



Illinois Department of Transportation

2300 South Dirksen Parkway / Springfield, Illinois / 62764

April 20, 2005

SUBJECT: FAI Route 90/94
Project ACIM-943(369)55
Section 2003-311
Cook County
Contract No. 62583
Item No. 125, April 29, 2005 Letting
Addendum A

NOTICE TO PROSPECTIVE BIDDERS:

Attached is an addendum to the plans or proposal. This addendum involves revised and/or added material.

1. Revised Table of Contents
2. Revised pages 48 – 49, 59 – 60, 61, 111 – 152 and 399 – 400 of the Special Provisions.
3. Added page 410 to the Special Provisions.
4. Revised pages 1, 6, 12 and 14 of the Schedule of Prices.
5. Revised sheets 2A, 2C, 4, 5, 6, 8 and 11 of the Plans.

Prime contractors must utilize the enclosed material when preparing their bid and must include any Schedule of Prices changes in their bidding proposal.

Bidders using computer-generated bids are cautioned to reflect any and all Schedule of Prices changes, if involved, into their computer programs.

Very truly yours,

Michael L. Hine
Engineer of Design
and Environment

A handwritten signature in cursive script, reading "Ted B. Walschleger P.E." with a small "P.E." to the right.

By: Ted B. Walschleger, P. E.
Engineer of Project Management

cc: Diane O'Keefe; N. R. Stoner; Roger Driskell; Jim White; Design & Environment File

TBW:TK:jc

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Basis Of Payment. This item shall be paid at the Contract unit price each for GROUND ROD, of the diameter and length indicated which shall be payment in full for the material and work described herein.

UNDERGROUND RACEWAYS

Revise Article 810.03 of the Standard Specifications to read:

“Installation. All underground conduit shall have a minimum depth of 700 mm (30-inches) below the finished grade, or as otherwise indicated on the plans.”

Add the following to Article 810.03 of the Standard Specifications:

“All metal conduit installed underground shall be Rigid Metal Conduit unless otherwise indicated on the plans.”

RACEWAYS EMBEDDED IN STRUCTURE

Section 810 of the Standard Specifications for Road and Bridge Construction shall be modified as follows:

Add the following to Article 810.03(c):

“(c) Coilable Nonmetallic Conduit.

Polyethylene Duct. The duct shall be a UL Listed plastic duct which is intended for underground use and can be manufactured and coiled or reeled in continuous transportable lengths and uncoiled for further processing and/or installation without adversely affecting its properties of performance.

The duct shall be in accordance with the requirements of ASTM F2160.

The duct shall be composed of black high density polyethylene meeting the requirements of ASTM D 3350, Class C, Grade PE30.

Duct dimensions shall conform to the following table within the manufacturing tolerances set forth in ASTM F2160. Duct sizes through 3” shall conform to Tables 3 and 8 for Schedule 40 PE conduit. 4” duct shall conform to Tables 2 and 5 for SDR 13.5 PE conduit.

Nom. Duct Diameter		Nom. Outside Diameter		Min. Wall Thickness	
mm	In	mm	in	mm	in
27	1	33.4	1.315	3.4	0.133
35	1.25	42.2	1.660	3.6	0.140
41	1.5	48.3	1.900	3.7	0.145
53	2.0	60.3	2.375	3.9	0.154
76	3.0	88.9	3.50	5.5	0.216
102	4.0	114.3	4.50	8.5	0.333

Performance Tests. Polyethylene Duct testing procedures and test results shall meet the requirements of ASTM F2160. Certified copies of the test report shall be submitted to the Engineer prior to the installation of the duct.

Coilable non-metallic conduit 2” and larger shall be machine straightened to remove the longitudinal curvature and ovality caused by coiling the conduit onto reels prior to installing in trench, encasing in concrete or embedding in structure. The straightening shall not deform the cross-section of the conduit such that any two measured outside diameters, each from any location and at any orientation around the longitudinal axis along the conduit differ by more than 6 mm (0.25”). The longitudinal axis of the straightened conduit shall not deviate by more than 20 mm per meter (0.25” per foot) from a straight line.

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The recommendations of the straightening machine manufacturer regarding ambient temperature shall be followed.”

Section 812 of the Standard Specifications for Road and Bridge Construction shall be modified as follows:

Add the following to Article 812.02:

“(d) Coilable Nonmetallic Conduit....1088.01(c)”

Change Article 812.03(d) to 812.03(e).

Add the following as the new Article 812.03(d):

“(d) Coilable Nonmetallic Conduit. Conduit installation shall be according to Article 810.03(c).”

Add the following paragraph to Article 812.03:

All conduits which extend outside of the structure but are not terminated in a cabinet, junction box, pull box, handhole, post, pole, or pedestal shall extend a minimum of 300 mm (12”) or the length shown on the plans beyond the structure. The end of this extension shall be capped and sealed with a cap designed for the conduit to be capped. The ends of rigid metal conduit to be capped shall be threaded, the threads protected with full galvanizing, and capped with a threaded galvanized steel cap. The ends of rigid nonmetallic conduit and coilable nonmetallic conduit shall be capped with a rigid PVC cap of not less than 3 mm (0.125”) thick. The cap shall be sealed to the conduit using a room-temperature-vulcanizing (RTV) sealant compatible with the material of both the cap and the conduit. A washer or similar metal ring shall be glued to the inside center of the cap with epoxy, and the pull cord shall be tied to this ring.

EXPOSED RACEWAYS

Effective Date: March 1, 2003

Add the following to Article 811.03(a)(3) of the Standard Specifications:

“Where PVC coated conduit is utilized, all conduit fittings, couplings and clamps shall be PVC coated. All other mounting hardware and appurtenances shall be stainless steel.”

Add the following to Article 811.03(b) of the Standard Specifications:

“The personnel installing the PVC coated conduit must be trained and certified by the PVC coated conduit Manufacturer or Manufacturer’s representative to install PVC coated conduit. Documentation demonstrating this requirement must be submitted for review and approval.”

“All conduit fittings, couplings and clamps shall be PVC coated. All other mounting hardware and appurtenances shall be stainless steel.”

Revise Article 1088.01(a) of the Standard Specifications to read:

“Couplings and fittings shall meet ANSI Standard C80.5 and U.L. Standard 6. Elbows and nipples shall conform to the specifications for conduit. All fittings and couplings for rigid conduit shall be of the threaded type.”

Revise Article 1088.01(a)(1) of the Standard Specifications to read:

“Rigid Steel Conduit. Rigid steel conduit shall be galvanized and manufactured according to UL Standard 6 and ANSI Standard C 80.1.”

Revise Article 1088.01(a)(3) of the Standard Specifications to read:

Revised 04-20-2005

LIGHT POLES

Effective Date: March 1, 2003

Revise the fifth sentence of Article 1069.01(b)(2)d of the Standard Specifications to read:

“A 9.525 mm (3/8 in.) – 16 tapped hole shall be provided in the frame for attaching a mechanical grounding connector.”

Revise the third sentence of Article 1069.01(c)(2)b5 of the Standard Specifications to read:

“A 9.525 mm (3/8 in.) – 16 tapped hole shall be provided in the frame for attaching a mechanical grounding connector.”

STAINLESS STEEL JUNCTION BOX

Effective Date: January 1, 2002

Revise the second sentence of the seventh paragraph of Article 1088.04 of the Standard Specifications to read:

“The gasket shall be extruded directly onto the junction box cover.”

UNIT DUCT

Revise the second paragraph of Article 816.03(b) to read:

“The unit duct shall be installed at a minimum depth of 760 mm (30-inches) unless otherwise directed by the Engineer.”

Revise Article 1066.01 to read:

“1066.01 Unit Duct. The unit duct shall be an assembly of insulated conductors which are factory pre-installed in a coilable nonmetallic conduit. The polyethylene duct shall be extruded directly over the cable at the factory in long continuous lengths. The unit duct shall be according to NEC Article 354 and be UL Listed.”

Revise Article 1088.01(c) to read:

“(c) Coilable Nonmetallic Conduit.

Polyethylene Duct. The duct shall be a plastic duct which is intended for underground use and can be manufactured and coiled or reeled in continuous transportable lengths and uncoiled for further processing and/or installation without adversely affecting its properties of performance.

The duct shall be in accordance with the requirements of ASTM F2160.

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The duct shall be composed of black high density polyethylene meeting the requirements of ASTM D 3350, Class C, Grade PE30.

Duct dimensions shall conform to the following table within the manufacturing tolerances set forth in ASTM F2160 for Schedule 40 (Tables 3 and 8):

Nom. Duct Diameter		Nom. Outside Diameter		Min. Wall Thickness	
mm	In	mm	in	mm	in
27	1	33.4	1.315	3.4	0.133
35	1.25	42.2	1.660	3.6	0.140
41	1.5	48.3	1.900	3.7	0.145
53	2.0	60.3	2.375	3.9	0.154

Performance Tests. Polyethylene Duct testing procedures and test results shall meet the requirements of ASTM F2160. Certified copies of the test report shall be submitted to the Engineer prior to the installation of the duct.”

REINFORCED CONCRETE DUCTBANK

Description. This item shall consist of forming and finishing a reinforced concrete ductbank including spacers, rebar and all required formwork as detailed on the plans and specified herein.

Materials. Materials shall conform to the requirements of the Standard Specifications except as modified below.

Revise Article 1088.01(c) to read:

“(c) Coilable Nonmetallic Conduit.

Polyethylene Duct. The duct shall be a UL Listed plastic duct which is intended for underground use and can be manufactured and coiled or reeled in continuous transportable lengths and uncoiled for further processing and/or installation without adversely affecting its properties of performance.

The duct shall be in accordance with the requirements of ASTM F2160.

The duct shall be composed of black high density polyethylene meeting the requirements of ASTM D 3350, Class C, Grade PE30.

Duct dimensions shall conform to the following table within the manufacturing tolerances set forth in ASTM F2160. Duct sizes through 3” shall conform to Tables 3 and 8 for Schedule 40 PE conduit. 4” duct shall conform to Tables 2 and 5 for SDR 13.5 PE conduit.

Nom. Duct Diameter		Nom. Outside Diameter		Min. Wall Thickness	
mm	In	mm	in	mm	in
27	1	33.4	1.315	3.4	0.133
35	1.25	42.2	1.660	3.6	0.140
41	1.5	48.3	1.900	3.7	0.145
53	2.0	60.3	2.375	3.9	0.154
76	3.0	88.9	3.50	5.5	0.216
102	4.0	114.3	4.50	8.5	0.333

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Performance Tests. Polyethylene Duct testing procedures and test results shall meet the requirements of ASTM F2160. Certified copies of the test report shall be submitted to the Engineer prior to the installation of the duct.

Coilable non-metallic conduit 2" and larger shall be machine straightened to remove the longitudinal curvature and ovality caused by coiling the conduit onto reels prior to installing in trench, encasing in concrete or embedding in structure. The straightening shall not deform the cross-section of the conduit such that any two measured outside diameters, each from any location and at any orientation around the longitudinal axis along the conduit differ by more than 6 mm (0.25"). The longitudinal axis of the straightened conduit shall not deviate by more than 20 mm per meter (0.25" per foot) from a straight line. The recommendations of the straightening machine manufacturer regarding ambient temperature shall be followed."

Concrete used in ductbank shall be Class SI meeting the requirements of the Standard Specifications for Road and Bridge Construction Section 1020 and shall be tested in accordance with the applicable requirements of the Standard Specifications.

Execution. Construction of the ductbank shall be in accordance with Section 810 of the Standard Specifications. Refer to plan sheets for details.

The engineer shall inspect the ductbank and verify location of reinforcing rebar, conduit spacers and duct joints prior to placing of concrete. The Contractor shall be responsible for coordinating the Engineer's inspection and obtaining his approval.

Basis of Payment. This item shall be paid for at the Contract unit price per foot for CONDUIT ENCASED, REINFORCED CONCRETE of the type, diameter and quantity specified, which shall be payment in full for the material and work described herein.

MAINTENANCE OF LIGHTING SYSTEMS

Effective Date: March 1, 2003

Replace Article 801.12 of the Standard Specifications with the following:

Effective the date the Contractor's activities (electrical or otherwise) at the job site begin, the Contractor shall be responsible for the proper operation and maintenance of all existing and proposed lighting systems which are part of, or which may be affected by the work until final acceptance or as otherwise determined by the Engineer.

Before performing any excavation, removal, or installation work (electrical or otherwise) at the site, the Contractor shall initiate a request for a maintenance transfer and preconstruction inspection, as specified elsewhere herein, to be held in the presence of the Engineer and a representative of the party or parties responsible for maintenance of any lighting systems which may be affected by the work. The request for the maintenance preconstruction inspection shall be made no less than seven (7) calendar days prior to the desired inspection date.

Existing lighting systems, when depicted on the plans, are intended only to indicate the general equipment installation of the systems involved and shall not be construed as an exact representation of the field conditions. It remains the Contractor's responsibility to visit the site to confirm and ascertain the exact condition of the electrical equipment and systems to be maintained.

Maintenance of Existing Lighting Systems

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The Engineer will notify the Contractor that a warranted item needs repair. The Contractor shall acknowledge the notification within 24 hours and replace or correct any part or parts of materials and equipment that are found defective within the two-year in-service warranty period. All items needing repair shall be returned to the Department in two weeks from the date of receipt at the Contractor's facility or replaced in-kind by the Contractor, and the Contractor shall be responsible for any return shipping costs. No compensation will be made to the Contractor for such replacements or corrections.

The Contractor shall provide a warranty certificate for this item and its related components to the Department. The Department reserves the right to transfer this service to other parties who may be Contracted with in order to provide overall maintenance of this item.

Basis of Payment. CABINET, MODEL 334 and CABINET, MODEL 334, DYNAMIC MESSAGE SIGN; measured as provided above, will be paid for at the Contract unit price each, which price shall be payment in full for furnishing and installing the cabinet and all connections; testing, and for all labor, tools, equipment, transportation, and incidentals necessary to complete this item of work.

(EK – 03/19/2004, Revised: CTE – 03/23/2005)

CCTV DISTRIBUTION SYSTEM

April 15, 2005

Description.

General. The CCTV (Closed Circuit Television) Distribution System shall be a fully integrated IP multicast system, comprised of hardware and software, providing multi-point internet protocol based video images and control over Ethernet to multiple monitoring center locations while minimizing bandwidth demand upon the system. The system shall be configured to avoid a single point of failure that could totally shut down the system. The system shall include video selection and control features as well as video management and archiving as specified.

The system shall be generally configured as indicated on the plans to collect video images and connect control from field mounted cameras at distribution node locations and to produce video images and controls at designated distribution nodes and at three monitoring locations under this contract work.

The work under this Special Provision shall include system integration and complete, coordinated submittals as specified. The work shall also include a structured shop-floor test of the assembled and interconnected nodal sub-systems witnessed by the Engineer as specified, staged installation and activation, complete record documentation, system maintenance during construction, system maintenance training, and extended maintenance and support, all as specified.

