



**TRANSPORTATION CABINET**

Frankfort, Kentucky 40622  
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May 4, 2012

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ADDENDUM # 1

Subject: Jefferson County, STP 2641 (174)  
Letting May 18, 2012

(1)Added - Notes - Pages 22(a)-22(r) of 144

Proposal revisions are available at <http://transportation.ky.gov/Construction-Procurement/>.

If you have any questions, please contact us at 502-564-3500.

Sincerely,

A handwritten signature in blue ink that reads "Ryan Griffith".

Ryan Griffith  
Director  
Division of Construction Procurement

RG:ks  
Enclosures



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COMMONWEALTH OF KENTUCKY  
TRANSPORTATION CABINET  
DEPARTMENT OF HIGHWAYS

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JEFFERSON COUNTY  
TRIMARC EXTENSION PROJECT (TEP)  
LETTING: MAY 18, 2012  
ITEM NUMBER: 5-804.10  
PROJECT NUMBER: FD52 056 0264 021-023  
STP 2641(174)

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## PROJECT DESCRIPTION

### GENERAL

This project includes reconstructing existing camera and installing two new web cameras.

This ITS Project complies with the requirements of 23 CFR 940. The ITS work to be performed is referenced in the current Kentucky 2009 Statewide ITS Architecture at Appendix C-4,5 and C-4 (Traffic Incident Management System ATMS08, and Traffic Information Dissemination ATMS06), and in the Updated Section 5 and Appendix B of the 2009 Addendum to the Original Kentucky ITS Business Plan.

### EQUIPMENT AND MATERIALS

All equipment and materials shall be new, free of defects and damage.

### SPECIFICATIONS AND WORKMANSHIP

Unless otherwise specified, all work shall conform to the following:

- Kentucky Standard Specifications for Road and Bridge Construction, latest edition.
- FHWA, Manual on Uniform Traffic Control Devices, latest edition.
- National Electrical Code, latest edition.
- National Electric Safety Code, latest edition.
- KYTC Department of Highways Standard Drawings, current editions.

- KYTC Department of Highways Sepia Drawings, current editions.
- International Municipal Signal Association (IMSA) Specification No. 51-7, current edition.
- AASHTO, Roadside Design Guide, latest edition.
- AASHTO, Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals, latest edition.

All work shall be performed in a neat and professional manner. The Contractor shall remove debris and trash from work areas during construction. The Contractor shall restore areas to original condition and clean up all debris after construction.

#### DAMAGE TO EXISTING FACILITIES

The Contractor shall be responsible for locating all underground utilities prior to excavation. The contractor shall repair damage caused to any public or private facilities at his expense. Utilities include but are not limited to telephone, power, water, gas, fiber optic cable, underground vaults, roadway lighting wiring, traffic signal wiring, and roadway drainage systems.

#### MATERIALS LIST

The contractor shall provide an equipment list in Microsoft Excel format to the Engineer containing the following information:

- Type of equipment
- Field location
- Make
- Model
- Serial number
- Date of purchase
- Manufacturer contact information
- Equipment vendor contact information (if different)
- Date of Installation
- Date warranty expires

This list shall be provided to the Division of Traffic Operations prior to burn-in testing.

#### WARRANTY

The Contractor shall provide a copy of all equipment warranty information to the Division of Traffic Operations. The Contractor shall provide documentation from the manufacturer that ownership of the warranty is transferred to the following:

Kentucky Transportation Cabinet  
Division of Traffic Operations  
200 Mero Street  
Frankfort, KY 40622

## TESTING

The Contractor shall demonstrate proper functioning of all devices at the field cabinets.

A 30 day equipment burn-in test will begin after each device is accepted. If a device fails during the 30 burn-in day test the Contractor shall repair or replace the device and demonstrate that the device is functioning at the field cabinet and a new 30 day burn-in test will begin for that device. Each device will be accepted after it has successfully completed its 30 day test. The 30 day burn-in test will be conducted by TOC personnel in Frankfort from the operations center and consist of operational control of PTZ and video of the remote camera location and sign control.

## SHOP DRAWINGS

All items that are used on this project shall have shop drawings sent to Engineer, who will contact Division of Traffic Operations for approval. All items shall be approved before purchase of said items.

