

MEMORANDUM

Region II – Design
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Construction Project
FSA 0503-081
Proj. Code: 19751

DATE: November 26, 2014
TO: All Holders of Plans for Project FSA 0503-081
SUBJECT: Revision No. 2 (to be acknowledged in all Bid Proposals)

Bid Proposal:

Revised Schedule – Prospective bidders not using EBS must submit their bids on the revised schedule dated 11/26/14 or the bid will be rejected. For EBS use the Amendment posted on the CDOT web site.

Project Special Provisions:

Page 1b – 2b: Revised Index
Page 73b – 85b: Revised Revision of Section 614 – Variable Message Sign (Led) (Overhead)
Pages 118b – 119b: Revised Force Account Items
Pages 128b – 129b: Added Revision of Section 606 – Tensioned Cable Barrier (TL-4)

Standard Special Provisions:

No revision Standard Special Provisions

Project Plan Sheets:

Sheet 1b – Revised Index of Sheets
Sheet 14b – Deleted Item 606-01460 – Median Terminal
 Added Item 606-21010 – End Anchorage (Tensioned Cable Barrier)
Sheet 16b – Added Item 630-80355 – Portable Message Sign Panel
 Deleted Item 630-80359 – Portable Message Sign Panel
 Added Item 630-85041 – Mobile Attenuator
Sheet 21b – Deleted Item 606-01460 – Median Terminal
 Added Item 606-21010 – End Anchorage (Tensioned Cable Barrier)
Sheet 237b – Added Item 630-85041 – Mobile Attenuator
 Revised Item Code for Portable Message Sign Panel
Sheet 304b – Revised height of VMS Panel & Montube

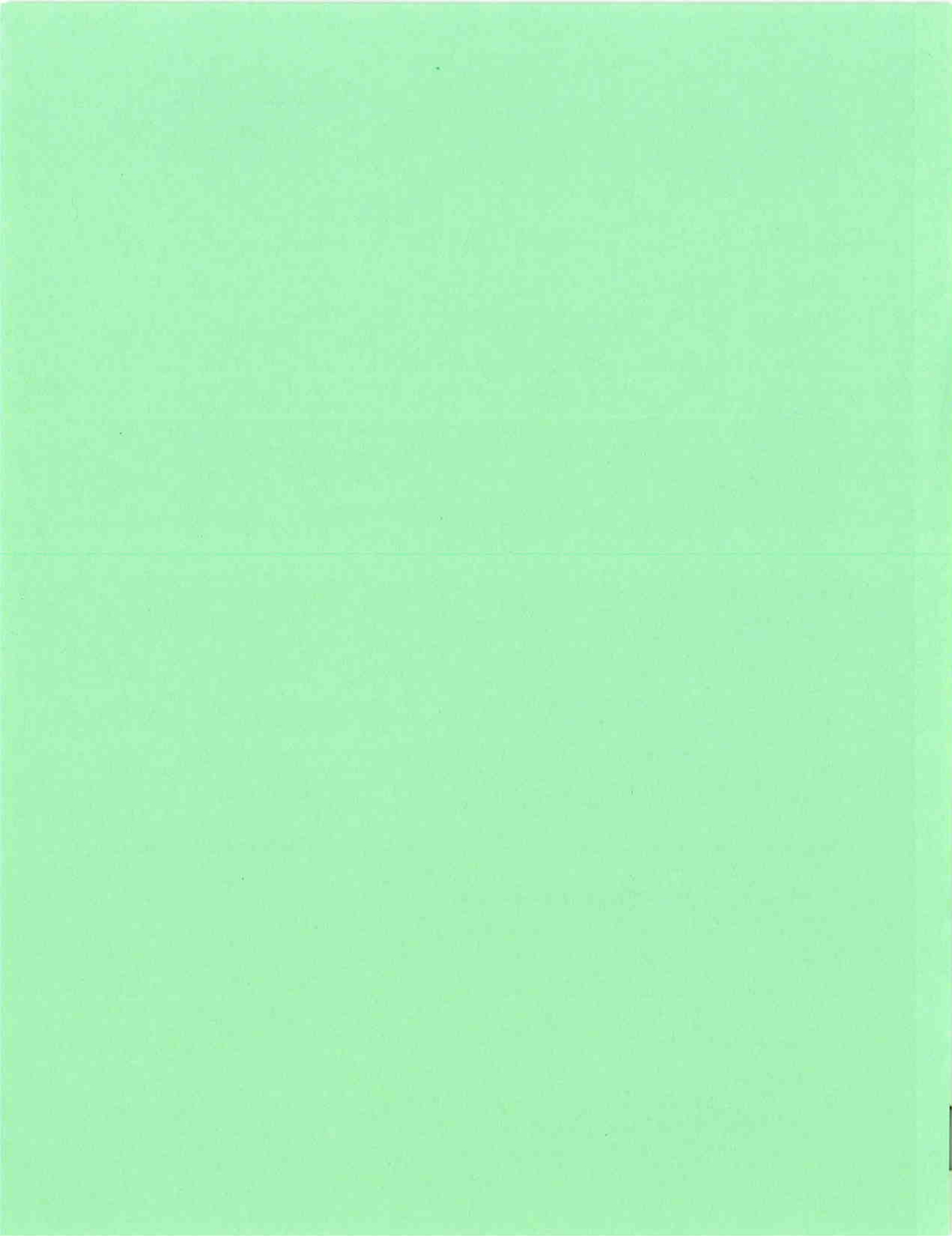
It is requested that you substitute the enclosed revisions in your copy of the plan documents and destroy those sheets superseded by this transmittal.