The three monitoring locations to be addressed by this contract under this item are:

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The ComCenter at the District 1 Headquarters in Schaumburg
The Traffic Systems Center in Oak Park

These monitoring locations and the distribution node locations are depicted on the plans and are as defined by the sub-system pay items under this Special Provision. The system shall have capability for additional locations under future work without the need to replace existing system equipment items.

Equipment shall be installed at locations as indicated on the plans, including existing buildings, existing and proposed distribution node equipment huts and at temporary locations as may be indicated.

The system shall utilize existing CCTV elements to the extent indicated but shall otherwise include all materials and equipment necessary to provide a complete operating system. Cameras that are provided under this contract are specified as separate pay items and the connection of these cameras to respective distribution system nodes is covered under separate pay item work. The work under this Special Provision includes the coordination with camera equipment provided under this contract and coordination with existing CCTV equipment as indicated, including adjustments of or supplements to the remote equipment as may be required, but in general, the CCTV Distribution System work shall encompass physical interface to electrical power, fiber optic cable and existing devices as indicated within the various distribution system nodes (equipment huts) and at the monitoring locations.

The system shall operate to allow monitoring location workstations to select and accept video image and control information on fiber from remote field devices and to route display within the monitoring location. When display or control is initiated from a monitoring center, the system shall select and route the image and control information producing the directed image on the selected monitor and connecting control to the selected camera. The system shall provide for display of the same selected image simultaneously at multiple monitoring center locations and on multiple monitors at the same monitoring center location without adding to the system bandwidth demand. Control features shall be as specified in detail elsewhere herein.

The integration of this system with existing CCTV distribution will allow the re-use of designated CCTV elements, but certain existing CCTV distribution elements will no longer be used within this system. Unless otherwise indicated, all existing CCTV equipment and systems that are removed from service shall remain property of the Department and shall be appropriately removed and delivered in working order in safe storage packing to the Engineer at a designated location within District 1.

Communications. The system's communications shall utilize and build upon the existing IDOT District I SONET infrastructure that uses both fiber and microwave radio links. Equipment shall be sized for OC-48 fiber capacity and OC-12 equivalent microwave capacity, even when initially provisioned for less.

The system shall employ MPEG-2 video compression at 6 Megabits per second.

Video Control. The system shall include a Video Control Subsystem as described herein for camera and display selection as well as control of camera pan, tilt and zoom. Where indicated,

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joystick control for pan, tilt and zoom functions shall also be provided. The system shall provide a programmable hierarchy of video selection and control, with system manager provisions, with protected security, at the District 1 ComCenter.

JPEG Interface. The system shall provide a regular continuous polling sample of all cameras connected to the system, with JPEG images that are extracted to files accessible to the IDOT ITS Office Gateway for display on the Gateway Web page. The JPEG Video Capture encoders shall be programmed to transfer a JPEG file to an IDOT FTP site. The Contractor shall program the file name and the IP address of the FTP site. This equipment set up shall include all necessary elements to provide file capture and transfer at regularly scheduled intervals. The length of these intervals will be identified by the Engineer.

Coordination with other Pay Items. The system shall be provided as a complete, integrated whole, grouped into installed location packages that are unique for each indicated location. Certain locations (such as I80 at the State Line) shall be provided with communications hut facilities under separate pay items, as indicated, in this contract. Other locations, (such as the Hillside Hub), have existing huts or buildings and the CCTV Distribution System items shall be installed within these existing facilities.

All wiring, cabling and other provisions necessary to connect and integrate components within each location package shall be included with the respective system package. The system, in addition to being coordinated with camera items specified elsewhere herein, shall be completely coordinated with associated pay items for System Integration and Shop Staging Tests, System Documentation and Training, Installed Testing and Commissioning, as well as Maintenance of Existing CCTV.

Coordination with Other Contracts. The final system installation will be dependent upon the completion of work done in other contracts, particularly as it applies to the completion of raceways and the installation of interconnecting fiber between system nodal locations. The installation of the system shall be fully coordinated with other contracts.

Certain nodal equipment included in this system is intended for ultimate installation in facilities that are provided or made accessible under a future separate contract. When indicated on the plans, the installation of this equipment may be directed by the Engineer to be at adjacent nodal locations, for future relocation under another contract. When such temporary interim placement is selected, fiber connection to the adjacent nodal equipment shall be made via a temporary connection and system configuration shall accommodate the interim absence of fiber optic communications continuity. Alternately, if the timing of other construction contracts permits, the Engineer reserves the option to designate installation at the planned locations, with the work appropriately coordinated with the other contract work.

Interconnecting Wiring. All wiring, cabling, and other provisions necessary to connect the installed system package to power panel boards, fiber optic patch panels, grounding systems, etc. at each nodal location shall also be included as part of each respective location package.

Maintenance of Existing CCTV System. Maintenance of the existing CCTV System shall be transferred from the ASMC (Advanced Systems Maintenance Contract). to the contractor from the time that access to the existing system is needed for field installation of the system expansion until final acceptance of the expanded system.

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The existing system shall remain in essentially continuous operation throughout the expansion construction, with limited downtime as approved in advance, in writing, by the Engineer. The existing system is used, among other things, for the operation of the gate system on the

Kennedy Expressway reversible lanes (REVLAC), and this system shall remain operational on a daily basis. The REVLAC system incorporates certain features that allow operation of devices from the various remote control buildings of the system. Should the contractor require extended (more than 8-hour downtime of the SONET system, with Engineer approval, the contractor shall be responsible for the costs to have the REVLAC system operated from the remote buildings by the ASMC contractor, on a time and material basis.

Submittals. The Contractor shall assemble and submit a complete and detailed description of the system including the proposed equipment, system interconnects, and software. Recognizing the complex detail of this system, the submittal timeframe for this submittal is extended beyond the 30 days from contract execution required for other contract items. The complete package for the CCTV Distribution System shall be submitted no later than 60 days after contract execution, although certain information shall be required at the preconstruction meeting.

At the preconstruction meeting, the contractor shall identify the following:

- CCTV System Integrator and Subcontractors
- CCTV Control and Video Management software vendor
- Video Encoder and Decoder manufacturer
- Communications Subsystem Integrator and Proposed Equipment

The system submittal package shall be complete and shall document compliance with all specified system requirements. It shall include product data of all manufactured components, interconnecting cabling, accessories and appurtenances. It shall include dimensioned shop drawings of any fabricated equipment and sub-assemblies (such as equipment rack layouts). The submittal shall include overall system diagrams and detailed interconnection diagrams for all parts of the system. The submittal package shall identify the details of non-equipment requirements of the system, such as specified maintenance training, and it shall include letters of commitment relative to specified extended maintenance support of key vendor items as specified. As a minimum, the submittal package shall include, but not be limited to:

- System installation schedule
- SONET/GigE System hardware, complete
- Fiber Optic Transceivers & other fiber optic hardware
- Video Encoders & Decoders
- Video Monitors
- Video Workstation equipment and software
- Video Administration and Central Control Hardware and software
- Communications Sub-System Management equipment and software
- Video Archiving equipment and software
- Power Supplies and associated appurtenances
- Equipment racks associated appurtenances
- All interconnecting power, signal and control cable, connectors and appurtenances

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- All mounting accessories and hardware
- Overall System Diagram
- Sub-System Location Diagrams
- Point-to-Point Interconnection Diagrams
- Dimensioned Rack Layout Drawings
- All installation and maintenance manuals or a schedule to provide them
- Shop Floor Testing Plan, location and interconnection details
- Video and Communications Maintenance Training Plans
- Documentation of Extended Warranty provisions, as specified
- Plan for providing specified documentation
- Cable Tray
- Schedule for submitting Test Plans

Materials.

SONET System Equipment.

Existing Configuration

The basic communications infrastructure shall build upon the existing SONET network and shall utilize SONET switches matching the existing Cisco 15454 SONET equipment, currently maintained under the district Advanced Systems Maintenance Contract (ASMC) having SONET maintenance performed by SBC. Switches shall be furnished and installed, configured and tested by a manufacturer-certified agent. The Contractor may request and inspection of the existing equipment prior to the Letting date.

Proposed Configuration

The system's communications shall use and build upon the existing IDOT District 1 SONET infrastructure, using both fiber and microwave radio links. Equipment shall be sized for OC-48 fiber capacity and OC-12 microwave capacity, even when initially provisioned for less.

The video transport shall use a combination of SONET and Ethernet. Five additional SONET node locations shall be provided; these are in addition to the existing Hillside Hub and Schaumburg HQ sites.

A new SONET ring shall include nodes at the Hillside hub, at I-55, at I-57/I-294, and the Traffic Systems Center. A SONET spur shall be included to I-80 at the State Line. At this time the I-80 site will not have an alternate path north towards I-55, this capability is being considered in a future phase and shall be taken into account in the equipment selection.

In order to be compatible with the existing system, the SONET nodes shall utilize the Cisco ONS 15454 Multi-Service Platform to transport both the Ethernet traffic for the new video application as well as TDM traffic in the form of DS1 circuit connectivity. The DS 1 circuits shall be further broken down using existing TDM channel bank equipment at several of the nodes sites to provide for RS-232, T1, and analog voice circuit connections.

In addition to the SONET nodes, several other locations shall be established that will use Ethernet fiber links for connectivity. These include video viewing locations at Traffic systems Center (TSC), as well as the Bishop Ford Freeway (BFF)/ I-57 video aggregation location.

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These locations will use Gigabit Ethernet switches for transport, video aggregation and multicast routing capability. The viewing locations do not aggregate video traffic, rather serve as the egress or drop off point for the multicast video traffic. Viewing equipment at these sites (TSC) provide the monitoring capability for the video application.

At the SONET locations, two (2) Gigabit Ethernet switches shall provide video aggregation and multicast routing capability. The switches at these sites also serve to connect the TSC viewing site and the BFF connection point via Ethernet over fiber.

Transportation of the Ethernet traffic from SONET-to-SONET site is accomplished by connecting a Gigabit port from the Gigabit Ethernet switch to one port of a 4-port gigabit card on the Cisco 15454. A point-to-point, STS-12c circuit will be mapped between each SONET node to provide a self-healing circuit path for Ethernet connections between the Gigabit Ethernet switches.

The SONET nodes in this design will not perform an Ethernet switching function. Unlike the switching capability provided by the ML series cards in the existing configuration. The G1K-4 gigabit card shall provide transparent point-to-point connections between the Gigabit Ethernet switches.

High availability, and redundant paths, shall be provided for the video application by a Layer 3 IP routing architecture, shall be implemented at redundant switching/routing nodes, and by the availability of multiple paths to reach the network route/switch nodes. For those circuits that have paths across the SONET infrastructure, the SONET switching shall provide 50ms failover times in the event of a fiber cable cut.

The SONET ONS shall be a NEBS-compliant shelf assembly that contains 17 card (module) slots, a backplane interface, a fan-tray assembly, a front panel with an LCD, and alarm indicators. The SONET ONS shall be capable of carrying traditional time-division multiplexing (TDM) and high-speed data traffic, a variety of card configurations offer incremental bandwidth increases as needed and support DS-1, OC-3, OC-12, OC-48, and 10/100 Ethernet and Gigabit Ethernet speeds.

Workstations shall be able to connect to the SONET ONS using direct, network (LAN and WAN), or DCC connections. The SONET ONS shall support TL1 and the Cisco Transport Controller (CTC), the SONET ONS CTC software interface shall provide card, node, and network-level provisioning and troubleshooting. The SONET ONS shall deploy a variety of network configurations, including point-to-point systems or linear add-drop multiplexers (ADMs), unidirectional path switched rings (UPSRs), two-fiber and four-fiber bidirectional line switched rings (BLSRs), subtending rings, and path-protected mesh networks (PPMNs).

The SONET ONS shall have 17 card slots numbered 1 to 17. All slots shall be card-ready, meaning that when you plug in a card it shall automatically boot up and become ready for service. The cards shall offer bandwidth in modular increments. The SONET ONS shall accept five types of cards: common control, alarm interface, electrical, optical, and Ethernet. The common control cards shall include the TCC+/TCC2 and the cross-connect cards (XC, XCVT, and XC10G). The alarm interface cards are the Alarm Interface Controller (AIC) and the Alarm Interface Controller-International (AIC-I).

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The SONET ONS shall be provisioned as required by the CCTV Distribution System and as indicated in the plans.

The Contractor shall synchronize the SONET components using the existing District's Stratum 2 clock. Additional hardware, if required to use this clock, shall be furnished, at no additional cost to the District, as part of this item.

The minimum requirements for the SONET Add/Drop Multiplexers include:

Environment

Temperature Range: -5 to +45 °C

Humidity: 95% humidity (non-condensing)

Power 120 VAC ±10%; 650 watts (nominal); UL listed

(Contractor shall furnish and install additional Eltek Mini Power Systems and batteries to augment and maintain compatibility with the systems currently installed. The batteries shall sustain operation of the SONET and alarm equipment for a minimum of four (4) hours during a total power failure.)

EMC Certified to FCC part 15

Network Management SNMP

Network Interfaces

Physical: RJ-45

Electrical: 1000 Base x
100/10 BaseT

DS-1

STS-3

Optical: OC-48

Network Protocols: RFC 1619

Spanning Tree according to IEEE 802.1D

Priority Management according to IEEE 802.1p

Logical VLANs support according to IEEE 802.1q

Flow Control according to IEEE 802.3X

The Contractor shall provide the necessary ports to provide the capabilities identified on the plans and in the special provisions. These capabilities shall include optical interfaces for OC-48 transmission with protection (counter-rotating, self-healing ring), DS-1 interface with user selectable AMI or B3ZS, and 1000BaseTx or 1000BaseFx Ethernet Interfaces, compatible with the Gigabit Ethernet switches being supplied. The power supplies for the SONET ONS shall be included in this item and not paid for separately. If an existing installation requires an increased power supply capacity, it shall be included in this pay item and not paid for separately.

The Contractor shall provide complete and working equipment, fully equipped to satisfy the overall system requirements. Specific cards identified in this specification are based on interfaces to other system components. The Contractor shall supply any additional cards, though not specifically called out in this specification, to complete the required functionality of the system.

The following cards shall be supplied as indicated in the plans.