## AS-BUILT DRAWINGS

The Contractor, at the completion of the project, shall submit as-built drawings. As-built drawings shall be submitted in electronic format such as .pdf, .tiff, .dgn or other standard image format acceptable to the Engineer. As-built drawings may be scanned from marked up field plans or drawn in MicroStation. As-built drawings shall be scanned at a resolution that will allow them to be clearly legible on a computer display. As-built drawings shall include the exact location of all above ground equipment, underground conduit, wire, sensors and other equipment. Drawings shall indicate any changes to the design including changes to the numbers of conductors, wire gage, splices, additional conduit, etc. Conduit locations shall be drawn to scale or shall be dimensioned and referenced to permanent roadway features. Turns in conduit shall be referenced so that the conduit paths may be derived from the as-built drawings. Existing underground utilities shall be indicated on the drawings. Two copies of the drawings shall be submitted. One copy of the drawings shall be submitted to the Engineer. One copy of the drawings shall be submitted to the KYTC Division of Traffic Operations Design Services Branch. The Contractor shall correct any drawings that are deemed unacceptable to the Engineer. As-built drawings shall be delivered prior to burn-in testing.

ONLY APPLIES TO JEFFERSON COUNTY INSTALLATIONS BUT ALL ABOVE ITEMS STILL APPLY FOR ANYTHING THAT IS NOT COVERED UNDER THIS

## SYSTEM COMPATIBILITY

The Contractor is responsible for coordinating with TRIMARC to insure equipment compatibility and to complete integration of equipment into the TRIMARC project.

## COMMUNICATIONS

Camera shall communicate with the control center over the new phone lines and/or DSL connection (coordinated with the TRIMARC). The Contractor shall be responsible for furnishing and installing all conduits, junction boxes and communication cables installed on Kentucky right-of-way as specified in the plans. The Contractor shall be responsible for the installation and correct operation of all communications systems located in the field cabinet to the field devices. Testing of the Contractor's work will be performed both locally at the cabinet and remotely at the TRIMARC Traffic Operations Center. TRIMARC personnel will assist with any troubleshooting necessary to resolve problems with the communication equipment.

#### EQUIPMENT LIST

The contractor shall provide an equipment list in Microsoft Excel format to the Engineer containing the following information:

- Type of equipment
- Field location
- Make
- Model
- Serial number
- Date of purchase
- Manufacturer contact information
- Equipment vendor contact information (if different)
- Date of Installation
- Date warranty expires

This list shall be provided to the Division of Traffic Operations and TRIMARC Systems Administrator prior to burn-in testing. See below for TRIMARC Info:

Mr. Todd Hood  
TRIMARC Systems Administrator  
901 W. Main St.  
Louisville, KY 40202  
Phone: 502-587-6624  
Fax: 502-587-6645  
Email: Todd.Hood@ngc.com

#### TESTING

The contractor shall demonstrate proper functioning of all devices at the field communications demarcation point. After each device can be successfully operated at the field communications demarcation point the devices will be integrated into the TRIMARC Traffic Operations Center. A 30 day equipment burn-in test will begin after each device is integrated and can be remotely controlled from the operations centers. The Contractor is responsible for repairing or replacing defective equipment during the period between the field test and the start of the 30 day burn-in test.

The 30 day burn-in test will be conducted by TRIMARC from the operations center and consist of operational control of PTZ and video of the remote camera location.

If a device fails during the 30 burn-in day test, TRIMARC personnel will test the device at the field cabinet. If the device cannot be operated at the field cabinet the Contractor shall repair or replace the device and a new 30 day burn-in test will begin for that device.

The project will be accepted after all devices have completed their 30 day test successfully, acceptable as-built drawings and warranty information have been received.

## **WEB CAMERA ASSEMBLY**

### **DESCRIPTION**

Furnish and install Web Camera Assembly in accordance with the plans, specifications and Standard Drawings.

### **MATERIALS**

The Web Camera Assembly shall be an Axis Network Dome Model 232D+ or approved equivalent. This item shall include the color camera, zoom lenses, environmental enclosure, pan/tilt unit, housing, dome, parapet mount, and all mounting hardware, power cable, connections, and incidentals necessary to complete the work.

Proposed alternates shall be commercially available. The Contractor shall identify an installed site where the proposed alternate Web Camera Assembly has been operating for a period of at least one year in a similar climate region.

