

SPECIAL PROVISIONS FOR SECTION 750-D: CLOSED CIRCUIT TELEVISION SYSTEM

The 2014 Edition of the New Mexico Department of Transportation Standard Specifications for Highway and Bridge Construction shall apply in addition to the following:

1.0 DESCRIPTION.

1.01 This work shall consist of constructing a Closed Circuit Television (CCTV) System complete. It will be used to observe traffic conditions within a highway corridor or the freeway system. The CCTV System is designed to provide the NMDOT with the ability to access video in metro areas or remote sections of the state. Communications are expected to utilize digitized video accessed via fiber, copper or wireless (Wi-Fi / Wi-Max, CDMA (EVDO) or cellular)

A CCTV System shall be composed of a controller cabinet, camera, all mounting hardware, environmental camera enclosure, surge protectors, communications, wiring and conduit, all connecting hardware, installation, video processor, switches, modems, and integration complete, with all applicable licenses necessary to run the installation at the TMC.

Specific Requirements:

1. Users at the transportation management center (TMC) shall be able to access and control the camera in the CCTV system.
2. The CCTV System shall establish a connection with the camera within a maximum of 1 minute.
3. The CCTV System shall provide an authentication process for access to the video signal.
4. The CCTV shall have pan capabilities of 360° continuous pan frame and -90° to 90° tilt range.
5. The CCTV System shall allow the user to command the camera to move to a minimum of 64 camera presets, changing the pan / tilt / zoom (PTZ) setting of the camera.
6. The CCTV System shall utilize NTCIP for controlling the PTZ capabilities of the camera.
7. The CCTV System shall provide a configuration capability that allows the system administrator to limit the access to the PTZ feature to specific users.
8. The CCTV System shall return a minimum of 1 frame per second over a wireless connection.
9. The CCTV System shall be able to utilize a higher bandwidth circuit (ISDN, DSL, T1, fiber optic, wireless or other high speed network technology) if it is made available to the CCTV System.
10. The digital video shall be encoded using Motion JPEG, MPEG, MPEG II or MPEG 4 utilizing uni-cast and/or multi-cast.
11. The digital video shall be viewable in the latest version Microsoft Internet Explorer, Google Chrome, Mozilla Firefox or applicable browsers.
12. The CCTV System shall allow the system administrator to send the digital video to another HyperText Transfer Protocol (HTTP) server to allow access to the video via a direct Internet connection.

13. The CCTV System shall be accessible via NMDOT specified communications to the camera site from the TMC in the event that the LAN is unavailable.
14. The CCTV System configuration utility for the camera shall be accessible both locally and from the TMC.

2.0 MATERIALS.

2.01 General. The Contractor shall furnish and install a CCTV system. All items furnished shall be new and shall be the most current, fully operational and tested version available. The design shall minimize the possibility that failure of any one component or module shall cause total system failure. The failure of one component or module shall not cause the failure of any other component or module.

2.02 Controller Cabinet. The control cabinet shall be mounted as indicated in the plans. This typically shall be on a pole structure away from traffic or protected by guardrail. The control box shall contain the following features:

1. Power-on indicator.
2. Waterproof local/remote switch.
3. Local control LED indicator.
4. RS-232 connection for the camera controller.
5. RS-232 cable
6. 2-120 VAC GFI outlets.
7. Pullout laptop shelf.
8. Modems – Contact ITS-IT Services for modem specifications
9. NEMA 3R rated with neoprene gasketing on doors.
10. Aluminum construction with natural finish.
11. Heavy duty 3-point padlockable hardware on all doors.
12. Minimum R4 rated cabinet insulation.
13. Continuous door length stainless steel hinges (or 1/8" inch aluminum with stainless steel pins)
14. Doors open to 90° with retainer for open position.
15. An RS-485 cable shall provide communication from the local control box to the sign controller.
16. IP Addressable Controller Board (If Applicable)
17. Integrated Surge Protectors with DIN Rails
18. Main Breaker Assembly for Power In to accommodate one (1) 125 VAC, 20 amp
19. Ethernet controlled remote service relay system- This system must be compatible with existing NMDOT control software. Contact NMDOT ITS Bureau regarding existing software details.

The cabinet shall be a sturdy, sheet aluminum housing with two hinged, pad lockable doors equipped with a lock for a Corbin #2 or equal. Two keys shall be furnished with each cabinet. The cabinet shall be at least 27-inches in width by 30-inches in height by 25.5-inches in depth or as required to house the specified equipment. All switches and controls shall be accessible through both doors.