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Gigabit Ethernet Cards (15454-E1000-2-G or approved equal)

Ports	2 GBIC Interface slots equipped with short range, multimode GBICs
Speed	1000 Mbps
Ethernet Switching Capacity	1.2 Gbps
VLAN Support (802.1Q)	512
MAC Address	8192 first in, first out
Priority (802.1P)	2-level, high/low
Transport Bandwidth	Up to 622 Mbps
Transport Granularity	STS-3c (155 Mbps) STS-12c(622 Mbps)
Power Consumption	60 W maximum
Operating Temperature	-5 to +45 °C

DS1 Cards (DS1-14 or approved equal)

DS1 cards shall supply 14 Telcordia compliant, GR-499 DS-1 ports. Each port operates at 1.544 Mbps over a 100-ohm, twisted-pair cable. The DS1 cards shall satisfy the following:

Input

Bit rate:	1.544 Mbps ± 32 ppm
Frame format:	Off, SF (D4), ESF (user selectable)
Line Code:	AMI, B8ZS
Termination:	Wire-wrap, AMP Champ
Input impedance	100 ohms
Maximum cable loss:	655 feet alvyn, 22 AWG (ABAM)
AIS:	TR-TSY-00191 compliant

Output

Bit rate:	1.544 Mbps ± 32 ppm
Frame format:	Off, SF (D4), ESF (user selectable)
Line Code:	AMI, B8ZS
Termination:	Wire-wrap, AMP Champ
Input impedance	100 ohms
Maximum cable loss:	655 feet alvyn, 22 AWG (ABAM)
AIS:	TR-TSY-00191 compliant
Power level:	12.5 to 17.9 dBm centered at 772 kHz -16.4 to -11.1 dBm centered at 1544 kHz
Pulse shape:	Telcordia GR-499-CORE Figure 9-5
Pulse amplitude	2.4 to 3.6 V peak-to-peak
Surge Protection	Telcordia GR-1089
Operating Temperature	-5 to +45 °C
Operating Humidity	5 to 95% non-condensing

Gigabit Ethernet Switches. Gigabit Ethernet Switches shall be provided that satisfy the following:

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Environmental	
Temperature:	0 to 40 °C (32 to 104 °F)
Humidity	10% to 90% (non-condensing)
Backplane	60 Gbps full duplex 4 Gbps uplinks
Port Density	48 minimum; expandable to 240
Physical Characteristics	
Weight (maximum)	100 pounds
Dimensions (nominal)	17.4" x 17.3" x 12.5"; the equipment shall mount in a standard EIA 19-inch rack and occupy no more than 10 standard rack units.
Power	120VAC±10%; redundant power supplies (The power supplies shall be removable while the equipment is operating with no degradation.)
Optical Interface	GBIC; single mode long haul and multimode short haul
Link Power Budget	17 dB at 1310 nm; 8.3 μm fiber core
Network Interface	
Physical Connector	RJ-45
Network Rates	10/100/1000 MHz Ethernet
Port Density:	240
Regulatory Compliance	
Safety	UL Listed; UL 60950
EMC	47 CFR (FCC) Part 15, Type A certification
Environmental	GR-63-Core Network Equipment Building Standards
Telecom	47 CFR (FCC) Part 68 compliance
Supported protocols	
Ethernet	IEEE 802.3; 10BaseT
Fast Ethernet	IEEE 802.3u; 100BaseTX
Gigabit Ethernet	IEEE 802.3z; IEEE 802.3x; and IEEE 802.3 ab
1000Base-X (GBIC)	1000Base-SX;1000Base-LX/LH;and 1000Base-ZX
Virtual LAN trunking/tagging	IEEE 802.1Q; IEEE 802.3ad
Spanning Tree Protocol	IEEE 802.1D; IEEE 902.1w; and IEEE 802.1s
Security	IEEE 802.1x

The Gigabit Ethernet Switches shall be Cisco Model 4506 or interchangeable equal approved by the Engineer.

The Gigabit Ethernet Switches shall operate on the District's single-mode optical fibers, as detailed in this specification. The GBIC shall provide a minimal optical link budget of 17 dB. If in-line optical attenuators are required for short links, the cost of the attenuators shall be included in this item and not paid for separately.

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The Contractor shall furnish adequate 100BaseT ports to satisfy the system requirements identified in the plans and special provisions. A standard manufacturer port count shall be utilized; a minimum of 24 unused ports or additional ports as indicated on the plans shall be provided, whichever is greater.

The Contractor shall furnish adequate licenses for each switch to use the RMON agent or the Border Gateway Protocol (BGP).

Fiber Optic Video Transceivers. Fiber Optic Transceivers shall be dedicated hardware devices all of the same Manufacturer and shall consist of two distinct types, the Fiber Optic Transceiver – Transmitter (FOVT) and the Fiber Optic Transceiver – Receiver (FOVR). The FOVR provided and installed under this item shall be the mate of the FOVT provided under the CLOSED CIRCUIT TELEVISION CABINET EQUIPMENT specification.

The fiber optic video transceiver - receiver shall receive optical simplex transmission of NTSC video from the CCTV cabinet and shall provide duplex optical communications of camera-control, asynchronous data. Optic video and data transmission shall use one single mode fiber operating in the 1310/1550 nm windows using simple wavelength division multiplexing.

Mechanical and environmental requirements include the following:

Nominal dimensions:	7 inches by 5 inches by 1.5 inches
Operating Temperature Range:	0°C to +70°C (minimum)
Storage Temperature Range:	0°C to +75°C (minimum)
Relative Humidity Range	0% to 95% (non-condensing)
MTBF	75,000 hours (minimum)

Optical requirements include:

Connector:	ST
Optical Power Budget	15 dB (minimum) using 9/125 μm single mode fiber
Operational Wavelengths	WDM using 1310/1550 nm and a single fiber

Video requirements include:

Connector	BNC
Input signal	0.5–2.0 V pk-pk (1 V nominal)/75 ohms impedance
Bandwidth	5 Hz – 7.0 MHz (minimum)
Differential Gain	≤5%
Differential Phase	≤5°
Tilt	≤1%
Signal-to-Noise Ratio	50 dB with 10 dB of link attenuation

The equipment shall operate from either 120 VAC or 12 VDC; maximum power requirements shall not exceed 12 watts.

Video Encoders and Decoders. Video encoders and decoders (codecs) shall be dedicated hardware devices, and except for differences between encoders and decoders they shall all of

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the same type from the same common manufacturer. The codecs may be either single or dual video type to transfer "full motion" 30 frame-per-second high quality color video via MPEG-2 video compression at 6 Megabits per second. The units shall operate to produce a robust data communications stream that shall allow for both video and audio transmission and shall be immune to timing disruptions in the IP multi-cast configuration specified herein.

The units shall be rack-mountable, complete with redundant power supplies as required for the rack configurations indicated on the plans, operating from a 120-volt single phase AC power input.

Encoder units shall accept NTSC video BNC inputs and Ethernet RJ-45 control/communications input connections.

Approvable codecs shall be compatible with and demonstrably interoperable with the standard codec product of at least one other vendor. Final approval of codec equipment shall be dependent upon a demonstration test of multi-vendor interoperability. Initial submittal information shall include documentation of this interoperability and a demonstration testing plan for approval by the Engineer.

The decoders shall be rack-mountable, complete with redundant power supplies as required for the rack configurations indicated on the plans, operating from a 120-volt single phase AC power input.

The encoders shall interface the serial communications port of the CCTV camera assembly through the fiber optic video link. Using the Ethernet port on the encoder and its IP address, commands shall be exchanged between the camera control computer at the Communications Center and the serial port of the CCTV camera.

Materials shall be supplied to satisfy the following:

Video

Analog Video	NTSC (30 fps)
Analog Video Connections	BNC connector, 75 ohms; S-Video
Encoding Format	ISO/IEC 13818 MPEG-2
Decoding Format	NTSC
Encoding Rate	1 Mbps to 12 Mbps
Decoding Rate	1 Mbps to 12 Mbps
G.O.P. Structure	User Selectable: I; I&P; I,B&P
Intra-picture Distance	1 to 19 frames
Reference Distance	0 to 2 frames
Resolution	D1, 720 x 480
Codec Control	Web server, IP and HTML interface
MPEG-2 Stream Types	Transport

Low Speed Data Transmission

Interface	RS232, RS422, RS485
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Connections	DB-9, RJ-45
Data Rate	1.2Kbps to 115.2 Kbps
Data Channel	
Format	Serial , asynchronous, RS-422
Interface	IEEE 802.3 Ethernet
Network Connections	RJ-45
Data Rate	100 Mbps
Broadcast	Unicast / Multicast
Management	SNMP, Web server, C. L. I.

The encoder's serial data channel (RS-422) for camera control shall be accessed through the network port using a TCP or EDP connection

Physical Requirements

Operating Temperature	0° to +70° C
Relative Humidity	95% non-Condensing

The encoders and decoders shall be UL listed and be type-accepted to 47 CFR (FCC), Part 15, Type A.

The Codecs shall be the standard product of an established North American manufacturer. The manufacturer shall have been in business for a minimum of 7 years. The manufacturer shall provide a minimum of a twelve (12) month warranty from the date of installation. The manufacturer shall provide technical support via email, fax and telephone. The above forms of support shall be provided Monday through Friday, 8:00am to 5:00pm EST. The Manufacturer shall also have a repair facility within North America.

The units shall be 19-inch rack-mountable, complete with power supplies as required for the rack configurations indicated on the plans, operating from a 120-volt single phase AC power input

The codecs shall be fully capable of transmitting the PTZ commands of the CCTV camera manufacturer being furnished under this contract as well as existing Philips/Bosch, Pelco, Vicon and Cohu camera commands. Serial data will be transmitted over TCP-IP. Each serial port must support IP addressing with the ability to select the appropriate IP socket number. The codecs must provide the ability to establish an IP connection directly from a workstation to any encoder IP address and socket number to pass serial data. Transmission of serial data must be independent of the video stream. Any serial data conversion required by the codec to communicate to the camera shall be included in this pay item and shall not be paid for separately.

The Encoder/Decoder serial data port must support Multicast data to broadcast a single serial data input to multiple remote encoder serial data port recipient. Bi-directional data must be supported on the codecs.

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If the codecs cannot consistently transmit the PTZ commands without any data errors, timing conflicts, or malfunctions, a serial device server shall be provided for each codec to interface the serial data to the multicast network and shall be provided at no additional cost to the State.

A demonstration of this low speed serial data transfer shall be required before material submittal approval is given. See submittal requirements in this Special Provision.

Latency shall not exceed 300ms at D1 resolution at a minimum data rate of 5 Mbps.

Codec operation and management.

Each unit must support a local console accessible using one of the serial interfaces to provide access to all configuration menus of the product including the initial IP address configuration as well as for troubleshooting purposes. The interface must be menu driven for novice users.

Each unit must support 'remote' Telnet console access functionality to provide access to all configuration menus of the product. The interface must be menu driven for novice users. The console access must be restricted by a username and password to prevent un-authorized access. For ease of management, both the local and Telnet console must present the same menu commands and structure to the operator.

All units (encoders and decoders) must support SNMPv2 management protocol to provide the ability to control and monitor all configuration parameters and diagnostics from any 3rd party SNMP management application.

The Encoders/Decoders must support firmware updates from a central site. Updates must be downloadable to a single unit or by bulk via a single command from a firmware utility application via the Ethernet network. The firmware utility application must provide confirmation of the successful and unsuccessful updates. Upon completing of the update, the units must resume to original configuration without the need to reload the unit configuration.

Still Picture Capture

The codecs shall support and shall be coordinated with an automated still picture capture application specified elsewhere. A demonstration of this compatibility shall be required before material submittal approval is given.

Special Submittal Requirements and Operational Demonstration

As a part of the product catalog cut submittal, the Contractor shall provide a demonstration of the codecs at the time of the initial product submittal. The manufacturer shall demonstrate the following interoperability with at least one other codec manufacturer. Compatibility shall also include successful transmission of PTZ commands. The demonstration shall be comprised of the following parts:

- **Codec CCTV camera PTZ compatibility.** The demonstration shall include a pair of the proposed codecs, a proposed CCTV camera, and a CCTV camera of another manufacturer other than the proposed CCTV which is of a manufacturer already installed in the State system.

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- **Video interoperability.** The demonstration shall demonstrate the following interoperability: The proposed encoder shall be capable of encoding a video stream that is decodable by at least one other Manufacturer compiling with this specification, or of a manufacturer which equipment is presently in use by IDOT District 1 at the time of bidding. The interoperability demonstration shall be conducted in multicast mode.
- **Software video decoding.** A software based video decoder with PTZ control shall be provided for viewing and controlling a video stream remotely over the IP network.
- **Video snapshot capability.** A fully functional copy of the proposed video snapshot program shall be provided for the demonstration and throughout the 10 day period described herein.

After a successful demonstration of the above requirements, the codec pair shall remain with the Department for 10 working days for further observation. After 10 working days, the Contractor may pick up the codec pair. All costs for this demonstration shall be included in the cost of this pay item. It is the Contractor's responsibly to provide all hardware (including dome CCTV cameras and Ethernet switches) and software to perform the demonstrations as specified.

Serial Device Server. The serial device server shall be a fully integrated port server and fiber optic Ethernet switch. The port server shall act as a bridge between a 100BaseT Ethernet network and low-speed serial devices. The port server shall comply with the following:

- Minimum of two (2) DB-9 or DB-25 male connectors
- Shall provide serial communication at speeds 10000 bps and above
- Shall support point-to-point and point-to-multi-point modes
- The serial interface shall be RS-232 DTE

The serial device server shall include a fully integrated Ethernet switch that complies with the following:

- Provides a minimum of two (2) RJ-45 10/100TX Ethernet ports; two of the ports shall be configured as 100BaseFX
- Shall provide auto-negotiation on 10/100TX ports
- Shall support 100BaseFX using single-mode fiber optic cable with either a LC or SC connector
- Shall support the following network services: HTTP Telnet, and Com-port control
- Shall provide a HTML web browser user interface for configuration and monitoring of the unit.
- The port server shall provide bi-directional data transfer over two fibers or one UTP Cat 5e cable.
- The port server shall operate on 120VAC
- The port server shall operate as specified over the temperature range of -20 C to +70 C.

Video Control Subsystem. The Video Control Subsystem shall consist of two redundant video control servers, multiple CCTV control workstations and software to allow an operator to select

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any camera and route the video from it to any monitor. In addition, the video control subsystem shall allow the operator to pan, tilt, and zoom the camera. It will also allow the operator to control the optics of the camera that have remote controllability.

The video control system shall be configured as a client-server with the CCTV server located at the ComCenter. Clients shall be installed on new work stations at the ComCenter and Traffic Systems Center.

Video Control Servers. The servers shall be designed to be rack-mounted in an EIA Standard 19-inch rack using no more than 2RU in height.

General requirements. The CCTV Distribution System Server shall be a standard product of an established brand name company with a demonstrated track record of providing high-quality long-term maintenance and service. The company shall have been producing leading-edge; PC based components for a minimum of five years prior to the bid. The company shall provide nationwide service and support on a 7 day a week, 24 hour a day basis and shall maintain a toll free customer support service. All major components such as the motherboard, power supply, processor, memory, hard disk, CD-ROM, integrated network interface card, audio and video components, shall be assembled and warranted by the computer's manufacturer. The CCTV Distribution System Server, as configured, shall be a standard ,model number of the manufacturer. Computers that are assembled from brand name components by system integrators or re-sellers will be considered "Clones" and are not acceptable.