The Web Camera Assembly shall include the following:

Outdoor pendant dome:

- UV protected, distortion free, polycarbonate lower dome
- IP66 Rated
- Operating temperature: -4 degrees F to 122 degrees F
- Fan-assisted Heater: 40 degrees F turn on; 60 degrees F turn off
- Input current Max. 0.4 A
- Max Output Power 40 W
- Unit weight: 11 lbs
- Clear lower bubble
- 24 VAC outdoor power supply

Mounting Hardware:

- Pole mount adapter with banding straps and clips

- Parapet Mount

#### Web camera

- Image Sensor: 1/4" Sony EXview HAD CCD
- Lens: F1.4-3.0, f=4.1 mm wide to 73.8 mm tele, autofocus with 18x optical zoom
- Lens horizontal viewing angle: 48 degrees (wide end) to 2.8 degrees (tele end)
- Lens focus range: 35 mm (wide) or 800 mm (tele) to infinity
- Minimum illumination: Color:0.3 lux at 301RE, B/W: 0.005 lux at 301RE
- Video compression: Motion JPEG, MPEG-4 Part 2 (ISO/IEC 14496-2)
- Resolution: 4CIF, 2CIFExp, 2CIF, CIF, QCIF
- Resolution Max. 704x480; Min. 160x120
- Frame rate: MPEG-4 up to 21/17 fps at 4CIF/2CIFExp; up to 30/25 fps at 2CIF/CIF/QCIF
- Image settings compression levels: 11 (motion JPEG)/ 23 MPEG-4
- Pan: 360 degrees endless, max speed 360 degrees/s
- Tilt: 0 degrees to 90 degrees, max speed 360 degrees/s
- Zoom: 18x optical, 12x digital
- 20 preset
- Guard tour
- Control
- Shutter speed: 1 sec to 1/10 sec
- IR illumination
- Security: Multiple user access levels with password protection IP address filtering, HTTPS encryption
- Event management: Events triggered by built-in motion detection, external inputs or according to a schedule; Image upload over FTP, email and HTTP; Notification over TCP, email, HTTP and external outputs
- Ethernet 10BaseT/100BaseTX, RJ-45
- Video processing and compression: ARTPEC-2
- 24 VAC Power requirements
- Operating temperature: 41 degrees F to 122 degrees F
- Video access from Web browser: Camera live view. Sequence tour capability for up to 200 Axis cameras, customizable HTML pages, complete remote control pan, tilt, and zoom
- Supported protocols: HTTP, HTTPS, SSL/TLS, TCP, SNMPv1/v2cv/v3 (MIB-II), RTSP, RTP, UDP, IGMP, RTCP, SMTP, FTP, DHCP, UPnP, ARP, DNS, DynDNS, SOCKS
- EN 55022 Class A, EN 61000-3-2, EN 61000-3-3, EN 55024 approvals
- FCC Part 15 Subpart B Class A, VCCI Class A, C-tick AS/NZS CISPR 22 Class A, ICES-003 Approvals

## INSTALLATION

Web Camera Assembly shall be installed on a wood pole or steel strain pole as specified in the plans and in accordance with the manufacturer's instructions. Installation shall



comply with all warranty provisions and warranty contract maintenance services. Installation shall comply with all local, state, and federal building, electrical and construction codes, and Motorola R-56 requirements. All wiring access to the Web Camera Assembly shall be through watertight fittings. Wiring access points shall be on the side or underneath components; no exposed top access is permitted. The Web Camera Assembly shall be installed so that the assembly is located on the side of the pole closest to the roadway when the camera is in its fixed position at the top of the pole. The contractor is responsible to verified all functions of the web camera through a laptop interface.

### **METHOD OF MEASUREMENT AND BASIS OF PAYMENT**

Web Camera Assembly will be measured for payment per unit each. The Department will make payment for complete, functioning, inspected, and accepted quantities. The Department will consider payment as full compensation for all work required under this section.

## **COMMUNICATIONS CABLE**

### **DESCRIPTION**

Furnish and install Communications Cable in accordance with the plans, specifications and Standard Drawings.