The Department will open bids for this project on **December 4, 2014**.

This revision is authorized by Dan T. Dahlke, Region 2 Resident Engineer.

Enclosure

cc: Duran / Stiller, Printing Center
M. Pyle, Bid Plans
G. Martinez, Business Programs
M. Gray, Constr. Contracts
G. Demos, Cost Estimating
Central Files
Hu, R-2 South Program Engineer
Dahlke, R-2 Resident Engineer
Phillips / Garcia, R2 South Program Design
Sandoval, Project Engineer



**COLORADO
 DEPARTMENT OF TRANSPORTATION
 SPECIAL PROVISIONS
 US 50 - McCulloch Blvd to Wills Blvd**

The 2011 Standard Specifications for Road and Bridge Construction controls construction of this project. The following special provisions supplement or modify the Standard Specifications and take precedence over the Standard Specifications and plans.

PROJECT SPECIAL PROVISIONS

	Page
Index to Project Special Provisions	(November 26, 2014) 1b-2b
Index to Standard Special Provisions	(November 06, 2014) 3-4
Notice to Bidders	(November 06, 2014) 5
Commencement and Completion of Work	(November 06, 2014) 6-7
Contract Goal (Combined)	(November 06, 2014) 8
OJT Contract Goal	(November 06, 2014) 9
Revision of Section 102 – Project Plans and Other Data	(November 06, 2014) 10
Revision of Sections 105 – Contractor Submittals	(November 06, 2014) 11
Revision of Sections 105, 106, And 203 – Conformity to the Contract of Embankment	(November 06, 2014) 12-13
Revision of Section 107 – Safety Critical Work	(November 06, 2014) 14-15
Revision of Section 107 – Legal Relations and Responsibility to Public	(November 06, 2014) 16
Revision of Section 108 – Prosecution and Progress	(November 06, 2014) 17
Revision of Section 201 – Clearing and Grubbing – Protection of Prairie Dogs	(November 06, 2014) 18
Revision of Section 202 – Removal of Structures and Obstructions	(November 06, 2014) 19
Revision of Section 202 – Removal and Trimming Trees	(November 06, 2014) 20-21
Revision of Section 202 – Removal Asphalt Mat (Planing)	(November 06, 2014) 22-24
Revision of Section 202 – Removal of Mat from Bridge	(November 06, 2014) 25
Revision of Section 202 – Removal of Portions of Present Structure	(November 06, 2014) 26-27
Revision of Section 203 – Excavation and Embankment Materials	(November 06, 2014) 28-29
Revision of Section 206 – Excavation and Backfill for Structures	(November 06, 2014) 30
Revision of Section 206 – Shoring	(November 06, 2014) 31
Revision of Section 207 – Topsoil	(November 06, 2014) 32
Revision of Section 208 – Permanent BMP as Constructed Survey	(November 06, 2014) 33
Revision of Section 209 – Watering and Dust Palliatives	(November 06, 2014) 34
Revision of Section 210 – Reset Microwave Vehicle Radar Detector	(November 06, 2014) 35-37
Revision of Section 210 – Relay Riprap	(November 06, 2014) 38
Revision of Section 217 – Herbicide Treatment	(November 06, 2014) 39-41