The cabinet shall be designed for side-of-pole mounting. Wiring access to the cabinet shall be through holes located in the bottom, drilled and threaded to accept a 1-1/2-inch GRC conduit, or as detailed on the plans. All cabinets shall be finished as specified by NMDOT.

Cabinet shall be mounted on the opposite side of the pole from the camera. Cabinet straps shall not cover the access panel for the camera lowering device.

All cabinet wiring shall be neat and firm. All wiring and harnesses shall be laced or bound together with Ty wrap or equivalent. All terminals shall be numbered and identified in accordance with a cabinet-wiring diagram, which shall be furnished by the supplier. The CCTV cabinet shall include the following terminals, protection devices, and switches:

1. Main power supply circuit breaker, 20 amp minimum rating.
2. Copper ground strip, grounded to cabinet, for connection of all common conductors.
3. Lightning arrester for filtering lightning or high voltages to ground for protection of equipment.
4. Equipment surge protectors located both in the cabinet and on the camera housing.

2.03 Camera Unit. The Contractor shall furnish and install NMDOT specified camera. The unit shall contain a camera, lens, and pan/tilt/zoom capabilities. The camera unit shall at a minimum meet the following technical criteria:

1. The camera and pan/tilt unit shall be an all-in-one color camera, allowing 360° degree "endless" horizontal viewing.
2. Shall have a focal length of 3.79 mm - 83.4 mm .
3. The tilt range of the camera shall be a minimum of -90° - 90° .
4. The camera shall be auto-panning with a minimum of 64 preset positions, with a designated home position.
5. A privacy masking function shall be provided such that specific areas of the arc may be made inaccessible.
6. The camera lens shall provide for up to 35X, with the camera providing an additional 12X electronic zoom.
7. Day/Night with low light technology (color 0.55 lux / black-white 0.0018 lux)
8. The camera maximum aperture ratio shall be 1:1.6 (wide) to 3.0 (tele).
9. The iris shall be user settable to either automatic (1/2 to 1/30,000) or manual (1/1.5 to 1/30,000).
10. The camera shall operate on a 115 VAC, 60 Hz power source and require no more than 14 watts nominal power.
11. All functions of the CCTV shall be compatible with the video processor.
12. Camera and pan/tilt/zoom shall operate between - 60° F and 140° F.
13. Camera and pan/tilt/zoom shall operate at a relative humidity of 95 percent or less.
14. The camera shall provide 470 horizontal resolution TV lines.
15. The camera will display directional orientation (compass) as its position is changed.
16. The camera shall come with a heater and wiper.

2.04 Environmental Camera Enclosure. The Contractor-supplied and installed camera shall include an environmental closure that is integral to the camera's housing. The housing shall meet NMDOT specified criteria.

2.05 Surge Protectors. The Contractor shall furnish and install surge protection for AC power, communication and video protection.

2.06 AC Power Surge Protector. The Contractor shall furnish and install a surge suppressor that shall be in compliance with NEMA TS1-2.1.06B. The AC surge protector shall connect incoming AC power to the modem. The AC surge suppressor shall at a minimum meet the following technical criteria:

1. Clamp voltage: 395 volts at 2 K amps.
2. Occurrences: minimum 20 impulses at peak current.
3. Operating humidity: 95% (non-condensing) maximum.
4. Operating temperature: -40° F to +185° F.
5. Response time: voltage never to exceed 395 volts during surge.
6. Service current: 16 amp maximum, 120 VAC, 60 Hz.

2.07 Communications Surge Protector. The Contractor shall furnish and install a I/O surge suppressor in the controller cabinet. The surge suppressor shall protect the CCTV System from power surges and transient lighting strikes that might enter the system through the communications infrastructure. The surge suppressor shall at a minimum meet the following technical criteria:

1. Clamp Voltage: 10V at 1 kA
2. Bandwidth: 0.25 MHz (-3dB).
3. Maximum surge current: 10,000 amps.
4. Operating humidity: 95% (non-condensing) maximum.
5. Operating temperatures: -40° F to +122°F.
6. Resistance: 4.3 Ohms.
7. Let Through voltage: 12 volts at 5kV.
8. Maximum working voltage: 0.5 V

2.08 Video Surge Protector. The Contractor shall provide a surge suppressor for the video coaxial line between the camera and the video server. The surge suppressor shall be a single coaxial line protector utilizing three stage hybrid technology. The coaxial line protector shall address over voltage transients with gas tubes and silicon avalanche devices. Furthermore, sneak and fault currents shall be mitigated with solid state resettable fuses. The video surge suppressor shall at a minimum meet the following technical criteria:

1. Peak Surge Current: 10KA
2. Attenuation: 0.1 dB @ 10 MHz.
3. Response Time: < 1 ns.
4. Protection: line to ground.
5. Clamp Voltage: 8 volts.