### **MATERIALS**

Communications cable shall be General Cable GenSpeed 5000 CAT 5e Outside Plant Cable 8 wire PN: 5136100 or approved equal. The cable shall meet or exceed the following specifications:

Performance:

- ANSI/TIA/EIA 568B (Category 5e)
- MIL-C-24640A Water Penetration
- Propagation Delay: 583 ns @ 100 MHz
- Return Loss @ 100 MHz: 20.1 DB
- Frequency Range: 1-350 MHz

Physical characteristics:

- Nominal Outside Diameter: 0.230 in
- Insulation Type: Polyolefin
- Maximum Pulling Tension: 25 lbs
- Maximum DC Resistance: 9.38 Ohms/100m
- Mutual Capacitance @ 1kHz: 17 pF/100m
- Operating Temperature: -45° C to 80° C

All connectors, terminators, fittings, etc. shall be incidental to the cost of installing the Communications Cable and no separate payment will be made.

## **INSTALLATION**

The Contractor shall install all cable and wire splice-free from the controller/service location to each cabinet, VMS sign, or CCTV camera the cable or wire is feeding. The Contractor shall not use excessive force when pulling wire through duct. The Contractor shall replace all wire damaged during installation. The Contractor shall submit to material testing at the discretion of the Engineer.

## **METHOD OF MEASUREMENT AND BASIS OF PAYMENT**

Communications Cable will be measured for payment per unit linear foot. The Department will make payment for complete, functioning, inspected, and accepted quantities. The Department will consider payment as full compensation for all work required under this section.

# **CONDUIT**

## **DESCRIPTION**

Furnish and install Conduit in accordance with the plans, specifications and Standard Drawings.

## **MATERIALS**

Conduit shall be rigid steel, schedule 40 PVC, or flexible, non-metallic conduit as specified. This item includes fittings, connectors, clamps, caps and other materials necessary for proper installation. The Contractor shall submit to material testing at the discretion of the Engineer.

## **INSTALLATION**

All conduit installed above ground or below ground under pavement shall be rigid steel. All conduits installed below ground, not under pavement shall be PVC. Flexible, non-metallic conduit shall be used as required and shall be incidental to the project. Unused conduits shall be capped on both ends. Conduit containing wire or cable shall be sealed with a piece of steel wool and capped off with duct seal putty. All conduits shall be accessible inside junction boxes. All conduits shall have bushings included. If rigid steel conduit, the bushings shall be bonded together with other similar types of conduits.

## **METHOD OF MEASUREMENT AND BASIS OF PAYMENT**

Rigid Steel and PVC Conduit will be measured for payment per unit linear foot. The Department will make payment for complete, functioning, inspected, and accepted quantities. The Department will consider payment as full compensation for all work required under this section. A direct measurement will not be made for flexible, non-metallic conduit. All flexible, non-metallic conduits shall be incidental to the project.

## **JUNCTION BOX**

### **DESCRIPTION**

Furnish and install Junction Box in accordance with the plans, specifications and Standard Drawings.

### **MATERIALS**

Junction box shall meet or exceed ANSI/SCTE 77-2002, tier 15. Junction box covers shall be marked "Traffic." Covers shall be attached with a minimum of two 3/8" stainless steel hex bolts.

### **INSTALLATION**

Where required, junction box shall be oriented such that the dimensions comply with the NEC. Junction boxes used as pull boxes along a conduit run shall be spaced at a maximum of 250'. Junction boxes shall not be placed in ditch lines or in areas where standing water may accumulate. Junction box covers shall be flush with the finished surface. The Contractor shall restore all disturbed areas to the satisfaction of the Engineer. This item includes the furnishing and installing of Fastrac bait bag in each junction box for rodent control.

### **METHOD OF MEASUREMENT AND BASIS OF PAYMENT**

Junction Box will be measured for payment per unit each. The Department will make payment for complete, functioning, inspected, and accepted quantities. The Department will consider payment as full compensation for all work required under this section.

## **SURGE DEVICES**

### **DESCRIPTION**

Furnish and install video surge device, data surge device, power surge device, and RF surge device in accordance with the plans, specifications and Standard Drawings.

### **MATERIALS**

#### **GENERAL**

Each surge device shall be compatible with the equipment it is protecting. Each surge device shall include cables, connectors, power supplies, and all incidentals required for operation.