Each CCTV Distribution System Server shall be equipped with the following:

Operating System:	Windows XP, SP2, Full Version on CDROM. System restoration disks are not acceptable.
Hard disk:	160 GB ATA-66/100 IDE (7200 rpm) or better.
Motherboard:	800 MHz bus clock speed. All PCI slots shall support bus-mastering. A single Xeon 2.8 GHZ CPU with a 1 MB cache shall be provided.
Memory:	Minimum of 1 GB of memory. At least one memory bank shall remain open for future expansion.
Optical:	24X IDE CD-RW/DVD ROM or better.
Video:	AGP 32MB SDRAM RAM Video card with DVI and VGA outputs.
Pointing Device:	A button, optical wheel mouse and joystick shall be supplied.
Monitor:	One 17" rack mounted flat-screen LCD monitor shall be provided as specified elsewhere.
Network Interface:	The workstation shall be supplied with an Integrated Network Interface supporting 10/100 MB/s. The server shall have a UTP (RJ-45) connector. The NI shall be compliant with IEEE 802.3 for Ethernet.

The backup CCTV Distribution System server shall be identical to the primary server except that it shall be configured as a backup server with automatic fail over.

Video Control Workstation. The video control workstation shall be a standard product of an established brand name company with a demonstrated track record of providing high-quality long-term maintenance and service. The company shall have been producing leading-edge PC based components for a minimum of five years prior to the bid. The company shall provide

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nationwide service and support on a 7 day a week, 24 hour a day basis and shall maintain an 800 customer support service. All major components such as the motherboard, power supply, processor, memory, hard disk, CD-ROM, integrated network interface card, audio and video components, shall be assembled and warranted by the computer's manufacturer. The workstation, as configured, shall be a standard model number of the manufacturer. Computers that are assembled from brand name components by system integrators or re-sellers will be considered "Clones" and are not acceptable.

Each workstation shall be equipped with the following:

Operating System: Windows XP Pro, SP2 (Shall be provided as a full version on CDROM. System restoration disks are not acceptable.)
Hard disk: 160 GB ATA-66/100 IDE (7200 rpm) or better.
Motherboard: 800 MHz bus clock speed with minimum of 4 dedicated PCI slots. All slots shall support bus-mastering. A single Pentium IV 3.0 GHz CPU with 1 MB cache shall be provided.
Memory: Minimum of 1 GB of memory. At least one memory bank shall remain open for future expansion.
Optical: 2 Drives: one 48x CD-RW and one 16x DVD+/-RW or better
Video Card: PCI Express 128 MB with DVI, VGA and TV output
Input Device: A 3-button, optical wheel mouse, keyboard and joystick shall be supplied. The joystick shall be configured for camera PTZ control.
Monitor: One 17" flat-screen, anti-glare monitors shall be supplied for each workstation. The monitor shall support resolution of 1600 x 1280 DPI at vertical refresh rate of minimum 100 Hz and horizontal refresh rate of 85 KHz. The monitor shall be energy star compliant. On-screen advanced control shall be supported.
Network Interface: The workstation shall be supplied with an Integrated Network Interface Card (NIC) supporting 10/100 MB/s and using 32-bit PCI bus-mastering technology. The card shall have a UTP (RJ-45) connector. The card shall be compliant with PCI local bus specification 2.0 and IEEE 802.3 for Ethernet. The card shall also support Netflex-3 technology.
Monitor: The workstation shall be provided with a desk mount 17" active matrix TFT LCD monitor. The monitor shall have a resolution of 1280 x 1024 pixels and a response time of 25 milliseconds. The contrast ratio shall be a minimum of 500:1. The monitor shall have both analog and digital (DVI) inputs.

CCTV Distribution System Video Management & Archiving Workstation.

In addition to the requirements for the CCTV Distribution System Workstation, the management and archiving workstation shall include the following:

The computer shall be rack-mounted and shall occupy no more than two (2) EIA Standard rack units.

Hard drive: The hard drive shall be as specified except that the drive shall have a minimum sustained transfer rate of 10MB/second.

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Video Capture Card: A dedicated PCI video capture board shall be included in the workstation. The video inputs shall include Composite video (RCA connector with a BNC adaptor) and an S-video input. The board shall perform hardware based MPEG-2 conversion, software based conversion is unacceptable.

Supported video compression shall be: MPEG-2 (ISO/IEC 13818-2) Main Profile at Main Level (I,B,P frames) with I frame support and MPEG-1 (ISO/IEC 11172-2) The video bit rates shall be as follows: MPEG-2 Standard 4M up to 15Mb/sec., MPEG2 Half D1/SIF 2M up to 8Mb/sec., MPEG-1 SIF 1M up to 1.8Mb/sec. The encoding shall support variable (one pass) and constant bit rates. The board shall support 3D Y/C separation filtering and noise reduction filtering. The board shall also include frame synchronization, time base correction and auto gain control. The board shall be manufactured by Canopus or approved equal. The equivalent manufacturer must equal all the performance and functionality of the Canopus MPEG-2 decoder. One stereo input as a minimum shall be provided with locked audio support

Video Archiving Software:

The workstation shall also include video production software with the following features: The archiving software shall be nonlinear, real time video editing. The product shall include 4:3 and 16:9 aspect ratio support, DVD creation with customizable menus and scene indexes. The package shall include a number of presets and transitions and a broadcast quality title engine. The package shall be Adobe Premiere Elements or approved equal. An approved equal must have all the features and performance of the specified package.

CCTV Distribution System Management and Monitoring Workstation. The Contractor shall furnish rack-mounted computer with the same attributes as the video workstation. The computer shall not occupy more than two standard rack units.

The computer shall include a system management system that can maintain the real-time status and provisioning of the SONET and Gigabit Ethernet switches. The Contractor shall furnish software and software licenses for these machines to control the equipment at the field locations. The system management software shall allow circuits to be provisioned remotely through the Cisco Transport Controller (CTC) with simple A-to-Z provisioning or through widely used TLI commands. For the Ethernet L2/L3 switches, Ciscoworks LAN Management solution Software (LMS) 2.2, or the latest version, shall be provided. The LMS shall be comprised of applications providing a wide variety of device management tools for centrally managing the devices. The LMS shall include: CiscoView, Resource Manager Essentials, Campus Manager, Device Fault Manager, nGenius Real Time Monitor, and the CiscoWorks Server. The LMS shall be installed and configured for operation of the CCTV Distribution System Management and Monitoring workstation.

Portable Computers for Setup and Maintenance. The Contractor shall furnish two (2) portable, laptop, camera control computers. These computers shall be turned over to the Bureau of Electrical Operations and used to setup, operate, and maintain equipment at field locations.

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The laptop computers shall include client software and maintenance software provided by the CCTV camera manufacturer. These computers will have the capability of accessing any camera in the system by connecting to the Gigabit network through a 100BaseT port on any of the Ethernet switches. In addition, the computer shall access individual CCTV cameras by connecting to the RS-422 cable in the CCTV cabinet at the base of the tower. The Contractor shall provide a minimum of ten (10) cables with appropriate connectors to interface the laptop computer to the Ethernet and ten (10) cables to interface the laptop computers to the RS-422 connection in the CCTV cabinet.

The laptop, camera control computer shall be a standard product of an established brand name company with a demonstrated track record of providing high-quality long-term maintenance and service. The company shall have been producing leading-edge PC based components for a minimum of five years prior to the bid. The company shall provide nationwide service and support on a 7 day a week, 24 hour a day basis and shall maintain an 800 customer support service. All major components such as the motherboard, power supply, processor, memory, hard disk, CD-ROM, integrated network interface card, audio and video components, shall be assembled and warranted by the computer's manufacturer. The computer, as configured, shall be a standard model number of the manufacturer. Computers that are assembled from brand name components by system integrators or re-sellers will be considered "Clones" and are not acceptable.

Each laptop computer shall be equipped with the following:

Operating System:	Windows XP Professional
Hard disk:	40 GB ATA-66/100 IDE (7200 rpm) or better.
Motherboard:	A single Intel M-processor or equal 1.4 GHZ CPU with 512 KB cache shall be provided.
Memory:	Minimum of 512 MB of memory. At least one memory bank shall remain open for future expansion.
CD-ROM:	40X CD-ROM or better.
Video Card:	Equivalent AGP with 32MB SDRAM RAM Video card.

Software. The Contractor shall furnish, install, provision, and test software to select and control the cameras. The software shall allow an operator to select a camera using a pointing device. The pointing device shall allow the operator to associate the camera with a specific monitor. When the operator clicks or releases a button, the video from that camera shall be displayed on the monitor.

The software shall also provide mouse and joystick control of the cameras. The operator shall have the option of using either the mouse or the joystick to pan, tilt, zoom, and otherwise control the cameras.

The basic video control program will be comprised of a server application, client application and device driver applications.

The various software components shall be able to be started in any order. The software shall allow clients, servers and device drivers to be added at any time, during or after initial configuration. The software shall allow additional devices to be added at any time during or after

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initial configuration. The software shall allow equipment from different manufacturers to be controlled by this program.

The unexpected or unplanned termination of a component shall not cause any other component to fail.

The software shall support client-to-server and client-to-multiple-server communications and operation. The software shall support server-to-server communications and operation to allow video sharing. The software shall be capable of linking to external access control and alarm systems to create an integrated security system.

Server Application. The server application shall have 'Hot Standby' capability with automatic switchover to the backup server. The configuration interface shall provide a connection manager for defining switchable connections within the system. The switching algorithm shall route video based on configurable parameters for path selection.

Time servers. The configuration interface shall provide a means to identify time servers and have other servers synchronize to them on a periodic basis, as established during the setup process. Any server shall be able to act as a network time server.

Operation Modes. The server application shall have two modes of operation: a run mode and a configuration mode.

In the run mode, the server application shall accept connections and requests client workstations

In the configuration mode, the server application shall present a graphical user interface that allows all aspects of the software to be configured.

The configuration and run modes shall be capable of running simultaneously to allow configuration to take place without interfering with the client connections and operation.

A single user interface shall be used to configure all devices, including equipment from different manufacturers. Functions not available for a specific piece of equipment shall be indicated through a difference in color or intensity.

Devices. The configuration interface shall provide the ability to add or remove devices and to modify the configuration of any configured device driver.

The software shall provide a configurable arbitration system that eliminates CCTV resource conflicts and allows users to take exclusive control of specific devices. The configuration interface shall provide the means to define interlocks between devices that conditionally prevent a device from being controlled.

User Configuration. The software shall provide configurable user groups and assign access privileges to them. Access privileges shall allow a user's access to administrative functions to be restricted. Access privileges shall allow a user's access to be restricted to each map and device independently. A user's access privileges may be configured to a subset of a device's features.

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Access privileges shall allow a user's access to workspaces to be restricted.

An initial configuration shall be as follows:

User Level	Select View	Assign Video	Control PTZ	Video Cutoff	Add Devices	Config Devices	Configure Workspace	Config Maps	Config Users
Level 5	X								
Level 4	X	X	X						
Level 3	X	X	X	X					
Level 2	X	X	X	X	X				
Level 1	X	X	X	X	X	X	X		
Administrator	X	X	X	X	X	X	X	X	X

Scripts and expressions. The software shall provide an expression service that allows events to be triggered based on system states or conditions of devices. The software shall provide a scripting language to allow automation of common tasks. The software shall support local and global scripts and variables. The scripting language shall support conditionals to ensure the correct conditions exist before a particular action takes place. Scripts shall be capable of executing in response to user input, conditions within the system, access or alarm input, or according to a schedule.

Labels and prompts. The software shall provide user-definable labels with scripting capability. The software shall provide user-definable prompts with scripting capability.

Timers and schedules. The software shall provide configurable timer and schedule services for executing specific tasks on a one-time or repetitive basis. The configuration interface shall provide a mechanism for configuring a group of users to notify when a scheduled event occurs.

Alarms and events. The software shall provide user-definable alarms and events that are triggered when specific conditions occur within the system. Alarms and events shall have scripting capability. The configuration interface shall provide a mechanism for configuring a group of users to notify when an alarm or event occurs. The configuration interface shall provide the means to configure a plan for dynamically escalating user notification of alarms and events. The software shall provide an archive engine capable of categorizing and storing up to 1 million alarms and events per day. Alarms and events shall have the capability to run one automated event when the alarm is triggered, a second automated event when a user selects the alarm or event in the viewer, and a third automated event when the user has acknowledged the alarm or event.

Maps. The software shall import maps in standard graphics file formats: wmf, .emf, .bmp, and jpg.

Users shall customize the maps by placing device icons, user-defined labels, user-defined hyperlinks, and alarm icons on them. The configuration interface shall provide a drag-and-drop capability for placing these labels, hyperlinks, device icons and alarm icons on maps. Device icons on maps shall be capable of showing the active status of the physical devices they represent. Labels on maps shall have single-click and double-click scripting capability. Hyperlinks on the maps shall have 'controllable transparency and scripting capability. Alarm icons on maps shall have scripting capability. Alarm icons on maps shall be capable of being animated when triggered.

Client Application. The client application shall be configurable to log into different servers. The client application shall provide server auto-discover functionality. The client application shall automatically synchronize with the server application after a valid username and password has been entered. This synchronization shall include all support and graphical files (i.e. maps) necessary for the client to run. The client interface shall be comprised of a main map display area, an event viewer, a device list, and any number of custom windows. The client application shall provide multi-monitor support.

Interface. The client program shall have a common interface to control equipment from different manufacturers. The same interface shall be used to retrieve archived video from different devices.

Workspaces. The client application shall have configurable workspaces that can be saved and loaded. There shall be no limit on the number of workspaces. Workspaces shall allow configuration of which predefined and custom windows are visible. Workspaces shall allow configuration of the size of predefined and custom windows, including the ability to make them fixed size or dynamically sizeable.

Workspaces shall allow configuration of the position of predefined and custom windows, including the ability to make them fixed position or moveable.

Workspaces shall allow configuration of the content of custom windows, including the permitted types of content and the default content. Workspaces shall allow configuration of the appearance of custom windows, including their borders and how they are layered. Workspaces shall support multi-monitor systems.

Custom windows. The client interface shall support any number of custom windows.

Custom windows shall allow users to view live and archived video, load maps, connect to and control remote PCs, or connect to the Internet via an integral browser window. Multipurpose windows shall have context sensitive toolbars to control the different types of window content. Custom windows shall have the ability to be opened and closed, moved, locked in place, scaled, and scaled to content. Custom windows shall be independent of each other, allowing different types of content to be displayed at the same time and different types of devices to be controlled. Custom windows shall allow video to be loaded by dragging the camera from a map or from the device list to the window's display area. Custom windows shall act as live control pads, allowing the user to control the currently loaded camera using the mouse or mouse wheel. Custom

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windows shall provide a search and filter utility to aid in locating archived alarms and events and archived video.

Camera Groups. The program shall have the ability for the user to place any camera together with any other camera into logical groups for use in other portions of the program. The group names shall be user assignable. The minimum number of camera groups shall be 64.

Video Monitor Quick Display. The program shall have a quick display option to enable the operator to quickly assign various video sources (cameras or groups of cameras) to specific monitors from one pull down menu without having to use a map interface. The menu shall consist of a two column display consisting of a column of monitors on the left and a column of sources on the right.

Video monitor rotation. The system shall include a application which will allow the operator to select a group of cameras to be displayed on a given monitor with the individual cameras within the group to be sequenced through at a user specified rate.