Revision of Section 240 – Protection of Migratory Birds	
Biological Work Performed by a CDOT Biologist	(November 20, 2014) 42a-44a
Revision of Section 304 – Aggregate Base Course	(November 06, 2014) 45
Revision of Section 401 – Hot Mix Asphalt Compaction (Pneumatic Tire Rollers)	(November 06, 2014) 46
Revision of Section 403 – Hot Mix Asphalt	(November 06, 2014) 47-49
Revision of Section 403 – Hot Mix Asphalt Ticket Collection	(November 06, 2014) 50
Revision of Section 506 – Soil Riprap	(November 06, 2014) 51
Revision of Section 514 – Pedestrian Railing (Steel) (Special)	(November 06, 2014) 52-53
Revision of Section 522 – Duplex Coating System	(November 06, 2014) 54-59
Revision of Section 603 – Storm Sewer Pipe	(November 06, 2014) 60-61
Revision of Section 603 – Reinforced Concrete Pipe	(November 06, 2014) 62
Revision of Section 604 – Manholes and Inlets	(November 06, 2014) 63

PROJECT PECIAL PROVISIONS

Page

Revision of Section 606 – Guardrail	(November 06, 2014)	64
Revision of Section 606 – Bridge Rail Type 10 (Special)	(November 06, 2014)	65
Revision of Section 608 – Detectable Warnings	(November 06, 2014)	66-67
Revision of Section 613 – Wiring	(November 06, 2014)	68
Revision of Section 613 and 715 – Electrical Conduit & Pull Boxes	(November 06, 2014)	69-72
Revision of Section 614 – Variable Message Sign (Led) (Overhead)	(November 26, 2014)	73b-85b
Revision of Section 614 – Intersection Detection System (Camera Reset)	(November 06, 2014)	86-87
Revision of Section 614 – Traffic Signal Controller – Operations	(November 06, 2014)	88
Revision of Section 614 – Fiber Optic Cable (Single Mode)	(November 06, 2014)	89-95
Revision of Section 620 – Field Facilities	(November 06, 2014)	96-99
Revision of Section 621 – Detour Pavement	(November 06, 2014)	100-101
Revision of Section 625 – Construction Surveying	(November 06, 2014)	102
Revision of Section 626 – Public Information Services	(November 06, 2014)	103-105
Revision of Section 627 & 713 – Epoxy Pavement Marking (Special)	(November 06, 2014)	106-108
Revision of Section 627 & 713 – Performed Thermoplastic Pavement Marking	(November 06, 2014)	109-110
Revision of Section 630 – Impact Attenuators (Temporary)	(November 06, 2014)	111-112
Revision of Section 630 – Portable Message Sign Panel	(November 06, 2014)	113-114
Revision of Section 703 – Aggregates	(November 06, 2014)	115
Revision of Section 715 – Lighting and Electrical materials	(November 06, 2014)	116-117
Force Account Items	(November 20, 2014)	118b-119b
Traffic Control Plan – General	(November 06, 2014)	120-122
Utilities	(November 06, 2014)	123-125
Revision of Section 240 – Black Tailed Prairie Dog Management (Western Burrowing Owl)	(November 20, 2014)	126a-127a
Revision of Section 606 – Tensioned Cable Barrier (TL-4)	(November 26, 2014)	128b-129b