6. Connector Type: BNC.
7. Impedance: 75 ohms.
8. Operating Temperature: -40° F to 185° F.
9. Operating Humidity: 95%, RH (non-condensing)
10. Bandwidth: 150 MHz
11. Let-through Voltage: 30 volts.

2.1 Video Server/Encoder. The Contractor shall furnish and install an approved uni-cast video server (when outside of the NMDOT-ITS Infrastructure) or an approved multi-cast processor/encoder with installed within the NMDOT-ITS Infrastructure, as specified by NMDOT-ITS. The video server shall receive analog NTSC color video signals from the CCTV cameras in the field, digitally encode them using Motion JPEG, MPEG, MPEG II, or MPEG IV and interface with the communication network for transmission to the TMC. The video server/encoder unit shall be capable of implementing a connection to the NMDOT network via ISDN service, cellular CDMA (EVDO), fiber optic, and the internet. The processor system shall be capable of decoding the encoded video transmissions at the TMC via hardware (decoder) and software applications. The video server shall at a minimum meet the following technical criteria:

1. Power Supply Input: 100-240 VAC, 50/60 Hz, ~ 55 watts and/or + 24 V
2. Power Output: +24 V up to 3.0 A
3. Operating Temperature: 32° F to 158° F.
4. Operating Humidity: Up to 90%, non-condensing.
5. Be Internet HTTP (IP) addressable.
6. Remote configuration and status using web based software tools.
7. Provide timestamps and text overlay.
8. Have a 10/100 Mbps Ethernet interface with a RJ-45 connector.
9. Support a single NTSC signal through a single BNC composite video connection with a 75 ohm termination.
10. Use standard internet TCP/IP suite of HTTP.
11. When applicable, shall be supplied with hardware and software decoding equipment compatible with NMDOT's TMC infrastructure, as specified by NMDOT.

2.1.1 Modem. The Contractor shall furnish and install a CDMA (EVDO) cellular modem and a fiber optics modem, as specified by NMDOT-ITS. The modem shall report connectivity between the video server and the TMC or designated intermediate server. The fiber optics modem shall at a minimum meet the following technical criteria:

Connectivity:

- 1-RS232 and 1-RS422/485 port
- 1-10BaseTX
- Fully compliant EIA/TIA RS485 and RS232 ports
- Built-In optional RS485 Termination

Serial Encapsulation:

- Transmit serial data over an IP network
- Support for Modbus TCP, DNP 3, TIN serial protocols
- Baud rates up to 230 kbps

- Point to point and multi-point modes
- Convert Modbus RTU to Modbus TCP
- Support multiple Modbus masters
- Use 'Serial IP' port redirection software to support PC applications statistics and built-in 'sniffer' for troubleshooting

Universal Power Supply Options:

- Input voltages of 24VDC, 48VDC, HI = (88-300VDC or 85-264VAC) for worldwide operability
- Integrated power supply eliminates need for an awkward external power transformer
- Screw down terminal blocks ensure reliable maintenance free connections
- CSA/UL 60950 safety approved to +85°C

Designed for Harsh Environments:

- Exceeds IEC 61850-3 requirements for electric power substations
- Exceeds IEC 61000-6-2 for industrial environments
- Exceeds NEMA TS 2 requirements for traffic control equipment
- Meets IEEE 1613 requirements for electric power substations
- 3kV (RMS) Isolated serial ports
- Operates over a temperature range of -40°C to +85°C without the use of fans for improved reliability
- 21 AWG galvanized steel enclosure and DIN or panel mounting options provide secure mechanical reliability

Management and Diagnostics:

- Web-based, Telnet, CLI management interfaces
- SNMP v2/v3 with traps
- Rich set of diagnostics with logging and alarms
- Ethernet and Serial LED indicators aid in field troubleshooting
- Flash memory for easy upgrades
- System watchdog with automatic reset
- Built in real time clock and SNTP time synchronization

The cellular communications modem must be compatible with NMDOT's current wireless carrier (Verizon). In addition, the following functional requirements must be met:

- Dimensions Less than 5" x 2" x 3"
- Input Voltage 9 - 28V DC
- Power Consumption (@12V DC)
 - Transmit / Receive (typical / max) 239/270 mA
 - Idle 104 mA