Event viewer. The client application shall provide an event viewer that shows activities as they occur, including alarms and events, scheduled events, and scripts. The event viewer shall have the ability to filter and sort activities on date, priority, event category, and key words in description fields. The event viewer shall provide the means to view archived alarms and events. The event viewer shall provide a search and filter utility to aid in locating archived alarms and events.

Device List. The device list shall list all the devices for which the user has access privileges. The device list shall provide access to each device's controls. The device list shall provide a means to switch devices.

Maps. The user shall be able to select a map from the list of available maps. The user shall be able to adjust the view of the currently loaded map by zooming in, zooming out, zooming to fit, and loading a stored view. Maps shall show icons representing physical devices and alarms. Clicking a device icon on a map shall provide access to controls for the device represented by that icon. The device list and event viewer shall provide all the functionality of maps, effectively making maps optional.

Device Drivers. Device drivers shall be provided to communicate with any device via direct serial cable connection, IP, or modem pool. Multiple device drivers shall be able to share all or a portion of a modem pool. Each device driver shall be unique to the type of equipment it controls. The addition of a new device driver shall require no modification to the client or server application. Device drivers shall run anywhere on the network, not necessarily located where the server is installed. Device drivers shall have the capability of running as a Windows Service or as an executable.

The software shall operate with the existing CCTV cameras and the CCTV cameras installed under this contract. The software system shall be equivalent to that of the Chameleon System provided by 360° Surveillance and approved by the Engineer.

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Video Monitors.

In-rack video display clusters.

The modular maintenance video display clusters shall have four 4-inch (diagonal measure), LCD displays with signal pass-through in a 2U rack-mount frame. Each display shall be 480 x 234 pixels and shall be NTSC compatible with individual color, tint, and brightness controls. The modular maintenance video display clusters shall be Marshall Electronics model V-R44P or approved equal.

In-rack 14-inch monitor.

The maintenance video monitors shall be a 19" rack mount CRT monitor, 350 mm (14") minimum diagonal measure, Pelco model PMC14H or approved equal.

LCD, 42-inch flat panel (suspended).

The 1070 mm (42") diagonal-measure flat-panel LCD monitors shall accept and display a standard NTSC signal in full resolution. Input connections shall include Normal Hi-Resolution Component Video, RGB In (15-Pin Connector), and A/V In (RCA jacks). The monitor shall be warranted against image burn-in for a period of not less than 1 year of continuous (24 hours per day, 7 days per week) use. The monitor shall NOT have a broadcast tuner.

LCD, 17-inch flat panel (desk top).

One 17" flat-screen, anti-glare monitors shall be supplied for each work station. The monitor shall support resolution of 1600 x 1280 DPI at vertical refresh rate of minimum 100 Hz and horizontal refresh rate of 85 KHz. The monitor shall be energy star compliant. On-screen advanced control shall be supported.

LCD, 15-inch, CCTV Monitor, Rack-mounted.

One 15" flat-screen, LCD, anti-glare rack mount monitor shall be supplied for the CCTV Distribution System Server rack. The monitor shall have a native resolution of 1024 x 768 DPI. The LCD shall be a TFT active matrix type with a 75° Horizontal and 55° vertical viewing angle. The monitor shall have a minimum contrast ratio of 300:1 with an average white luminance of 250 cd/m². The monitor shall accept a VGA analog signal. The monitor shall be energy star compliant. On-screen advanced control shall be supported. A freestanding LCD monitor attached to a shelf will not be acceptable.

The Contractor shall furnish hardware to mount the monitor in the EIA Standard 19-inch equipment cabinet.

4-port Keyboard-Video-Mouse (KVM) Switch. One 4 Port Keyboard-Video-Monitor (KVM) Switch shall be provided for the CCTV Distribution System Server rack. The KVM switch shall include the following features: automatic scanning, cascading capabilities, hot pluggable operation, keep alive function, intellimouse support, mouse reset function, on-screen display

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(OSD) capability, password security, pc mouse/keyboard/video support, push button or keyboard switching, scanning capabilities, status indicator LED's and support video modes up to 1600 x 1200 at 72Hz.

As an alternative to the use of hardware capture devices, The Contractor shall provide a software solution to capture JPEG images using the inherent capability of the decoder. This software program shall have the capability to automatically capture still images in the JPEG format directly from the MPEG2 video stream without the use of capture cards or devices. The captured images shall be published to an FTP site for public access, as identified by the ITS Program Office. The program may be the product of the control program publisher or it may be an extension created by a third party compatible with both the codec's and control program. The still picture capture program shall run on a CCTV Distribution System Still Image Capture Workstation.

The capture program shall have the capability to automatically capture still images in the JPEG format directly from the MPEG2 video stream without the use of capture cards or devices. The program may be the product of the control program publisher, codec manufacturer, or it may be an extension created by a third party compatible with both the codecs and control program. The program shall be user configurable to allow the end user to add, delete and configure cameras to the capture routine as needed with out programming. The program shall allow the user to specify the interval between image captures and shall be capable of being configured for a minimum of 300 cameras. The images shall be saved at a user specifiable resolution of up to 720x480 pixels with a user specifiable filename and storage path. The program shall have an option to either add an number to the specified file name or overwrite the previous file. The still picture capture program shall run on the Distribution System Still Image Capture Workstation described elsewhere herein. If the JPEG picture capture cannot be performed directly from the MPEG2 video stream, hardware devices for JPEG capture shall be provided at no additional cost to the State.

CCTV Distribution System Still Image Capture Workstation (DSIC). If a software JPEG video capture is approved for use, the Contractor shall provide a CCTV Distribution System Still-Image Capture Workstation. In addition to the requirements for the CCTV Distribution System Workstation, the Still-Image Capture Workstation shall include the following: The Still Image Capture unit shall be rack mounted in a standard 19-inch rack using no more than 2RU in height. The DSIC shall be connected to the KVM in the rack an shall utilize the rack mounted keyboard and 15" monitor.

Video Distribution Amplifiers. Video distribution amplifiers shall be high performance, high impedance design with an input loop-through connection. The amplifier shall include signal gain and cable equalization. The distribution amplifiers shall meet the following requirements:

Bandwidth	29MHz (-3dB) minimum
Gain	-3dB to +3dB adjustable (0.7Vp-p to 1.5Vp-p output when input level is 1.0Vp-p)
Input levels	0.4v to 2.0v with no offset at unity gain
Connectors	BNC
Impedance	75 Ohms

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Return Loss	greater than 35dB at 5 MHz
Differential Phase Error	±0.1° to 5 MHz
Differential Gain Error	±0.1% to 5 MHz
Frequency Response	±0.1 dB to 5 MHz
Input connections	1 composite video
Output connections	four (4) as indicated on plans, one (1) composite loop-through

The distribution amplifiers shall be rack mounted in 3 RU rack mounted frame with an integral power supply. Multiple single channel video distribution amplifiers placed on or fastened to a rack mount shelf will not be acceptable. Corded modular power supplies will also be unacceptable.

I-55 Cut-Over Fiber Optic Modems

The Contractor shall furnish three Meridian Model PR-200iR-V/0-1D/ST fiber optic video modems and one Meridian SR-2001 Universal Subrack Frame to be used to demonstrate system functionality in the Shop Floor Testing and for a phased cutover of the I-55 CCTV circuits at the I-94/I-55 Shelter. The Meridian Model 200i shall satisfy the following:

- Video and simplex data model Meridian Technologies PR-200iR
- Unit shall operate using single mode fiber
- Unit shall receive Frequency Modulated light and convert to NTSC video; shall convert data PTZ controller from source to Frequency Modulated light and transmit over the same fiber.
- Card shall occupy one card slot
- Data format shall be Biphasic; RS-232 to biphasic converter shall be included.
- Optical Source for Single mode shall be >0 km but <40 km
- Card shall operate at 1310/1550 nm

System Video Performance

Video Input/Output impedance:	75 ohms
Video Input/Output levels:	1.0 V p-p; 1.5 V max
Bandwidth	5 Hz to 8 MHz
Differential Gain (10%-90% APL)	<±1.5%
Differential Phase (10%-90% APL)	<0.5%
S/N Ratio at 1 km	67 dB
FM Carrier Frequency	70 MHz

System Data Performance

Data Rate	DC to 300 kbps
BER	10 ⁻⁹

Operating Temperature -25C to +70C

The SR-2001/AS2 Universal Frame shall be one supply, rack-mountable frame for installation of Model 200iR cards.

- Chassis shall be made of extruded aluminum and steel sheet metal components.
- Dimensions shall be 19"x11"x5.25"
- Chassis shall include 200W switching power supply for powering up to 18 Meridian Technologies transceivers.

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Power supply shall include auto ranging 87-240 VAC input (50/60 Hz); over voltage protection; short circuit protection; and over current protection.

Equipment Racks. Equipment racks and cabinets shall be installed as shown in the plans. Unless otherwise stated, equipment racks shall be installed at the communications shelters, equipment cabinets shall be installed at the ComCenter and TSC.

Equipment cabinets at the shelters shall not include castors or rollers. The cabinet shall have maximum dimensions of 82 inches high by 24 inches wide by 36 inches deep. The cabinet shall be capable of mounting 2,000 pounds of equipment and hardware. The cabinet shall provide a minimum of 42 standard rack units of mounting space. The cabinet shall have beige, powder-coat paint finish. The front and back of the rack shall have heavy-gauge doors of perforated metal, protecting the components in the rack but permitting the enclosed equipment to be viewed and allowing ventilation air to enter. The front and back doors shall be lockable. The front door shall be split. The equipment rack shall be APC Model 2800 or approved equal.

Equipment cabinets at the Communications Center shall include castors or rollers. The cabinets shall be installed with slack or flexible cables to allow them to be moved forward to allow access to the rear of the cabinet. The cabinet shall have maximum dimensions of 82 inches high by 24 inches wide by 36 inches deep. The cabinet shall be capable of mounting 2,000 pounds of equipment and hardware. The cabinet shall provide a minimum of 42 standard rack units of mounting space. The cabinet shall have beige, powder-coat paint finish. The front and back of the rack shall have heavy-gauge doors of perforated metal, protecting the components in the rack but permitting the enclosed equipment to be viewed and allowing ventilation air to enter. The front and back doors shall be lockable. The front door shall be split. The equipment rack shall be APC Model 2800 or approved equal.

Equipment racks shall be equipped with all hardware required to mount equipment that has been designed to mount in accordance with EIA-310-D. Where a camera PTZ selector-controller is required, a pull-out shelf designed for use with such a controller shall be furnished as part of the equipment rack. Where equipment in the rack requires the use of a keyboard, mouse, or both, the rack shall be furnished with a pull out shelf for the keyboard, mouse, or both. Pull-out shelves for equipment control shall be mounted at a working height of 34 to 42 inches.

Interconnecting Cabling.

600 volt cable

All 120 VAC distribution wiring that is entirely within the communication hut shall be made with NEC Type THHN/THWN cable rated for 600V, with a minimum wire gauge of 12 AWG. All conduits shall be a minimum of electrical metallic tubing (EMT), and all EMT conduit fittings shall be compression, not set-screw type. Outlet and junction boxes shall all be galvanized steel with galvanized steel faceplates or covers. All switches, receptacles, and other wiring devices shall be industrial specification grade.

All power wiring (600 volt cable) shall be in electrical metallic tubing (EMT).

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Two 20-Ampere circuits from the UPS panel shall be dedicated to each equipment rack, and provide a minimum of 3 duplex receptacles per circuit at evenly spaced intervals for the entire height of the each rack.

Plug Strips may be used within the equipment racks, but shall not reduce the number of duplex receptacles required per circuit . The plug strip housing shall be all metal and shall mount in the rack using the standard 19" rack and occupy no more than 1 U in height. Plug Strips shall be Tripp-Lite PDU-1220 or approved equal.

Wall-mounted plug strips shall be furnished and installed to be mounted on plywood backboards. These strips shall include a 15-ampere circuit breaker and shall include solid-state surge protection. The surge protection shall be rated for 800 joules or greater.

Power Supplies for equipment requiring other than 120 VAC shall be manufactured by or approved in writing for that use by the maker of the equipment they are to serve. Power supplies shall be rack-mounted, or shall be bolted or otherwise mechanically attached to shelving designed for mounting in the equipment rack. Connections between the power supplies and the equipment they serve shall be made with PVC-jacketed cables.

Unjacketed individual conductors shall not be permitted.

Coaxial Cable (including connectors)

The coax cable shall be a Belden 1694A precision video cable, or approved equal complying with the following specifications. The center conductor shall be a 18 AWG, Solid Bare Copper conductor, the insulation shall be Gas Injected Foam High Density Polyethylene, and the shield shall consist of an Aluminum Foil-Polyester outer shield with 100% shield coverage plus tinned copper Braid Shield with 95% shield coverage. For installations in shelters, the jacket material shall be Polyvinyl Chloride, suitable for indoor and outdoor-aerial applications.

For installations at the ComCenter and TSC, the coaxial cable shall be plenum rated in accordance with NEC 800-51(a). The coax shall be equivalent to Belden 1695A 0071000.

Applicable Specifications: UL/NEC CMR, C(UL) CEC CMG. Flame Resistance: UL 1666 Vertical Shaft, CSA T4.

Electrical Characteristics:

Impedance:	75 +/- 1.5 ohms
Inductance:	0.106 microH/ft.
Capacitance Conductor Shield:	16.2 pF/ft. (nominal)
Velocity Of Propagation:	82 % (nominal)
Delay:	1.24 nS/ft. (nominal)
Nom. Conductor Dc Resistance @ Deg. C:	206.4 ohms/1000 ft.
Nom. Shield Dc Resistance @ 20 Deg. C:	2.8 ohms/1000 ft.

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Return Loss: 23dB minimum, 5 - 850 MHz
21dB minimum, 851 – 3000 MHz
Max. Operating Voltage: not less than 300 Vrms (UL)

Nominal Attenuation

MHz	dB/100 ft	MHz	dB/100 ft	Physical Characteristics:
1.0	.24	180	2.42	Temperature Rating: - 30 TO + 75 DEG. C Min. Bend Radius: 10x O.D. or 2.75"
3.6	.45	270	2.97	
5.0	.54	360	3.43	
7.0	.63	540	4.25	
10.0	.72	720	4.95	
67.5	1.57	750	5.00	
71.5	1.60	1000	5.89	
88.5	1.75	1500	7.33	
100.0	1.84	2000	8.57	
135.0	2.10	2250	9.14	
143.0	2.16	3000	10.67	
Max. Pulling Tension:		69 LBS		
Nom. Weight/1000 ft:		40 LBS		
Jacket Color:		BLACK for CMG cable; violet for CMP cable		
Applicable Specifications:		UL/NEC: CMR/CMP C(UL)/CEC: CMG		
Flame Resistance:		UL: 1666 VERTICAL SHAFT CSA: FT4		

Coaxial connectors shall be BNC or as required by the equipment to which the cables connect. The connectors shall attached to the cable by crimping or by a cord-grip clamping action. Connectors shall be plated for corrosion resistance and good electrical connections. All BNC connectors shall be physically designed to fit the specified cable without adaptation and shall have a characteristic impedance of 75 ohms. Connectors with a characteristic impedance of 50 ohms are not acceptable and shall be replaced by the Contractor at no additional cost to the State.