**REVISION OF SECTION 614
VARIABLE MESSAGE SIGN (LED) (OVERHEAD)**

Section 614 of the Standard Specifications is hereby revised for this project to include the following:

DESCRIPTION

This work consists of furnishing and installing a Light Emitting Diode Variable Message Sign (LED VMS) and associated equipment cabinets at locations as shown in the plans. The sign shall be fully compatible with the mounting hardware and support structure shown on the plans. The LED VMS shall be equipped with the ability to display 3 lines of text at a height of 18-inch tall characters and shall have a display made up of a full matrix configuration. The sign shall have a 66-70 mm pixel pitch. All LEDs shall have a viewing angle of 30 degrees.

The sign shall be 18' wide x 8.5' tall x 4' deep with an allowable variation of (+ / - 7 inches). The sign shall include a power shut off mounted to the sign structure near the controller interface cabinet. The sign shall be capable of operating without any decrease in performance over a temperature range of -34° F to +140° F with a relative humidity of 0 to 99 percent, non-condensing. The sign shall have a minimum design life of 20 years.

MATERIALS

- a) *Certifications:* Prior to start of the installation of the LED VMS the Contractor shall provide the following certifications to the Engineer for review and approval:
- (1) Certification showing that the manufacturer of the LED VMS is fully compliant with ISO 9001 as of the bid date for this project. The ISO 9001 Certification shall apply to the facility, and to the design, fabrication, installation, and maintenance of the LED VMS. The facility where this company actually designs and manufactures the LED VMS shall be ISO 9001:2000 certified a minimum of one year prior to the bid date for this project.
 - (2) Working drawings showing the sign housing and tilting brackets shall be sealed by an Engineer registered in the State of Colorado and shall be submitted in accordance with subsection 105.02.
 - (3) Certification showing that welding of the LED VMS housing is in accordance with the American Welding Society (AWS) Standards, ANSI/AWS D1.2-97. The LED VMS manufacturer's welders and welding procedures shall be certified by an ANSI/AWS Certified Welding Inspector to the ANSI/AWS D1.2-97 Structural Welding Code for Aluminum.
 - (4) Certification that all aluminum face materials have a coating that meets or exceeds the requirements of the American Architectural Manufacturers Association (AAMA) Specifications Publication No. 2605.
 - (5) Certification that the LEDs were tested and binned in accordance with the CIE Test Method A.
 - (6) Documentation and information on software as described in Appendix A of this document.
 - (7) Documentation verifying the VMS is listed by an accredited 3rd party testing organization for conformance to UL48 and UL 1433.
 - (8) All workmanship shall comply with IPC-A-610C, Class 2 titled "Acceptability of Electronic Assemblies"
 - (9) Documentation providing proof PCB silicon conformal coating conformance to MIL-I-46058C Type SR and IPC-CC-830.
 - (10) Documentation that the sign's structural integrity is in Conformance to AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaries and Traffic Signals (Third Draft).
 - (11) Documentation that the VMS conforms to the Transient Protection and Vibration of the NEMA Standard TS4, Section2.
- b) *Sign Housing:* All component parts shall be easily and readily accessible by a single person for inspection and maintenance. There shall be room for a technician to work. Access shall be made by entering the side of the housing. The housing shall be weather tight, and compliant to the NEMA 3R Standard. The bottom panel of the housing shall have a minimum of four drain holes, with snap-in, drain filter plug inserts.

Any visible manufacturer's logo/trade name/reference on the VMS shall be placed on the bottom side of the access door or back panels of the VMS.