#### **VIDEO SIGNAL COAX CONDUCTOR SURGE DEVICE**

Video Signal Coax Conductor Surge Device shall be EDCO CX12-BNC-Y or approved equal. This surge protector shall:

- Have a clamping voltage response time of less than one nanosecond
- Have a maximum clamping voltage of 12 volts when subjected to a 3 kA, 8x20 microsecond wave

- Have a peak surge current of 20kA with 8x20 microsecond wave
- Have BNC connectors
- Pass signals from DC to 80 MHz with less than 3 dB insertion losses
- Be UL 497B listed

#### DATA SIGNAL CONDUCTOR SURGE DEVICE

Data Signal Conductor Surge Device shall be for RS 422 and RS 485 Communication conductors shall be EDCO PC642C-015 or approved equal. This surge protector shall:

- Have a clamping voltage response time of less than one nanosecond
- Have a maximum clamping voltage of 12 volts when subjected to a 1 kA 8x20 microsecond wave
- Have a peak surge current per wire of 10 kA with 8x20 microsecond wave
- Have a maximum inline resistance of 6 ohms
- Have a maximum attenuation of -3db at 50MHz

#### RS 232 COMMUNICATION DATA SIGNAL CONDUCTOR SURGE DEVICE

Data Signal Conductor Surge Device for RS 232 Communication conductors shall be EDCO PC642C-015 or approved equal. This surge protector shall:

- Have a clamping voltage response time of less than one nanosecond
- Have a maximum clamping voltage of 30 volts when subjected to a 1 kA 8x20 microsecond wave
- Have a peak surge current per wire of 3kA with 8x20 microsecond wave
- Have a maximum inline resistance of 6 ohms
- Have a maximum attenuation of -3 db at 0.5 MHz

#### 100 BASE-T AND 10 BASE-T COMMUNICATION DATA SIGNAL CONDUCTOR SURGE DEVICE

Data Signal Conductor Surge Device for 100BaseT and 10BaseT Communication conductors shall be EDCO LCDP-30 or approved equal. This surge protector shall:

- Have a clamping voltage response time of less than one nanosecond
- Have a maximum clamping voltage of 30 volts when subjected to a 0.5 kA 8x20 microsecond wave
- Have a peak surge current per wire shall be 1kA with 8x20 microsecond wave
- Have a maximum attenuation shall be -3db at 100 MHz
- Have a N.E.X.T. worst pair of better than -40 db at 100 MHz
- Have a maximum attenuation of -3db at 0.5 MHz

#### POWER CONDUCTOR SURGE DEVICE

Conductor Surge Device for power carrying conductors shall be EDCO SHA-1210 or approved equal. This surge protector shall meet or exceed the following specifications:

- Nominal Line Voltage           120 V
- Peak Current                    20,000 Amps
- Clamp Voltage                  280 volt typical @ 20kA

- Response time <5ns
- Continuous Service Current 10 Amps max. 120 VAC, 60 Hz

#### RF ANTENNA COAX CONDUCTOR SURGE DEVICE

RF Antenna Coax Conductor Surge Devices shall meet all manufacturer recommendations for the particular use of the radio antenna coax conductors.

#### INSTALLATION

The Contractor shall supply surge devices in model 334/336 enclosures, VMS signs, on poles, and on sign trusses as specified on layout sheets. Surge devices shall be located in said equipment such that they are easily accessible for maintenance activities.

#### METHOD OF MEASUREMENT AND BASIS OF PAYMENT

Surge Device will be measured for payment per unit each. The Department will make payment for complete, functioning, inspected, and accepted quantities. The Department will consider payment as full compensation for all work required under this section.

### TRENCHING AND BACKFILLING

#### DESCRIPTION

Trenching and Backfilling shall be performed in accordance with the plans, specifications and Standard Drawings.

#### MATERIALS

All trenches shall be marked with underground utility warning tape.

#### INSTALLATION

The Contractor shall be responsible for locating all underground utilities prior to excavation. The Contractor shall excavate the trench, place warning tape above the conduit, backfill the trench and restore all disturbed areas to the satisfaction of the Engineer. Backfill material shall be placed and compacted in lifts of 9 inches or less.

#### METHOD OF MEASUREMENT AND BASIS OF PAYMENT

Trenching and Backfilling will be measured for payment per unit linear foot. The Department will make payment for complete, inspected, and accepted quantities. The Department will consider payment as full compensation for all work required under this section.

## **BORE AND JACK**

### **DESCRIPTION**

Bore and Jack shall be performed in accordance with the plans, specifications and Standard Drawings.