- Dormant 85 mA
- LED Indicators
 - Network, Signal, Activity, Service, Power
- Radio Features
 - EV-DO Rev. A with Fallback to EV-DO Rev. 0 and CDMA 1x
 - Dual-Band Support (800 MHz cellular and 1900 MHz PCS)
 - Receive Diversity
- Data Rates
 - EV-DO Rev. A:
 - Downlink - 3.1 Mbps max; 450 - 850 Kbps typical
 - Uplink - 1.8 Mbps max; 300 - 400 Kbps typical
 - EV-DO Rev. 0:
 - Downlink - 2.4 Mbps max; 300 - 500 Kbps typical
 - Uplink - 153.6 Kbps max; 60 - 90 Kbps typical
 - CDMA 1x:
 - Downlink - 153.6 Kbps max; 60 - 90 Kbps typical
 - Uplink - 153.6 Kbps max; 60 - 90 Kbps typical
- Certification
 - Class I Div 2, Parts A, B, C & D
- Host Interfaces
 - Ethernet *10/100 Mbps RJ-45*
 - RS-232 *DB9 DCE (300-230400 baud)*
 - Antenna Connection *Primary - 50 Ohm SMA*
Receive Diversity - 50 Ohm SMA
- Application Interfaces

TCP/IP, UDP/IP, DHCP, HTTP, SNMP, SMTP, SMS, MSCI, Modbus

3.0 CONSTRUCTION REQUIREMENTS.

3.01 General. The hardware and support services specified herein are intended to describe the minimum configuration that will be acceptable for a CCTV System. All changes to this special provision are subject to approval by the ITS Engineer or designee. The Contractor shall provide all drawings, schematics, material lists, fabrication details and specifications to the ITS Engineer or designee for approval 30 days prior to procurement of the equipment.

All cabling and connections required to ensure the CCTV System is fully operational shall be furnished by the Contractor and shall be considered incidental to the system. All cabling shall be copper/fiber unless approved by the ITS Engineer or designee.

Any integration to communicate with the system shall be the responsibility of the Contractor and completed at the expense of the Contractor without additional cost to the NMDOT.

The CCTV system shall include all incidental items, hardware, and equipment necessary to make the CCTV system operational and complete in all respects, including all items not individually specified, and the items shall be furnished and installed without additional cost to the NMDOT.

3.02 Integration. The Contractor shall coordinate with the NMDOT – ITS IT Staff to determine specific IP addresses and network routing for the video over the LAN. Video images shall be routed over the NMDOT – ITS LAN to the TMC.

The Contractor shall be responsible for the configuration of all hardware and development and implementation of any applications necessary to communicate between computers within the network. It is envisioned that this networking shall be done using NMDOT specified software. Such communications shall include, but are not limited to:

1. Initiation of accessing the camera video server/processor from a desktop or central controlling application at the TMC or any other configured computer with access to the NMDOT LAN.
2. Identification and assignment of IP addresses to the video server/processers and other CCTV related devices as necessary.

All camera control functions and desktop applications for the camera selection, routing, addressing and control shall be provided by the Contractor via NMDOT-specified software and/or developed and sold by the manufacturer of the CCTV equipment procured for this contract. Camera control functions must comply with NTCIP.

Development and installation of this software shall be considered incidental to the CCTV Communication System, and shall not be additionally compensated by the NMDOT. These applications and any licenses shall become property of the NMDOT upon payment for the system and as such may be copied and installed on other NMDOT machines at the discretion of the NMDOT.

3.03 Documentation. The Contractor shall provide manufacturer documentation for all components of the CCTV System. The documentation shall provide a complete and precise technical description of the system equipment and materials and shall thoroughly demonstrate that the systems, including all assemblies, fully conform to all requirements of the specifications.

The Contractor shall provide an electronic copy of the manual on the operation, maintenance, and troubleshooting of all system components. The documentation shall include routine maintenance procedures and schedules for all equipment and materials. The manuals shall be included in the bid price for the CCTV System.

3.04 Data Collection. Contractor shall provide following data included in GPS shape file of the system installed. GPS data shall be collected in WGS84 and decimal degrees format. In addition, the Contractor shall contact ITS Engineer to obtain the excel file template of documenting required data.

Project CN, Lat, Long, Manufacturer, Mount, CCTV Type, Comm, Processor, Meter Info, Model No., Serial No.

3.05 Testing. In addition to these requirements, the Contractor shall be required to demonstrate compliance with special provision “ITS System Acceptance Testing”. Where there is a difference between the two requirements the more conservative requirement must be met.

The Contractor, prior to final acceptance, shall test the CCTV System. The Contractor shall furnish all necessary equipment and labor required for the testing at the site, including, but not limited to a laptop computer with software enabling local control of all CCTV functions required in this specification.