Connectors shall be Amphenol part number 31-70000 or approved equal.

Ethernet Cable (including connectors)

Ethernet Cable shall be ANSI/TIA/EIA-568-B.2 Category 5e, UL verified to Category 5e, 4 twisted pair, 24 AWG bare copper with polyolefin insulation. The cable shall be unshielded with polyvinyl chloride (PVC) insulation. The cable shall be Belden part number 1500A or approved equal. The terminations shall be crimp-on RJ-45, Ideal Industries 85-396 or approved equal.

Fiber Optic Cable (including jumpers, splices, connectors)

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Single-mode fiber optic cable shall be furnished, installed, and terminated under the pay items for the single-mode fiber optic cable. Single mode fiber optic terminations inside the communication huts shall be made with Amphenol 942 series terminations or approved equal, or as required in the fiber optic cable special provision, whichever is more stringent. Single mode fiber optic patch cables shall be absolutely minimized. If required, Single mode fiber optic patch cables shall be Amphenol 942 series, ultra-polished, or approved equal.

Multi-mode fiber optic cable shall be used only for inter-equipment signal transmission within a particular subsystem. All multi-mode fiber optic cable shall be furnished as pre-manufactured patch cables, Amphenol 943 with 62.5/125 cable and 3mm jacket, or approved equal. Multimode fiber optic cable is included in the cost of this pay item and will not be paid for separately.

Video Patch Panels

Video patch panels shall consist of video patch jacks, a black phenolic panel, and video patch cords. The video panel shall mount 24 looped-thru video jacks and shall be one (1) rack unit high. The video jacks consist of two coaxial jacks that are looped normal-thru. The interface to the jacks shall be BNC female connectors. The jacks shall be self-terminating such that an un-patched jack of a module will be automatically terminated in 75 ohms if the other jack is patched.

The patch jacks shall satisfy the following:

Characteristic Impedance	75 ohms nominal
Voltage Rating	400 Vrms
Insulation Resistance	5000 Megohms
Return Loss	Better than 23 dB through 2.25 GHz
Center Contact Resistance	not greater than 15 milliohms
Outer Conductor Resistance	not greater than 0.2 milliohms

The Contractor shall furnish ten 24-inch patch cords with each video patch panel. Each patch cord shall be a coaxial with the characteristics identified for the coaxial cable in this specification and shall be terminated on both ends with a plug that mates with the patch jack.

Cable Identification Materials

All cables, fiber optic cables, and individual conductors and fiber strands when broken out from a cable assembly shall be uniquely labeled in accordance with the Contractor's interconnection diagram. Labels shall be computer-printed and shall be waterproof and non-smearing. Labels shall be polyester adhesive wrap labels produced by the W. H. Brady Company or approved equal. The labeling shall comply with ANSI/EIA/TIA -606-A

Cable Tray

Unless otherwise indicated on the plans, the Contractor shall furnish cable tray with 3/8" x 1-1/2" high tensile tubular steel stringers and 1" x 1-1/2" x 1/8" channeled cross slats.

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The nominal width of the tray shall be 12" and the distance between cross slats shall be 8". The Contractor shall furnish all hangers, rods, straight splices, unistrut, threaded rods, nuts, open clips, closed clips, wall anchors, J-bolt assemblies, straight clamps, corner clamps, and other hardware required to complete the assembly required by the plans. The Contractor shall include all necessary bonding and grounding hardware to bond and ground the new cable tray; the new cable tray shall be bonded to any existing cable tray and connected to any existing building ground.

Fiber Optic Termination Panel – Wall Mounted

The wall-mounted fiber optic termination panel shall be a two door, wall mounted box with nominal dimensions of 13"H x 13"W x 3"D. The exact dimensions may deviate by ± 2 " for any dimension. The termination panel shall terminate 24 single mode fibers in ST connectors or connectors matching the terminations on the equipment. All connectors shall be identical. The left chamber of the box will contain splices between the incoming cable and the pigtailed connectors that attach to the bulkhead connectors. The right chamber will house the incoming distribution cables, connecting the incoming fibers to the terminal equipment. Suitable terminations panels would include Corning WIC-02P, 3M 8434, or ADC FL-1000 with proper connectors, splice trays, connector plates, and pigtails.

Construction.

General. Each defined subsystem shall be one or more, self-contained assemblies of rack-mounted components. These components are assembled, integrated, and coordinated as required for the defined functionality, complete with all interfaces and interconnecting cabling, suitable for advanced shop staging and testing, as defined elsewhere herein, with other subsystem assemblies. Each shall be installed at its indicated location and connected to power and communications circuits as indicated and as required.

The interconnections are generally as depicted on the Plans. The Contractor shall be responsible for submitting a complete, integrated interconnection diagram, all as part of shop drawings required for the work, and shall mark the Plans during construction as part of Record Drawing requirements. It shall be noted that the Plans may not show every detail of interconnecting wiring and that the contractor is required to provide all the interconnections within each location to satisfy the requirements of the system being furnished.

Product information and shop drawings shall be submitted for approval in detail. The submittal shall include, but not be limited to:

- Product information on all components, highlighted to indicate specification compliance
- Product information that applies to more than a single specific model or variation, and may list optional equipment or features, shall clearly indicate the model, variation and options selected
- All warranty information
- Shop drawings of assemblies of equipment, with layout and dimensions
- Interconnection wiring diagrams, indicating all component and cabling identification

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- Interconnection wiring diagrams shall be of such detail that a competent electrician, though unfamiliar with the equipment, is able to properly select and terminate all wiring required for proper system operation
- Installation drawings, detailing dimensioned placement at facilities and all connections
- Description of location and arrangements for Shop Staging Tests

All submitted information shall be provided in both hardcopy and electronic format on CD-ROM.

Although not explicitly detailed on each plan sheet, the Contractor shall bond and ground all equipment, cables trays, and hardware. This bonding and grounding shall comply with the National Electric Code and manufacturers' recommendations for the equipment being installed.

Communications System Installation. Equipment shall be furnished and installed, configured and tested by a manufacturer-certified agent. The submittals for the equipment shall address the following installation requirements. The installer shall meet the following requirements:

- The installer shall have at least four (4) Cisco CCIE level certified fulltime Engineers on the payroll at time of Letting and through out the contract duration.
-
- The installer shall be familiar with the design, configuration and deployment of optical solutions, Layer 3 switches, and IP multi-cast.
-
- The installer shall demonstrate previous design and implementation experience with Cisco or other vendor's optical solutions.
-
- The installer shall have local field engineering resources.
- The installer shall have project managers certified by the Project Management Institute.
-
- The installer shall have the capability to provide 24 hour network monitoring from a NOC facility

If any of the above requirements cannot be meet by the installer, the installer will be unacceptable and the Contractor must submit another installer for review and approval.

Prior to installation the following shall be submitted for review and approval:

- A detailed equipment list
- A drawing depicting physical layout and icons that represent the equipment required at each node
- A scope of work for testing methods that they will utilize for validating implementation and configuration.

Documentation. The installer shall provide record documents, in addition to other documents specified elsewhere herein, that will provide physical chassis card/slot assignments, logical addressing information, SONET layer drawings, and IP layer drawings.

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Integration. The Contractor shall develop a system architecture identifying the interconnection, provisioning, and setup of all equipment. This architecture shall be approved by the Engineer and shall address the following:

Future expansion and requirements as depicted in the plans

The interconnection of existing T-1 requirements at the I80/Stateline, I294/I57, and I94/I55 shelters

The interconnection of the northern SONET ring under phase 2 of this effort

The use of Gigabit Ethernet switches to interface video encoders and transport video using the Internet Protocol (IP).

High availability and redundant paths will be implemented using a Layer 3 IP routing architecture, utilizing redundant switches and fiber optic links

OC-48 SONET rings will provide point-to-point STS-12c links for transporting the IP packets between critical nodes.

The Contractor shall develop an addressing scheme for assigning the IP addresses. This scheme shall be approved by the Engineer.

The system is intended to be a complete integrated whole. Manufacturer equipment variances shall be taken into consideration in assembling the complete package, and no necessary component, appurtenance, software or other interface shall be omitted if required to achieve the defined system functionality, even though not explicitly defined in these Special Provisions or not explicitly shown on the plans. The Contractor shall remain responsible for the successful integration of the various sub-parts of the system; the Contractor may identify one key vendor, such as the communications system vendor, as the designated integration coordinator for a specific subsystem.

Shop Floor Testing. The contractor shall establish a location for shop-floor, simulated operational testing of assembled and interconnected sub-systems. The facility shall be within District' 1, indoors, with heating and air conditioning as required for the operational environment of the equipment, and with adequate power, lighting and restroom facilities to allow extended operational witness testing of the system.

This facility shall connect all equipment to be installed under this specification in an operational configuration. The equipment shall be grouped by ultimate location and configured as such. Optical links with simulated losses equal to those anticipated on the actual links plus three decibels (3 dB) shall interface the equipment. The equipment shall be equipped and provisioned as it will be in the final configuration.

This facility shall be used to validate and demonstrate the entire CCTV system design, from CCTV camera to video monitors. The Contractor shall demonstrate all functionality of the system. This shall include selecting and controlling cameras, selecting monitors and displaying video from any camera, and the operation of all alarms. The Contractor shall demonstrate the

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ability of controlling the system setup and provisioning through the network management system.

This facility shall be used to validate the software and system design. The Contractor shall develop a comprehensive Test Plan to verify the operation of the system and its ability to support the anticipated traffic loads. This Test Plan shall include all configurations and settings (hardware and software), test procedures, and anticipated results. A draft of the Test Plan shall be submitted to the Engineer for approval not less than 30 days prior to the initiation of any testing.

System tests shall be witnessed by the Engineer and the Contractor shall schedule the tests with the Engineer, allowing at least two (2) weeks advance notice. The contractor shall provide all test equipment, materials and interconnecting cable necessary to simulate a complete interconnected system. System-wide fiber losses shall be estimated and dummy loss attenuation shall be include to simulate, as close as possible, real installed system conditions at the end-of-life of the components. This shall equate to the anticipated link loss plus three (3) dB.

Testing shall include all of the camera equipment in the Video Distribution Control System, including components furnished under other items of this contract. Further, the Department will provide one of each type of existing CCTV camera for testing the integration of legacy cameras. The contractor shall provide the necessary temporary mounting provisions and connections for all of the cameras. The contractor shall provide lighting controls to simulate daytime and nighttime lighting conditions.

The contractor shall prepare and submit a detailed plan to test the proposed configuration and provisioning of the equipment and to demonstrate system performance of all specified and all submitted operational functionality for approval by the Engineer. The test plan shall simulate a matrix of mode and component failures and the system shall successfully perform all tests, as witnessed and approved by the Engineer. Should malfunctions or failures occur, the contractor shall make system corrections and repeat the associated tests. A complete record of all tests shall be kept by the contractor and delivered to the Engineer.

Once shop-floor testing is successfully completed, individual location sub-systems may be installed and connected at their respective field locations. The contractor shall use appropriate care in the transfer of the sub-systems and shall assure the physical protection of all equipment from mechanical damage and from the elements and shall also assure security of equipment.

Coordination With Other Contracts. The final system installation will be dependent upon the completion of work done in other contracts, particularly as it applies to the completion of raceways and the installation of interconnecting fiber between system nodal locations. The installation of the system shall be fully coordinated with other contracts.

Certain nodal equipment (such as the equipment for the I-80 locations) included in this system is intended for ultimate installation in facilities that are provided under another contract. The Contractor shall coordinate installation work with the other contractor and, to the extent possible shall coordinate interface work to minimize re-work and to optimize the use of space.

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Interconnecting Wiring. All wiring, cabling, and other provisions necessary to connect the installed system package to power panel boards, fiber optic patch panels, grounding systems, etc. at each nodal location shall also be included as part of each respective location package. Where the plans indicate wire and cable that exceeds immediate installed system use, the spare cables shall be labeled and terminated, and where terminated at equipment rack locations, the lengths of any spares shall be first approved by the Engineer as suitable for extension to future equipment in the line-up.

Maintenance of Existing CCTV System. Maintenance of the existing CCIV System shall be transferred from the ASMC (Advanced Systems Maintenance Contract) to the contractor from the time that access to the existing system is needed for field installation of the system expansion until final acceptance of the expanded system.

The existing system shall remain in essentially continuous operation throughout the expansion construction, with limited downtime as approved in advance, in writing, by the Engineer. The existing system is used, among other things, for the operation of the gate system on the Kennedy Expressway reversible lanes (REVLAC), and this system shall remain operational on a daily basis. The REVLAC system incorporates certain features that allow operation of devices from the various remote control buildings of the system. Should the contractor require extended (more than 8-hour downtime of the SONET system, with Engineer approval, the contractor shall be responsible for the costs to have the REVLAC system operated from the remote buildings by the ASMC contractor, on a time and material basis.

Phased Cut-over of Existing CCTV Circuits on I-55

The Contractor shall cutover the existing CCTV circuits on I-55, three circuits at a time. The new fiber optic modems and Universal Sub rack Frame shall be installed in the I-94/I-55 Shelter. The fibers from the transceivers at the CCTV field locations on I-55 shall be terminated on the new receivers. After testing the new configuration and verifying that the video and camera control is operational at the shelter, the video shall be connected to the encoders and the system retested in its final configuration. When the three CCTV circuits have been successfully reconfigured and successfully tested, the Contractor shall relocate three transceivers from the TSC to the I-94/I-55 shelter and the process shall be repeated for the next three circuits. This process shall continue until all CCTV circuits are terminated in the new shelter.

Installed Operational Testing. Once all CCTV camera equipment and all CCTV Distribution System location sub-systems are installed, connected and locally operational, the entire system shall be tested. The contractor shall submit a test plan for approval by the Engineer, and the test plan shall assure demonstration of all required system functionality.

Fiber optical loss values on existing fiber runs to be employed in the CCTV Distribution System are as indicated in the plans. The contractor may confirm these values prior to interconnecting to the existing fiber. Prior to system testing, all fiber optic runs to be employed for the system shall be tested optical loss values between nodes and overall and the test values shall be documented and compared with system requirements. Except for proven excess losses in existing fiber runs, the contractor shall remain responsible for any amplification necessary to establish system performance as specified. Testing shall incorporate testing of all of the camera equipment furnished under other items of this contract.

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System tests shall be witnessed by the Engineer and the Contractor shall schedule the tests with the Engineer, allowing at least 2 weeks advance notice. The contractor shall provide all test equipment, materials and interconnecting cable necessary to perform the tests.

ComCenter at District Headquarters. In accordance with the plans, the Contractor shall accomplish the following: (Note: no specific order is intended; order and scheduling shall be identified by the Contractor. In addition, these are partial lists only generally summarize the work to be done; they are neither exhaustive nor specific.)

