the same manufacturer. The Contractor shall furnish, install, and test the Video Encoder that meets the following requirements:

1. The Video Encoder shall accept a standard analog NTSC color or monochrome video signal (1 volt p-p, 75 ohm) from the field CCTV camera.

2. The Video Encoder shall be constructed for easy installation in standard, Rack mount 483 mm or 584 mm EIA standard equipment racks within the CCTV field equipment cabinet. The Video Encoder shall be a maximum of 50 mm high, 200 mm wide and 200 mm deep.

3. The Video Encoder shall be software configurable to use either MPEG-2 or MPEG-4 video compression.

4. The Video Encoder shall use MPEG-2 and MPEG-4 compression algorithms proven to provide satisfactory operation/performance in a full motion, video application involving surveillance of vehicles at speeds from zero (0) up to one hundred and thirty (130) mph.

5. The Video Encoder’s MPEG-2 and MPEG-4 IP compression algorithm, when distributed through an IEEE 802.3 Ethernet communications network, shall provide image quality near that of the camera’s analog, NTSC video. The video compression algorithm shall be tuned to not cause artifacts and distortion (i.e., jumping, blurring, blocking, etc.) when compressing and transmitting full-motion video with a high degree of motion / change between frames and control data over a wireless or wire line channel.

6. Video Software Decoder
   - The software decoder plug-in shall be compatible with Microsoft Windows XP operating system and the existing decoder software provided by Coronet for use in the TMC.
   - The software plug-in shall be easy to install and uninstall if needed.
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- The software decoder application shall be configurable for Hypertext Transfer Protocol (HTTP) or User Datagram Protocol (UDP) protocol settings.

7. Each Video Encoder shall incorporate the following:
   - Layer 3 QoS; DHCP and Static IP addressing; IP Ping, RTP & UDP; SAP (Session Announcement Protocol); Auto negotiation compliant to 802.1u; IP Ping.
   - Remote download via Flash memory
   - 10/100Base-T Ethernet/IP video, full and half duplexing.
   - Low end-to-end video latency: In order to maintain real time response of the pan/tilt/zoom (PTZ) camera control on the received video on the monitor, the end-to-end video latency shall not exceed 250 milliseconds
   - In-band (RS-232/422/485, 10BaseT) or external control
   - EIA 250C medium haul transmission compliant
   - Support live one video channel encoding, where High Quality Image Resolution and Lower Quality Image Resolution can be sent through a 10/100Base-T Ethernet interface. The Encoder shall support the Real Time Streaming Protocol (RTSP) and Real Time Transport Protocol.
   - Simple Network Management Protocol (SNMP) capability with Web server interface and command line over IP for remote control. The Encoder shall be equipped with front panel craft port for local control.
   - IP video for distribution to PC workstations via the software decoder.
   - The encoded video signal shall be transmitted over digital network via 10/100Base-T Ethernet interface via RJ-45 connector and UDP protocol supporting IP video destination addressing and Video Encoder control using Transmission Control Protocol over IP (TCP/IP).
   - MPEG-2 with I, IP, IPB, IPBB frames (GOP – Group of Pictures) for video compression.
   - MPEG-4 with I, IP frames (GOP – Group of Pictures) for video compression.
   - Encoder functions shall be software configurable remotely through RJ-45/10BaseT and/or DB9/RS-422/RS232 interfaces.
   - Adjustable horizontal and vertical resolution as follow: 720x480 (D1), 360x480(1/2 D1), 352x240 CIF,
   - A software controlled adjustable video transmission rate from:
     - 1.5 Mbps to 12 Mbps (MPEG 2)
     - 64 Kbps to 6 Mbps (MPEG 4)
   - A software controlled adjustable frame rate of 1, 2, 3, 4, 5, 6, 7, 10, 15, or 30 frames per second (fps) for MPEG4 transmissions.
   - A fixed frame rate of 30 fps for MPEG2 transmissions.
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- A “Bandwidth Cap” configuration that enables the units to adjust to allow maximum bandwidth utilization.
- Software controlled adjustments for video sizing, input brightness, contrast, sharpness and hue, and for selecting between I, IP, IPB and IPBB frames.
- Allow protocol independent PTZ data to be passed through from the Ethernet interface to the camera assembly. The bit rate shall be software controlled for 1.2 or 115.2 Kbps. A standard bi-directional EIA-232 serial port shall be configured as DTE/DCE for pan/tilt/zoom data transmission.
- An additional EIA-232 for connection of other ITS data device such as Dynamic Message Sign or Vehicle Detector Station.
- The video connectors shall be BNC (f) 75 Ω unbalanced. The encoder shall accept NTSC video input signals at 1Vpp ±0.2 across 75 ohms. Both composite and S-video formats shall be supported for input to the encoder.
- The Video Encoder shall contain front panel LED indicators denoting: Power On/Off, Link failure, Built-in test failure, Test or Operational mode, and local/remote control status.
- The minimum MTBF shall be 60,000 Hours. The Contractor shall provide the record of the reliability and MTBF from the laboratory test or the operational unit at the different project. The record shall be approved by the Engineer to be acceptable.
- JPEG frame capture for display of camera images on the Internet.