-2-

**REVISION OF SECTION 614
VARIABLE MESSAGE SIGN (LED) (OVERHEAD)**

The sign housing shall be capable of withstanding a wind loading of 120 mph without permanent deformation or other damages. The sign housing shall also be designed, stamped and signed by a Professional Engineer licensed in Colorado to withstand current AASHTO specified group loading combinations including: sign weight, repair personnel and equipment, ice and wind loads. It shall also meet strength requirements for truck-induced gusts as specified in NCHRP Report 412.

The sign housing shall be engineered to withstand snow loading of 40 pounds per square foot, as well as the ability to be mounted in a manner that prevents the buildup of snow and creates a natural means by which snow can run off without impeding flow of traffic. The performance of the sign, including the visibility and legibility of the display, shall not be impaired due to continuous vibration caused by wind, traffic or other factors. The housing shall be designed to accommodate mounting on the rear vertical plane and shall be structurally sufficient to be mounted to the sign support structure.

The sign housing and structural components for the tilting system if required by design shall be structurally sufficient to perform under all applicable loading conditions including gravity, wind, traffic, weather, roadway deicers, maintenance, and other environmental factors. Working drawings showing the sign housing shall be submitted in accordance with subsection 105.02. Working drawings shall be sealed and signed by an Engineer registered in the State of Colorado.

All parts shall be made of corrosion resistant materials, such as plastic, stainless steel or aluminum. Painted steel is not acceptable. No self-tapping screws shall be used. The exterior front face surfaces shall be finish coated by a system that meets or exceeds the AAMA Specification No. 2605. The finish shall be matte black. The main body of the sign housing shall be constructed of aluminum with a natural mill finish. All exterior seams shall be continuously welded by an inert gas process, except for the coated fascia material.

Each panel shall have a single polycarbonate sheet attached securely to the inside of the aluminum panel. The polycarbonate sheet shall cover all of the pixel openings. The polycarbonate shall be sealed to prevent water and other elements from entering the DMS. The polycarbonate shall contain UV inhibitors that protect the LED display matrix from the effects of ultraviolet light exposure and prevent premature aging of the polycarbonate itself. The use of a plastic lens system will not meet the requirements and will be cause for rejection. No louvers shall be allowed.

Polycarbonate sheets shall have the following characteristics:

- Tensile Strength, Ultimate: 10,000 PSI
- Tensile Strength, Yield: 9,300 PSI
- Tensile Strain at Break: 125%
- Tensile Modulus: 330,000 PSI
- Flexural Modulus: 330,000 PSI
- Impact Strength, Izod (1/8", notched): 17 ft-lbs/inch of notch
- Rockwell Hardness: M75, R118
- Heat Deflection Temperature Under Load: 264 PSI at 270F and 66 PSI at 288F
- Coefficient of Thermal Expansion: 3.9×10^{-5} in/in/F
- Specific Heat: 0.30 BTU/lb/F
- Initial Light Transmittance: 85% minimum
- Change in Light Transmittance, 3 years exposure in a Southern latitude: 3%
- Change in Yellowness Index, 3 years exposure in a Southern latitude: less than 5%

LED display modules shall mount to the inside of the DMS front face panels and be accessible from the inside of the sign housing only. No tools shall be needed for removal and replacement of LED display modules.

The external front face panels shall have the following minimum dimensions: The perimeter panels shall be a minimum of 12 inches wide. The external front face panels shall be thermally insulated from the rest of the sign housing. The glazing, aluminum mask and the external front face panels shall be easily replaceable from within the sign housing.

-3-

**REVISION OF SECTION 614
VARIABLE MESSAGE SIGN (LED) (OVERHEAD)**

The ventilation system shall be forced air. The system shall be designed to adequately cool the pixels from all sides along with the front and rear of the display module and all other internal components. The ventilation system shall have the following properties:

- (1) Positive pressure (exhaust fans are not acceptable).
- (2) The fans shall have ball or roller bearings, shall be permanently lubricated and shall require no periodic maintenance. The fans are to be positioned in such a manner so as to provide a balanced air flow to the ventilation system in the event of failure of any fan.