- Install equipment cabinets.
- Install SONET multiplex equipment.
- Install two Gigabit Ethernet switches.
- Install decoders and video amplifiers. Connect decoders to the video amplifiers.
- Connect the decoders to the Gigabit Ethernet Switches and the video amplifiers to the existing video switching matrix.
- Replace five existing 42" LCD monitors.
- Install two new 42" LCD monitors. Connect to power panel and existing video switching matrix.
- Install port server. Connect to Gigabit Ethernet switch; connect RS-232 ports to alarm monitoring CPU.
- Install video control workstation with client video control software; connect to Gigabit Ethernet switch
- Install four rack-mounted computers; two video control servers, one Distribution System Video Management and Archiving Workstation, and one CCTV System Management and Monitoring Workstation. Connect these computers to the keyboard, mouse, and 15" rack-mounted monitor through the KVM switch.
- Setup and provision equipment and software

As part of the ComCenter, establish a remote fiber optic link to the ITS Project Office. Furnish and install one Gigabit Ethernet Switch, one Camera Control System Workstation, and four Video Decoders for installation at this site. This link shall use existing single mode optical fibers. Four additional 17" LCD Monitors shall be furnished and installed next to the existing plasma monitor. The Contractor shall furnish and install ceiling brackets to secure these monitors. The Contractor shall install the coax and power for these monitors in the wall and restore the wall to its original condition. Fiber optic cables shall be furnished and installed to interconnect this equipment to the existing termination panels. All work shall be coordinated with the Engineer and the building representative.

Traffic Systems Center. In accordance with the plans, the Contractor shall accomplish the following: (Note: no specific order is intended; order and scheduling shall be identified by the Contractor. In addition, these are partial lists only generally summarize the work to be done; they are neither exhaustive nor specific.)

- Install SONET multiplex equipment.
- Install two Gigabit Ethernet switches.
- Connect the SONET multiplex equipment to the channel banks.
- Install video decoders and video amplifiers.

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- Install Video Control Subsystem
- Install power to all equipment.
- Remove the existing Meridian Fiber Optic Video Transceivers and transport them to the I94 at I57 shelter.
- Connect the outputs of the decoders to the video amplifier. Connect one output of the video amplifier to the existing video switching matrix, connect one output to the
- Install a video control workstation with client software. Provide power to the computer.
- Connect the video control workstation to the video decoders using the existing TSC LAN.
- Setup and provision equipment and software

I-80 at State Line. In accordance with the plans, the Contractor shall accomplish the following: (Note: no specific order is intended; order and scheduling shall be identified by the Contractor. In addition, these are partial lists only generally summarize the work to be done; they are neither exhaustive nor specific.)

- Install SONET multiplex equipment.
- Install two Gigabit Ethernet switches.
- Connect Gigabit Ethernet switched to SONET multiplex.
- Connect power to SONET multiplex equipment, Gigabit Ethernet equipment, video amplifiers, and JPG capture encoders. The size and number of conductors shall be as indicated in the drawings. All electrical conductors shall be installed in EMT conduit.
- Disconnect coaxial cables from existing transmission equipment and reconnect to new video amplifiers.
- Install coaxial cables between the video amplifiers and the JPG capture encoders and the MPEG-2 encoders.
- Disconnect the existing channel multiplex equipment from the existing transmission equipment. Reconnect the channel multiplex to the DS-1 port on the SONET multiplex.
- Install serial port server. Connect port server to Gigabit Ethernet switch and one RS-232 port on the port server to the shelter's alarm panel.
- Setup and provision equipment and software

I-80 at I-394. In accordance with the plans, the Contractor shall accomplish the following: (Note: no specific order is intended; order and scheduling shall be identified by the Contractor. In addition, these are partial lists only generally summarize the work to be done; they are neither exhaustive nor specific.)

- Reconfigure existing video circuits and fiber optic patches. Work could include removing fiber optic video receivers for installation at either the I-80/State Line or I-57/I-294 shelters. This work shall be included in the I-80 at State Line and I-57 at I-294 pay items.

CCTV Distribution Subsystem, I-57 at I-294. In accordance with the plans, the Contractor shall accomplish the following: ((Note: no specific order is intended; order and scheduling shall be identified by the Contractor. In addition, these are partial lists only generally summarize the work to be done; they are neither exhaustive nor specific.)

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- Install SONET multiplex equipment.
- Install two Gigabit Ethernet switches.
- Install video patch panel.
- Connect Gigabit Ethernet switched to SONET multiplex.
- Connect power to SONET multiplex equipment, Gigabit Ethernet equipment, video amplifiers, and JPG capture encoders. The size and number of conductors shall be as indicated in the drawings. All electrical conductors shall be installed in EMT conduit.
- Disconnect coaxial cables from existing transmission equipment and reconnect to new video amplifiers.
- Install coaxial cables between the video amplifiers and the JPG capture encoders and the MPEG-2 encoders.
- Disconnect the existing channel multiplex equipment from the existing transmission equipment. Reconnect the channel multiplex to the DS-1 port on the SONET multiplex.
- Install serial port server. Connect port server to Gigabit Ethernet switch and one RS-232 port on the port server to the shelter's alarm panel.
- Setup and provision equipment and software

CCTV Distribution Subsystem, Hillside Hub. In accordance with the plans, the Contractor shall accomplish the following: (Note: no specific order is intended; order and scheduling shall be identified by the Contractor. In addition, these are partial lists only generally summarize the work to be done; they are neither exhaustive nor specific.)

- Install new equipment racks and cable tray
- Install power to new cable racks
- Install SONET multiplex equipment.
- Install three Gigabit Ethernet switches.
- Connect Gigabit Ethernet switched to SONET multiplex.
- Install video patch panel.
- Connect power to SONET multiplex equipment, Gigabit Ethernet equipment, video amplifiers, and JPG capture encoders. The size and number of conductors shall be as indicated in the drawings. All electrical conductors shall be installed in EMT conduit.
- Disconnect coaxial cables from existing transmission equipment and reconnect to new video amplifiers.
- Install coaxial cables between the video amplifiers and the JPG capture encoders and the MPEG-2 encoders.
- Disconnect the existing channel multiplex equipment from the existing transmission equipment. Reconnect the channel multiplex to the DS-1 port on the SONET multiplex.
- Install serial port server. Connect port server to Gigabit Ethernet switch and one RS-232 port on the port server to the shelter's alarm panel.
- Set up and provision equipment and software

CCTV Distribution Subsystem, I-94 at I-57. In accordance with the plans, the Contractor shall accomplish the following: (Note: no specific order is intended; order and scheduling shall be identified by the Contractor. In addition, these are partial lists only generally summarize the work to be done; they are neither exhaustive nor specific.)

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- Install SONET multiplex equipment.
- Install two Gigabit Ethernet switches.
- Install video patch panel.
- Connect Gigabit Ethernet switched to SONET multiplex.
- Connect power to SONET multiplex equipment, Gigabit Ethernet equipment, video amplifiers, and JPG capture encoders. The size and number of conductors shall be as indicated in the drawings. All electrical conductors shall be installed in EMT conduit.
- Disconnect coaxial cables from existing transmission equipment and reconnect to new video amplifiers.
- Install coaxial cables between the video amplifiers and the JPG capture encoders and the MPEG-2 encoders.
- Disconnect the existing channel multiplex equipment from the existing transmission equipment. Reconnect the channel multiplex to the DS-1 port on the SONET multiplex.
- Install serial port server. Connect port server to Gigabit Ethernet switch and one RS-232 port on the port server to the shelter's alarm panel.
- Patch fibers at the Skyway and Maintenance shelters as indicated in the plans to connect the CCTV cameras to the shelter at I94 and I57.
- Set up and provision equipment and software

CCTV Distribution Subsystem, I-94 at I-55. In accordance with the plans, the Contractor shall accomplish the following: (Note: no specific order is intended; order and scheduling shall be identified by the Contractor. In addition, these are partial lists only generally summarize the work to be done; they are neither exhaustive nor specific.)

- Install SONET multiplex equipment.
- Install two Gigabit Ethernet switches.
- Install video patch panel.
- Connect Gigabit Ethernet switched to SONET multiplex using Ethernet cables.
- Install video amplifiers.
- Install power to SONET multiplex equipment, Gigabit Ethernet equipment, video amplifiers, and JPG capture encoders.
- Disconnect coaxial cables from existing transmission equipment and reconnect to new video amplifiers.
- Install coaxial cables between the video distribution amplifiers and the JPG capture encoders, between the video distribution amplifiers and between the MPEG-2 encoders, and between the video distribution amplifiers and the in-rack video display clusters.
- Using coaxial cables, connect the input of the video amplifiers to a jack on the video patch panel. Connect the jack in the video patch panel to the corresponding fiber optic video receiver.
- Re-install Meridian FO Video Transceivers removed from the TSC. Reconnect the optical port to the fiber termination panel, careful to maintain the current configuration. Connect the RS-485 port of the to the control port on the corresponding MPEG-2 encoder. Connect the video output of the FO Video Transceiver to the field side (line) of the video patch panel; connect the output side (equipment) of the video patch panel to the distribution amplifier.

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- Install serial port server. Connect port server to Gigabit Ethernet switch and one RS-232 port on the port server to the shelter's alarm panel.
- Patch fibers at the Skyway and Maintenance shelters as indicated in the plans to connect the CCTV cameras to the shelter at I94 and I55.
- Set up and provision equipment and software

Integration. The Contractor shall provide a third party to integrate software into the CCTV system. This software will control existing cameras and cameras installed under this project. The software shall allow any operator to select a camera and to place it on a monitor located at their facility of operations center. This capability shall be provided to operators at the Communications Center and the Traffic Systems Center. Five levels of access will be provided and assigned by user log-in identification. These privileges shall be controlled by the system administrator located at the Communications Center. The system shall support a minimum of 100 users or user identifications.

The Integrator shall assign system IDs to field equipment, locations, and populate the network's information database. This shall include legacy CCTV hardware.

The Contractor shall furnish and install two-colored, embossed identification tags for all equipment based on the system IDs. This requirement will be further defined by the Engineer regarding standard nomenclature and methods.

The Contractor shall provide a third party to integrate the SONET and Gigabit Ethernet System. This CCTV System Integrator shall have a minimum of ten years of experience with designing and integrating systems using Cisco equipment. The Integrator shall prove a 24/7/365 point of contact and system support. The Technical Staff shall include a minimum of three individuals certified at the level of Cisco CCIE.

The Contractor shall also integrate the new system equipment into the existing System Management System at the Communications Center. This work shall include alarm panels in the new communications shelters.

Final Documentation. The system shall not be complete until the delivery and approval of final documentation of the installed system. Documentation shall be provided in both hard-copy and electronic format. Hard copy documentation shall be in triplicate in heavy-duty piano-hinge binders or other rugged bindings as approved by the Engineer, and each lot of documentation shall be in rugged plastic or metal storage containers suitable for future access of materials. Electronic format documentation shall be PDF on CD media, in duplicate, and in a rugged positive-closure hard-shell container.

Documentation shall include but not be limited to approved copies of all submittal material complete with any modifications and corrections made in the course of construction, all test plans and test results, bid drawings marked to indicate all changes and field adjustments made in the course of construction, and all installation and maintenance manuals.

The Contractor shall provide a maintenance history for each piece of electronic equipment provided on this project. This history shall include the equipment type, model and serial

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numbers, date of manufacture, date and location of installation, date of all associated tests required by these Special Provisions and the performance of the equipment during these tests. Any maintenance activity performed on the unit because of a failure shall be documented, and shall include: an explanation of all failures, date that the equipment was removed from a cabinet, the repairs that were made, the date and nature of any tests made to check the correct operation of the unit, and the date and the location where the unit was reinstalled in the field.

Software Manuals.

Software manuals shall include the following:

Client Manual

The Client Manual shall clearly outline all steps necessary to operate the software. The manual shall include the following:

- Step by step instructions on how to perform all the tasks the system is capable of.
- Screen captures taken directly from the software to illustrate the instructions.
- A table of contents and index.

Server Manual

The Server Manual shall clearly outline all steps necessary to configure the software. The manual shall include the following:

- The Server Manual shall include screen captures taken directly from the software to illustrate the instructions.
- The Server Manual shall contain a table of contents.
- The Server Manual shall contain an index.

Driver Application Notes

Each device driver shall have Driver Application Notes that document configuration and operation of the driver and its devices.

The Driver Application Notes shall clearly outline all steps necessary to configure the software.

The Driver Application Notes shall include screen captures taken directly from the software to illustrate the instructions.

The Driver Application Notes shall contain a table of contents.

Training. Training shall be conducted at two levels, a systems operation level and a specific equipment level. A letter of commitment describing the proposed training shall be submitted along with the equipment submittals for review and approval.

System Operation training. The system operation training shall be conducted on the system when it becomes operational and prior to any final inspections. System training shall consist of actual hands-on training of the functioning system. The training shall encompass and

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demonstrate all aspects of the video system. System operation training shall be broken up into two levels, end user and administrator. The end user training will encompass monitor and camera selection as well as PTZ functions. The administrative level training will begin where the user training leaves off and include all operational and configuration topics including, but not limited to: maps, device designation/configuration, user configuration, system maintenance operations, and trouble shooting. A course outline shall be submitted for approval by the Engineer. Training shall be for up to 12 State employees. The Contractor may add other personnel to the training at no additional cost to the State.

Equipment training. Training on specific equipment shall be provided under this contract. The specific equipment training shall consist of hands on training of the SONET optical router and the gigabit Ethernet switches. The training shall be conducted by a manufacturer certified training partner. The training company shall have a minimum of 5 years experience in training individuals of this type of equipment. The manufacturer's representative or distributor shall not perform the equipment training. Training classes shall be provided for each of the two types of equipment. The classes shall be multi-day, held at the District One Headquarters or at a location within District One, excluding downtown Chicago. Any prerequisite classes required for the specific equipment training shall be provided by the same training company as the specific equipment training. Training shall be for up to 10 State employees. The Contractor may add other personnel to the training at no additional cost to the State. Topics covered in detail shall be VLANs, IP Networking & Addressing, IP Sub netting, Configuration of switches, Spanning Tree protocol, IP Multicast, Multilayer switching and QoS.

There shall also be a complete one day session, in addition to the specific equipment training, for system specific training. The training shall include system setup, configuration, operation, maintenance, and trouble shooting. Specific equipment configuration settings shall be explained and discussed in detail during this training as well as operation and maintenance.

Warranty.

System Warranties. In addition to the specified contractor's warranty for the contract work as a whole, the CCTV Distribution System shall be furnished to the Department complete with manufacturer's warranties for incorporated equipment and systems. The time period for these shall be the same as that for the contract work, 6 months from the date of final acceptance of the work or the manufacturer's published standard warranty term from the date of final acceptance, whichever is longer. The contractor shall provide extended warranty coverage as may be necessary to meet these requirements at no additional cost to the state. Submittal information shall include complete warranty information and a contractor's certification of commitment to provide extended warranty coverage as specified.