Testing shall be performed in the presence of the ITS Engineer or designee. The contractor shall submit documents containing proposed test procedures, test equipment, and expected results to the Engineer for review at least 30 days prior to performing any tests. Tests shall not be performed without written approval of the ITS Engineer or designee.

Local testing shall be done using a laptop computer. The computer monitor shall be used to display the real time view of the camera during testing. At a minimum, the testing shall demonstrate all features, including those required by this specification, and any additional features, including, but not limited to:

1. Demonstrate 360 degree pan of camera
2. Demonstrate a tilt range of -90 to 90 degrees with the camera.
3. Demonstrate the privacy masking function such that specific areas of the arc may be made inaccessible.
4. Demonstrate the camera lens capability of 35X viewing and the camera capability of an additional 12X electronic zoom.
5. Demonstrate the user settable iris in both automatic and manual modes.
6. Demonstrate that the camera can be connected from a user workstation of the TMC via the LAN.
7. Demonstrate that the camera can be connected using the central controlling software at the TMC via the LAN.
8. Demonstrate that the camera can be connected from user workstation at the TMC via internet.
9. Demonstrate that the camera can be switched to 64 different presets via the LAN and via dialup from the TMC.
10. Demonstrate the camera can display directional orientation (compass) when position is being changed.

A complete report of each test performed shall be submitted. The report shall include all actions and results and all failures and corrective or preventive measures taken. Full compensation for performing the local operational tests as specified herein shall be considered incidental to the CCTV System and no separate payment will be made therefor.

4.0 Warranty. All equipment shall have a minimum warranty period of five (5) years from the date of acceptance. Each warranty shall include actual parts and labor for any warranty work performed at the manufacturer's facility. Warranty is to also include on-site diagnostic and repairs [up to two (2) per year] at no additional expense to the Department. If a repair requires more than three (3) working days to complete during the warranty period, temporary replacement equipment shall be installed at no expense to the Department during the warranty period until the original equipment may be reinstalled.

A copy of each written warranty shall be included and submitted by the Contractor and approved by the ITS Engineer or designee prior to construction of the CCTV System. The NMDOT shall be designated as the holder of each component warranty. Each warranty shall indicate the manufacturer responsible for the

components of the system and contact information for the manufacturer shall be provided with each warranty. The manufacturer shall be responsible for the replacement or repair of any system component that fails during the warranty period. Any replacement or repair of the system shall be done to the satisfaction of NMDOT ITS Engineer or designee during the warranty period.

Each manufacturer shall be available (return response within two hours) via telephone/e-mail/pager 24 hours per day, 365 days per year for technical service assistance. This shall minimally include toll-free telephone support with emergency voice mail/paging features for after hours contact, toll-free nationwide paging, and a complete supply of repair parts and access to manufacturer's technicians to perform additional contracted services.

5.0 METHOD OF MEASUREMENTS.

Closed Circuit Television System will be measured by the unit per each.

6.0 BASIS OF PAYMENT.

6.01 The accepted quantities of a Closed Circuit Television System will be paid for at the contract unit price per each.

Pay Item

Pay Unit

Closed Circuit Television (CCTV) System

Each

- Fifty percent (50%) of the bid price for this item will be paid upon successful installation and completion of the approved on-site stand alone.
- Twenty percent (20%) of the bid price will be paid upon successful installation and completion of the approved TMC stand alone test
- Twenty percent (20%) of the bid price will be paid upon successful installation and integration and completion of the integrated system acceptance tests for all systems.
- Ten percent (10%) of the bid price will be paid upon successful completion of the 30 calendar day operational test period and delivery of approved GIS data.

6.02 Work Included in Payment.

When a CCTV System is called for in the Contract, the accepted quantity complete in place will be considered full compensation for furnishing all materials, labor, tools, equipment, testing, warranty, and appurtenances necessary to complete the work as directed by the ITS Engineer or designee. Materials shall be considered to include camera unit, environmental enclosure, surge protectors, video server/processor, switches, modems (fiber optics and CDMA/EVDO), and all cabling and miscellaneous hardware required.

The documentation of the system shall be provided by and at the expense of the Contractor. All documents shall be provided to the ITS Engineer or designee at least 30 days in advance of final acceptance. The

documentation shall be approved by the ITS Engineer or designee prior to final acceptance of the CCTV System.

The testing of the system components as an integrated unit shall be done by and at the expense of the Contractor under the direct supervision of the ITS Engineer or designee.

The training of NMDOT staff to operate and maintain the CCTV System shall be done by and at the expense of the Contractor under the direct supervision of the ITS Engineer or designee, when training is specified as part of the contract.