Access door shall be mounted to an integral doorframe, which mounts to the DMS housing using non-corrosive hardware. A continuous vertical stainless steel hinge shall support the door, and the door shall open outward towards the monotube structure. In the closed position, each door shall latch to its frame with a three-point draw-roller mechanism. The latching mechanism shall include an internal handle and release lever. Door release levers shall be located so that a person with no key and no tools cannot become trapped inside the housing.

Access doors shall be framed and swing open and lock in-place open at a 90 degree angle and 110 degree angle from the DMS housing end wall. The bottom edge of each door shall be at least 3.5-inches from the bottom edge of the DMS housing. This will provide clearance for the doors to swing open over external access platform.

The door will be fitted with an interior and exterior lockable heavy duty handle. Each Exterior door shall be furnished with a handle that is pad lock ready and Corbin #2 key lock. Each door shall close around its flanged frame and compress against a closed-cell foam gasket, which adheres to the door. All doors shall contain a stop that retains the door in a 90 and 110-degree open position. When a door is open, the door and its stop shall withstand damaged by a 60 mph wind gust.

The DMS must be equipped with an OSHA compliant safety rail assembly, which when closed across an open access door, prevents service personnel from falling out of the DMS. DMS shall have a rail assembly to be provided for each door in the display. The rail assembly shall require no tools to open and close.

The door shall incorporate an open/closed sensor that is detectable by the sign controller and notifies the Central system control software whenever the door is accessed.

Minimum headroom of 72-inches shall be provided in the DMS housing. This free space shall be maintained across the entire width of the DMS housing, with the exception of structural frame members. Structural members shall be designed not to obstruct the free movement of maintenance personnel throughout the DMS interior.

A level aluminum walkway shall be installed in the bottom of the DMS housing. The walkway shall be a minimum of 24-inches wide and it shall run the entire length of the housing, from access door to access door. The walkway's top surface shall be non-slip and shall be free of obstructions that could trip service personnel. The walkway shall support a load of 300 pounds per linear foot.

The internal structural members shall be extruded aluminum and shall accommodate both the display module mountings while allowing air distribution. The display modules shall be removed and replaced without the use of tools and without disturbing adjacent modules. The sign shall have in cabinet heaters that are sufficient to elevate the temperature within the sign to 30° F above the temperature outside the sign. These heaters shall be controlled by a manually operated automatic shut-off timer in the sign and remotely from central computers.

The system power and communication lines shall each be protected by two stages of surge protection devices. The first stage shall be an arc discharge, gas discharge tube or a thyristor surge protection based unit with local and remote reporting capability. The second stage shall be metal oxide varistor (MOV) based. This second stage shall include a crowbar circuit, that when remotely enabled, shall trip the power circuit breaker when the second stage surge suppressor is activated. In both cases, tripping of each stage (or both if tripped simultaneously) of the surge protection and shall report the power surge condition to the sign controller for report to central. The crowbar shall be an option that is either

-4-

REVISION OF SECTION 614
VARIABLE MESSAGE SIGN (LED) (OVERHEAD)

enabled or disabled and is selected and downloaded from the central system control software to the sign controller. When this option is enabled, tripping of the second stage of surge protection shall prevent power from reaching any components of the sign until the surge protection has been replaced. When this option is disabled, the sign will continue to function normally after the second stage of surge protection is tripped.

c) *Sign controller:* The sign controller and associated communication equipment shall be installed inside the DMS equipment cabinet. Each DMS shall be controlled and monitored by its own sign controller. The sign controller shall be a stand-alone microprocessor-based system, which does not require continuous communication with DMS control software in order to perform most DMS control functions.