Method of Measurement. Each individual subsystem shall be counted for payment when furnished and installed, connected, field tested and accepted. A 25% payment will be allowed when all sub-systems are assembled, delivered to the shop staging location and approved for testing by the Engineer. An additional 25% payment will be allowed when all sub-systems have been connected in simulation and successfully passed shop staging testing as approved by the Engineer. An additional 25% payment will be allowed for individual sub-systems as they are installed and made operational. The final 25% payment will be allowed when all sub-systems

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have been installed, connected and passed installed operational testing; when all training has been provided; and when all documentation has been completed, delivered and approved by the Engineer.

Basis of Payment. The CCTV Distribution System, although operating as an integrated whole, will be paid on the basis of the system elements installed at each individual location as follows:

CCTV DISTRIBUTION SUBSYSTEM, COMCENTER
CCTV DISTRIBUTION SUBSYSTEM, TRAFFIC SYSTEMS CENTER
CCTV DISTRIBUTION SUBSYSTEM, I-80 AT STATE LINE
CCTV DISTRIBUTION SUBSYSTEM, I-57 AT I-294
CCTV DISTRIBUTION SUBSYSTEM, HILLSIDE
CCTV DISTRIBUTION SUBSYSTEM, I-57 AT I-94
CCTV DISTRIBUTION SUBSYSTEM, I-55 AT I-94

CLOSED CIRCUIT DOME VIDEO CAMERA, MATERIAL ONLY

Effective Date: February 25, 2005

Description. This item shall consist of furnishing an integrated Closed-Circuit Television (CCTV) Dome Camera Assembly as describer herein and as indicated in the Plans.

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deems appropriate and as approved by the Engineer. Any damage to the concrete encasement and conduit during construction shall become the responsibility of the Contractor to repair or replace, as determined by the Engineer.

The Contractor shall ensure that the conduit is continuous, with no break from one handhole to the end cap as shown on the Plans. The Contractor shall test the integrity of the conduit upon completion of the roadway above each conduit. The Contractor shall install sensor carriers for the entire length of the conduit to demonstrate its suitability and correct installation. These carriers shall be removed upon approval of the Engineer and completion of the demonstration.

Method of Measurement. This item shall be measured for payment in feet for CONDUIT ENCASED, CONCRETE, 3" DIA., PVC. Measurements will be made in straight lines along the centerline of the conduit between ends.

Basis of Payment. This work shall be paid for at the contract unit price per foot for CONDUIT ENCASED, CONCRETE, 3" DIA., PVC, which shall include conduit, labor and miscellaneous materials required to make a complete and operational installation as specified herein and as directed by the Engineer.

COILABLE NON-METALLIC CONDUIT

Description. This work shall consist of furnishing and installing coilable non-metallic raceways, fittings, and accessories either laid in trench or pushed (bored and pulled).

Materials. Materials shall conform to requirements of the Standard Specifications except as modified below.

Revise Article 1088.01(c) to read:

“(c) Coilable Nonmetallic Conduit.

Polyethylene Duct. The duct shall be a UL Listed plastic duct which is intended for underground use and can be manufactured and coiled or reeled in continuous transportable lengths and uncoiled for further processing and/or installation without adversely affecting its properties of performance.

The duct shall be in accordance with the requirements of ASTM F2160.

The duct shall be composed of black high density polyethylene meeting the requirements of ASTM D 3350, Class C, Grade PE30.

Duct dimensions shall conform to the following table within the manufacturing tolerances set forth in ASTM F2160. Duct sizes through 3" shall conform to Tables 3 and 8 for Schedule 40 PE conduit. 4" duct shall conform to Tables 2 and 5 for SDR 13.5 PE conduit.

Nom. Duct Diameter		Nom. Outside Diameter		Min. Wall Thickness	
mm	In	mm	in	Mm	in
27	1	33.4	1.315	3.4	0.133
35	1.25	42.2	1.660	3.6	0.140
41	1.5	48.3	1.900	3.7	0.145
53	2.0	60.3	2.375	3.9	0.154
76	3.0	88.9	3.50	5.5	0.216
102	4.0	114.3	4.50	8.5	0.333

Performance Tests. Polyethylene Duct testing procedures and test results shall meet the requirements of ASTM F2160. Certified copies of the test report shall be submitted to the Engineer prior to the installation of the duct.

Coilable non-metallic conduit 2" and larger shall be machine straightened to remove the longitudinal curvature and ovality caused by coiling the conduit onto reels prior to installing in trench, encasing in concrete or embedding in structure. The straightening shall not deform the cross-section of the conduit such that any two measured outside diameters, each from any location and at any orientation around the longitudinal axis along the conduit differ by more than 6 mm (0.25"). The longitudinal axis of the straightened conduit shall not deviate by more than 20 mm per meter (0.25" per foot) from a straight line.

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The recommendations of the straightening machine manufacturer regarding ambient temperature shall be followed.”

In order to trace the fiber optic cable after installation, pull tape shall be installed or come pre-fabricated in the conduit for each fiber optic cable run. The pull tape shall clearly indicate English units of length on the apparatus. The pull tape shall have a minimum tensile strength of 1250 lbf. All pull tape splices shall be kept to a minimum and shall incorporate maximum lengths of cable supplied by the manufacturer. Pull tape shall be run continuously from handhole to handhole. Pull tape shall be grounded at handholes and cabinets meeting the requirements of Section 801.14, Equipment Grounding Conductor.

CONSTRUCTION REQUIREMENTS

Coilable Non-metallic Conduit, pushed (bored and pulled) or in trench, shall have a minimum depth of 30” feet below the finished grade as indicated on the plans.

Coilable Non-metallic Conduit, pushed (bored and pulled) or in trench, shall be installed according to Section 810.03(c) of the Standard Specifications.

Method of Measurement. This work will be measured for payment according to section 801.04 of the Standard Specifications.

Basis of Payment. This work will be paid for at the Contract unit price for CONDUIT IN TRENCH, HIGH DENSITY POLYETHYLENE, COILABLE, of the size specified, or CONDUIT PUSHED, HIGH DENSITY POLYETHYLENE, COILABLE of the size specified, which price shall be payment in full for furnishing and installing the coilable nonmetallic conduit and all labor, tools, equipment, and incidentals necessary to complete the work.

ENGINEER’S FIELD OFFICE TYPE A (SPECIAL)

This item shall consist of furnishing all utilities and maintaining, in good condition, the existing office space, located at 900 South DesPlaines Avenue, Chicago, for the exclusive use of the Engineer or Authorized Representative. The Office shall meet the requirements of Article 670.02 of the Standard Specifications with the following modifications:

1. The following equipment and furnishing shall be provided by the Contractor for the rear portion of the building that has been previously subdivided, as approved by the Engineer.
 - A. Twenty (20) desks with minimum working surface (1.1m x 750mm) each and Twenty (20) non-folding office chairs with upholstered seats and backs.
 - B. Three (3) 4-post drafting tables with minimum top size of (950mm x 1.2m). The top shall be basswood or equivalent and capable of being tilted through an angle of 50 degrees. Three (3) adjustable height drafting stools with upholstered seats and backs shall also be provided.
 - C. Five (5) freestanding file cabinets legal size with locks, four drawers with an Underwriter’s Laboratories insulated file device 350 degrees one hour rating.
 - D. One (1) office-style refrigerator minimum size of 0.3 cubic meters with a freezer unit included.
 - E. Three (3) electric desk type tape printing calculators.
 - F. Ten (10) telephones and one (1) telephone answering machine (for exclusive use by the Engineer). Eight (8) telephone lines should be provided including one (1) telefax line and two (2) modem lines.
 - G. Two (2) electric water cooler dispenser.
 - H. One (1) telecommunications fax machine including maintenance and operating supplies. The fax machine shall use plain paper.
 - I. One (1) desktop dry process office copier (including maintenance and operating supplies capable of copying field books). Supply paper and trays for 215mm x 280mm; 215mm x 355mm; and 280mm x 430mm sizes. The copier shall be complete with automatic feeder and sorter.

Revised 04-20-2005

BUCK BOOST TRANSFORMER

Description. This work shall consist of furnishing and installing a buck boost transformer for temporary wiring at the locations shown on the Plans or as directed by the Engineer. Removal of the transformer shall also be included in this item. The transformer shall remain the property of the Contractor.

Materials. Transformers shall be suitable for outdoor pole mounted applications, Class 7400 as manufactured by Square D or equivalent models of Cutler-Hammer, Sola/Heavi-Duty or approved equal. Previously used transformers will be acceptable for installation upon inspection and approval of the Engineer.

Installation. Transformer shall be installed in the location shown on the plans to increase the voltage in the temporary lighting circuit as required for proper operation of the luminaires. Necessary mounting brackets for attachment to existing metal poles or temporary wood poles and all required wiring connections at the transformer shall be included in this item.

When a buck boost transformer is shown on the plans the contractor shall measure the voltage at the last light tower. If the voltage at the last light tower is less than 220 volts line to neutral a buck boost transformer shall be installed in the location shown. If the voltage measured is 220 volts or greater the buck boost transformer shown on the plans is not required and shall not be installed. Cost of measuring the voltage to determine if a buck boost transformer is required shall not be measured for payment but shall be considered included in the cost of the contract.

The buck boost transformer shall increase the voltage at the point of installation to 240 volts line to neutral. For pricing purposes the contractor shall use 3 KVA transformers. Transformer sizing shall be determined by the Contractor based on average and voltage measurements taken by the Contractor at the point of connection of the temporary wiring to the permanent wiring as shown on the Plans or directed by the Engineer. Transformers less than 3 KVA shall be utilized as required but will be paid for at the same unit price as the 3 KVA transformer. Transformer sizing shall be approved by the Engineer.

Basis of Payment. This work will be paid for at the Contract unit price for BUCK BOOST TRANSFORMER, which price shall be payment in full for furnishing, installing, wiring and removing the buck boost transformer and all labor, tools, equipment, and incidentals necessary to complete the work.

(CTE – 04/14/2005)

Added 04-20-2005

ILLINOIS DEPARTMENT OF TRANSPORTATION
 SCHEDULE OF PRICES
 CONTRACT
 NUMBER - 62583

State Job # - C-91-085-03
 PPS NBR - 1-74823-0505
 County Name - COOK- -
 Code - 31 - -
 District - 1 - -
 Section Number - 2003-311

Project Number
 ACIM-0943/369/055

Route
 FAI 90/94

Item Number	Pay Item Description	Unit of Measure	Quantity	x	Unit Price	=	Total Price
* XX004046	AERIAL CABLE REMOVAL	FOOT	22,758.000				
XX004383	REL CONTR T4 CAB SPL	EACH	1.000				
XX104800	COMB CC&G TBV.12	FOOT	115.000				
X0321973	MOD EX SERVICE INSTAL	EACH	2.000				
X0322300	ELCBL C 18 4C TW SH	FOOT	147,009.000				
X0322920	COMM CABINET & EQUIP	EACH	1.000				
* X0323360	WOOD POLE REMOVAL	EACH	163.000				
X0323363	ELCBL C 12 3/C	FOOT	5,134.000				
X0323364	ELCBL C 19 6/C	FOOT	2,926.000				
X0323426	SED CONT DR ST INL CL	EACH	282.000				
X0323574	MAINTAIN LIGHTING SYS	CAL MO	33.000				
X0323710	REMOV COND ATT TO STR	FOOT	2,158.000				
X0323898	CCTV DOME CAMERA	EACH	20.000				
X0323900	CONC FDN TY 1	FOOT	206.000				
X0323907	COMMUNICATIONS VAULT	EACH	31.000				
* REVISED : APRIL 19, 2005							

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Item Number	Pay Item Description	Unit of Measure	Quantity	x	Unit Price	=	Total Price
X0324945	LED DMS F-MAT CNFG IO	EACH	11.000				
* X0324950	BK BOOST TRANSFORMER	EACH	7.000				
X4066414	BC SC SUPER "C" N50	TON	21.000				
X4066426	BC SC SUPER "D" N70	TON	19.000				
X4066614	BCBC SUP IL-19.0 N50	TON	49.000				
X6640200	TEMP CH LK FENCE	FOOT	1,755.000				
X6700410	ENGR FLD OFF A SPL	CAL MO	33.000				
X7011015	TR C-PROT EXPRESSWAYS	L SUM	1.000				
X7040600	FUR TEMP CONC BARRIER	FOOT	1,120.000				
X7240600	REM RE-ERECT EX SIGN	EACH	5.000				
X8040100	ELECT CONN TO SIN STR	EACH	71.000				
X8100045	CON ENC RC 1-3" CNC	FOOT	252.000				
X8100060	CON T 4 GALVS PVC CTD	FOOT	20.000				
X8101300	CON T 5 GALVS PVC CTD	FOOT	550.000				
X8110110	CON ATS 1 GALVS PVC	FOOT	15,686.000				
X8110115	CON ATS 2 GALVS PVC	FOOT	10,849.000				
* REVISED : APRIL 19, 2005							

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Route
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Item Number	Pay Item Description	Unit of Measure	Quantity	x	Unit Price	=	Total Price
66410400	CH LK FENCE REM & RE	FOOT	773.000				
66900200	NON SPL WASTE DISPOSL	CU YD	796.000				
66900450	SPL WASTE PLNS/REPORT	L SUM	1.000				
66900530	SOIL DISPOSAL ANALY	EACH	10.000				
67100100	MOBILIZATION	L SUM	1.000				
72000100	SIGN PANEL T1	SQ FT	266.000				
72000300	SIGN PANEL T3	SQ FT	179.000				
72700100	STR STL SIN SUP BA	POUND	954.000				
73400100	CONC FOUNDATION	CU YD	4.000				
80400200	ELECT UTIL SERV CONN	L SUM	1.000		140,000.00		140,000.00
* 80700140	GROUND ROD 5/8 X 10	EACH	430.000				
* 80800400	TEMP WP50 CL4	EACH	55.000				
80800500	TEMP WP60 CL4	EACH	43.000				
80800850	TEMP WP90 CL4 15MA	EACH	22.000				
80802600	W POLE 50 CL 2	EACH	1.000				
* REVISED : APRIL 19, 2005							

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Item Number	Pay Item Description	Unit of Measure	Quantity	x	Unit Price	=	Total Price
81300830	JUN BX SS AS 18X18X8	EACH	20.000				
81300840	JUN BX SS AS 18X18X12	EACH	2.000				
81300960	JUN BX SS AS 42X36X12	EACH	8.000				
81306400	RELOC EX JUNCT BOX	EACH	64.000				
81306500	REM EX JUNCTION BOX	EACH	11.000				
81400100	HANDHOLE	EACH	1.000				
81400200	HD HANDHOLE	EACH	114.000				
81500200	TR & BKFIL F ELECT WK	FOOT	213,469.000				
81700110	EC C EPR RHW 1C 10	FOOT	60,729.000				
81800100	A CBL 3-1C3/0 A MES W	FOOT	1,400.000				
* 81800700	A CBL 3-1C2 AL MESS W	FOOT	29,868.000				
82102310	LUM SV HOR MT 310W	EACH	4.000				
* 82106100	LUM SV HMHM 400W (IO)	EACH	842.000				
82107110	UP LUM 70W HPS SS HS	EACH	366.000				
82107310	UP LUM 150W HPS SS HS	EACH	8.000				
* REVISED : APRIL 19, 2005							