### **MATERIALS**

Bore and Jack does not include furnishing and installing conduit.

### **INSTALLATION**

The Contractor shall be responsible for boring a hole for installing conduit under the existing roadway in accordance with the construction method described in the first, second, and fourth paragraphs of Section 706.03 of the Standard Specifications.

### **METHOD OF MEASUREMENT AND BASIS OF PAYMENT**

Bore and Jack will be measured for payment per unit linear foot. The Department will make payment for complete, inspected, and accepted quantities. The Department will consider payment as full compensation for all work required under this section.

## **WIRE AND CABLE**

### **DESCRIPTION**

Install Wire and Cable in accordance with the plans, specifications and Standard Drawings.

### **MATERIALS**

Wire being supplied, Bid Code 24474ED, shall include installing specified wire or cable within a conduit as indicated on the plan sheets. Exceptions to this must be approved by the engineer or as specified on the plans. The contractor will receive wire in 1000 foot rolls from our warehouse. The contractor shall return all excess wire to the traffic barn in District 5. If the wire supplied does not equal enough suitable to install all runs splice free, the contractor can ask for more wire to be supplied by the Division of Traffic Operations. This request shall go through the resident engineer to Central Office Division of Traffic Operations. Each run of wire from controller cabinet to pole shall be the following color coded: black (hot), white (hot), and green (ground). This item shall include all connectors, splicing and insulating hardware, ties, tape, labels and incidentals required for electrical connections. The Contractor shall submit to material testing at the discretion of the Engineer.

### **INSTALLATION**

The Contractor shall install all cable or wire runs splice-free from the controller/service location to each cabinet, VMS sign, or CCTV camera the cable or wire is feeding. All wire shall be labeled inside cabinets and junction boxes. The contractor shall not use

excessive force when pulling wire through duct. The contractor shall replace all wire damaged during installation. The Engineer may require testing of wiring for damaged insulation. Wire that does not pass an insulation resistance test of a minimum of 100 hundred megohms to ground shall be replaced by the Contractor at his cost.

**METHOD OF MEASUREMENT AND BASIS OF PAYMENT**

Wire and cable will be measured for payment per unit linear foot. The Department will make payment for complete, functioning, inspected, and accepted quantities. The Department will consider payment as full compensation for all work required under this section.

## GLOSSARY

The following acronyms, abbreviations, and definitions shall govern this specification:

- AASHTO – American Association of State Highway and Transportation Officials
- ABS - Acrylonitrile Butadiene Styrene
- AC – Alternating Current
- AlInGaP – Aluminum Indium Gallium Phosphide (refers to the chemical composition of an LED).
- ANSI – American National Standards Institute
- ASCII – American Standard Code for Information Interchange
- ASN.1 – Abstract Syntax Notation 1
- ASTM – American Society for Testing and Materials
- AWG - American Wire Gauge
- AWS – American Welding Society
- BCD – Binary Coded Decimal
- B frames – Bi-directional Predicted Frames
- BGP – Border Gateway Protocol
- Bin – Group of LEDs categorized and sorted by intensity or color. Each bin has upper and lower intensity or color specifications and contains only LEDs that are measured to be within that range. LED manufacturers sort LEDs into bins to ensure consistent intensity and color properties.
- BOOTP – Bootstrap Protocol
- CALTRANS – California Department of Transportation
- CAN – Control Area Network
- CCTV – Closed Circuit Television
- CDPD – Cellular Digital Packet Data
- CLI – Command Line Interface
- CNC – Computer Network Control
- Control Computer – A desktop or laptop computer used in conjunction with VMS control software to communicate with VMS sign controllers. The control computer can instruct a VMS sign controller to program and control the VMS, monitor VMS status, and run VMS diagnostic tests. A control computer can be used for remote control of one of more VMS, as well as for local control of a single VMS
- DC – Direct Current
- DHCP – Dynamic Host Configuration Protocol
- DMS – Dynamic Message Sign. An industry term that applies to various types of changeable sign technology
- DVI-D – Digital Visual Interface - Digital
- EIA – Electronic Industries Association
- ELFEXT – Equal Level Far End Crosstalk
- EPA – Effective Projected Area
- FCC – Federal Communications Commission
- FDA – Food and Drug Administration