8. An analog video splitter shall be provided that accommodates NTSC video via BNC (f), 75Ω unbalanced connectors.

d- Wiring
All wiring shall meet the requirements of the National Electric Code. All wires shall be cut to proper length before assembly. No wire shall be doubled-back to take up slack. Wires shall be neatly laced into cable with nylon lacing or plastic straps. Cables shall be secured with clamps.

e- Power Service Protection
The equipment shall contain readily accessible and manually resettable or replaceable circuit protecting devices (such as circuit breakers, fuses, etc.) for equipment and power source protection.

f- Mechanical Requirements
Enclosure: The equipment shall be packaged in a sturdy durably finished sheet metal housing suitable for mounting in EIA standard 483 mm or 584 mm rail spacing. The Video Encoder shall have dimensions not to exceed 200 mm W x 50 mm H x 200 mm D.
g- Connectors and Harness
All external connections shall be made by means of connectors. The connectors shall be keyed to preclude improper hookups. All wires to and from the connectors shall be color coded and/or appropriately marked.

h- Environmental Requirements
The equipment shall meet all its specified requirements during and after subjecting to any combination of the following conditions:

- Ambient temperature range of -40 degrees C to 74 degrees C.
- Relative humidity 10 to 95%, non-condensing.

i- Power Service
The Video Encoder shall contain a power supply with an operational voltage range of 115 ± 20 VAC, 60 ±3 Hz. The power required shall not exceed 15 Watts per unit. The equipment operation shall not be affected by transient voltages, surges and sags normally experienced on commercial power lines.

CONSTRUCTION DETAILS:

Installation:
The MPEG-2/MPEG-4 Video Encoders shall be installed in the equipment cabinets as specified in the contract documents. The power feed to MPEG-2/MPEG-4 Video Encoder shall be connected to a 120 VAC power source. Appropriate connectors shall be supplied to connect the CCTV camera located on the pole or rooftop to the analog video splitter provided as part of this item.

One meter of slack shall be provided in the cable used to connect the MPEG-2/MPEG-4 Video Encoder to the Ethernet Switch. The Video Encoder configuration and video output stream shall be set to assure connection.

The video splitter shall be mounted in the equipment cabinet. The Contractor shall connect the input of the video splitter to the video signal from the CCTV camera and one output from the video splitter to the video input on the Video Encoder. The Contractor shall connect the other output from the video splitter to the video control panel installed in the cabinet. The Contractor shall provide the video splitter details to the Engineer prior to installation for approval.

The Contractor shall install and configure the decoder software at the TMC. Installation shall be coordinated with the Engineer to minimize the impact on TMC operations.

Documentation:
The Contractor shall prepare shop drawings which detail the complete installation of the MPEG 2/MPEG-4 Video Encoder and Decoder and all components to be supplied. Particular care shall be given to the interconnection of all of the components and the cabling. The Contractor shall
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submit shop drawings 30 days prior to the installation of the Encoder-Decoder to the Engineer for review and approval.