- Font – The style and shape of alphanumeric characters that are displayed on the VMS matrix to create messages viewed by motorists and travelers
- Frame – see *Page*
- FSORS – Full, Standardized Object Range Support – an NTCIP term. See the NTCIP standards for additional information.
- GUI – Graphical User Interface
- HDPE – High Density Polyethylene
- HHR – Half Horizontal Resolution
- HTTP – Hypertext Transfer Protocol
- IEEE – Institute of Electrical and Electronic Engineers
- I frames – Intra-frames
- IC – Integrated Circuit
- IGMP
- InGaAlP – Indium Gallium Aluminum Phosphide
- I/O – Input/Output
- IP – Internet Protocol – in transceivers
- IRE – Institute of Radio Engineers
- ISO – International Organization for Standardization
- ITE – Institute of Transportation Engineers
- ITS – Intelligent Transportation System
- Kbps – Kilobits per second
- KYTC – Kentucky Transportation Cabinet
- LAN – Local Area Network
- LCD – Liquid Crystal Display
- LED – Light Emitting Diode
- MDPE – Medium Density Polyethylene
- Message – Information displayed on the VMS for the purpose of visually communicating with motorists. A VMS message can consist of one or more pages of data that are displayed consecutively
- MIB – Management Information Base
- Module – Assembly consisting of a two-dimensional LED pixel array, pixel drive circuitry, and mounting hardware. Modules are installed in the display adjacent to each other to form the display matrix.
- MTBF – Mean Time Between Failures
- MPEG – Moving Picture Experts Group
- NEC – National Electrical Code
- NEMA – National Electrical Manufacturers Association
- NESC – National Electrical Safety Code
- NEXT – Near End Crosstalk
- NCHRP – National Cooperative Highway Research Program
- NRZ – Non Return to Zero
- NRZI – Non Return to Zero Inverted
- NTCIP – National Transportation Communications for ITS Protocol

- NTSC - National Transmission Standards Committee
- Object – An NTCIP term referring to an element of data in an NTCIP-compatible device that can be manipulated to control or monitor the device.
- OER – Octet Encoding Rules
- OSHA – Occupational Safety and Health Administration
- OTDR – Optical Time Domain Reflectometer
- Page – An NTCIP term referring to the data that is displayed on the VMS display matrix at a given moment in time. Also referred to as a frame.
- P frames – Forward Predicted Frames
- PCB – Printed Circuit Board
- Pixel – Picture element. The smallest changeable (programmable) portion of a VMS display matrix
- PMPP – Point to Multi-Point Protocol
- PPP – Point to Point Protocol
- PSELFEXT – Power Sum Equal Level Far End Cross Talk
- PSNEXT – Power Sum Near End Crosstalk
- PTZ – Pan/Tilt/Zoom
- PVC – Polyvinyl Chloride
- PWM – Pulse Width Modulation
- QSIF – Quarter Source Input Format
- RAM – Random Access Memory
- RARP – Reverse Address Resolution Protocol
- RGB – Red-Green-Blue
- Schedule – A set of data that determines the time and date when a VMS sign controller will cause a stored message to be displayed on the VMS
- SDRAM – Synchronous Dynamic Random Access Memory
- SIF – Source Input Format
- SNMP – Simple Network Management Protocol
- STMP – Simple Transportation Management Framework
- Stroke – Refers to the vertical and horizontal width of the lines and curves of a display font. Single stroke denotes character segments that are one pixel wide. Double stroke denotes character segments that are two pixels wide.
- TFTP – Trivial File Transfer Protocol
- TIA - Telecommunications Industry Association
- TMA – Truck Mounted Attenuator
- TOC – Traffic Operations Center
- UL – Underwriters Laboratories
- UPS – Uninterruptible Power Supply
- USB – Universal Serial Bus
- VLAN – Virtual Local Area Network
- VMS – Variable Message Sign. A type of VMS that is fully programmable such that the content of its messages are fully changeable remotely and electronically.
- VMS Controller – A stand-alone computer that is located at a VMS site, which

controls a single VMS. A sign controller receives commands from and sends information to a control computer

- WAN – Wide Area Network
- WYSIWYG – What You See Is What You Get. More specifically, what you see on the VMS control computer monitor is a scaled representation of how a message will appear when it is being displayed on the VMS. Similarly, after a pixel diagnostic test routine has been run, what you see on the control computer monitor is a scaled representation of the functional status of each pixel in the VMS display matrix.