Two hard copies and one soft copy of all operations and maintenance manuals for each MPEG-2/MPEG-4 Video Encoder shall be delivered for each unit installed. The manuals shall, as a minimum, include the following:

- Complete description of system operations.
- Complete and accurate schematic diagrams.
- Complete installation procedures.
- Complete performance specifications (Functional, electrical, mechanical and environmental) on the unit.
- Complete parts list including names of vendors for parts not identified by universal part numbers such as JEDEC, RETMA, or EIA.
- Pictorial of components layout on circuit board.
- Complete maintenance and trouble-shooting procedures.
- Complete stage-by-stage explanation of circuit theory and operation.

Warrantee

All components to be supplied under this specification shall be warranted for a minimum of two-years from the conclusion of the System Acceptance Test. This warranty shall include repair and/or replacement of all failed components via a factory authorized depot repair service. All items sent to the depot for repair shall be returned within two weeks of the date of receipt at the facility. The depot location shall be in the United States. Repairs shall not require more then two weeks from date of receipt and the provider of the warranty shall be responsible for all return shipping costs. The depot maintainer designated for each component shall be authorized by the original manufacturer to supply this service. A warranty certificate shall be supplied for each component from the designated depot repair site indicating the start and end dates of the warranty. The certificate shall be supplied at the conclusion of the System Acceptance Test and shall be for a minimum of two years after that point. The certificate shall name NYSDOT as the recipient of the service. NYSDOT shall have the right to transfer this service to other private parties who may be contracted to perform overall maintenance of the facility.

Testing:

Standalone Tests shall be performed for each MPEG-2/MPEG-4 Video Encoder at the cabinet. The Video Encoder shall be connected to the CCTV Camera via the analog video splitter. The digital outputs from the MPEG-2/MPEG-4 Video Encoder shall be connected to the Ethernet Switch. Using a laptop connected to the switch, a client connection shall be opened from the MPEG-2/MPEG-4 Video Encoder to view the video streams. The Standalone Test shall verify the MPEG-2/MPEG-4 Video Encoder is fully operative and can encode video data without
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misrepresentation. In addition, the test shall include the use of the management tool, where the Video Encoder performance and settings shall be demonstrated to be in accordance with the contract documents. The Contractor shall provide a test procedure for the MPEG-2/MPEG-4 Video Encoder Standalone Test to the Engineer for approval a minimum of ten working days prior to the test.

Central Operation Tests shall be performed after establishing all communication links from the field locations to the central hubs. The Central Operation Test shall be performed on the Video Servers to verify that the multicast video streams sent from the MPEG-2/MPEG-4 Video Encoders located in the field cabinet get to the Video Server location and can be viewed in accordance with the specifications criteria and settings. The test shall also be performed using the control management tool in order to have access to the MPEG-2/MPEG-4 Video Encoder unit and view or change the current settings. The Contractor shall provide the Central Operation Testing Procedure to the Engineer for approval prior a minimum of ten working days prior to the test.

System Acceptance Test: When all construction and installations have been completed, and the Central Operations Tests have been passed by all Contract Items, then all ITS elements, and the communications network shall be tested, in order to perform the overall System Acceptance Test. The System Acceptance Test shall be considered to have been passed after 6 months of operation of the ITS equipment from the Traffic Operations Center without any failures.

METHOD OF MEASUREMENT:
The Video Encoder-Decoder Unit will be measured for payment as the number of units furnished, installed, made fully operational and tested. For each Video Encoder Unit furnished, five copies of the Video Decoder software along with three licenses shall be furnished and transferred to NYSDOT.

BASIS OF PAYMENT:
The unit price bid for each Video Encoder Unit shall include the cost of furnishing all labor, materials, Decoder Software, tools and equipment necessary to complete the work in the field and in the control center. Payment for all miscellaneous hardware, cabling, connectors, necessary documentation, testing and training shall be included under this item.

The field equipment cabinets will be paid for under other bid items.

Progress payments will be made in the following percentages of the bid price for each item after each milestone is reached.

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<thead>
<tr>
<th>Stage</th>
<th>Percentage</th>
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<tbody>
<tr>
<td>Approval of Shop Drawings</td>
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<tr>
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<tr>
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<tr>
<td>System Acceptance Test</td>
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