The sign controller shall meet the following operational requirements:

- Communicate using embedded NTCIP protocol
- Contain memory for storing changeable and permanent messages, schedules, and other necessary files for controller operation
- Include a front panel user interface with graphical VFD or LCD and keypad for direct operation and diagnostics as described herein
- Contain a minimum of three (3) NTCIP-compliant RS232 communication ports
- Contain a minimum of one (1) NTCIP-compliant Ethernet port with RJ45 connector
- Contain a minimum of one (1) NTCIP-compliant RS422 communication port with RJ45 connector
- Have the ability to play volatile messages
- Contain DMS-specific control firmware (embedded software) that shall monitor all external and internal sensors and communication inputs and control the display modules as directed by external control software and the front panel interface
- Ability for remote firmware upgrades that error check to eliminate firmware corruption

NTCIP shall be natively supported in the DMS controller. External protocol converter or translator devices shall not be allowed.

The sign controller shall be programmed to receive and transmit NTCIP compliant sign control commands from the central system control software and laptop computer.

The controller shall have power-up and auto-restart capabilities with programmable default actions when recovering from a power off condition. A hardware watch dog circuit shall provide automatic reset of the controller and communications device. Central control shall have ability to perform a remote command for the controller and communications device reset. The controller shall be able to accept standard UPS shutdown commands via Ethernet or serial interface.

The Controller shall perform all communication, control and feedback functions and shall not require an intermediate control device and be the only sign controller. Communication and control lines between the sign controller and the system interface circuits shall be opto-coupled.

The following shall be mounted inside the main sign housing:

- (1) NTCIP compliant DMS controller
- (2) Fold-down laptop shelf and document holder for maintaining sign.
- (3) Modem/ Ruggedized Ethernet switch/router or communication device
- (4) Display system interface circuits
- (5) Local/remote control switch
- (6) Sign to ground voice communication RJ-11 jack
- (7) USB plug-in connection or a serial connection with a USB converter cable for the controller interface.
- (8) RS-232 cable (a minimum of 4 feet long to connect the controller interface to a laptop computer)
- (9) A.C. surge protection and communication surge protection

There shall be an outside controller interface box that shall be made of aluminum or stainless steel, be weather tight, corrosion resistant, and meet NEMA 3R standards. The separate controller interface box shall be mounted as indicated on the plans. This typically will be on the sign support structure pole furthest from traffic.

-5-

REVISION OF SECTION 614
VARIABLE MESSAGE SIGN (LED) (OVERHEAD)

The controller interface cabinet shall contain the following assemblies:

- (1) Power-on indicator
- (2) Waterproof local/remote switch
- (3) Local control LED indicator
- (4) RS-232 cable a minimum of 4 feet long to connect the controller interface to a laptop computer.
- (5) 120 VAC GFI outlet
- (6) For dialup installations, an RJ-11 jack for connecting the dialup phone line shall be installed with in-line surge protection.

d) *Electronics:* All electronic components, except printed circuit boards, shall be commercially available, easily accessible, replaceable and individually removable using conventional electronics repair methods.

All printed circuit boards shall be sealed with a silicone conformal coating.

Components shall be arranged so they are easily accessible for testing and replacement. All circuit designs shall utilize high quality electronic components and shall provide a meantime before failure of at least 3 years.

The DMS shall contain an automatically controlled defog system that warms the DMS front face when the internal DMS relative humidity is near condensation levels. This system shall keep the front face polycarbonate panel free of fog and condensation. The heat generated by the defog system shall not damage any part of the DMS.

The sign and the controller shall be capable of operating with 120/240 VAC, 38 to 50 amp per leg, 60 Hz, single phase power. The sign shall have a 50-amp two-pole breaker (common trip) main, 120/240 VAC, single phase, four wire load center with 20 circuit capability. Each circuit in the sign shall be powered from a circuit breaker. Inside the sign housing, all 120 VAC service lines shall be independently protected by a thermo magnetic circuit breaker at the sign housing entry point. All 120 VAC wiring shall be located in conduit, pull boxes, raceways, or control cabinets as required by the National Electrical Code (NEC). No 120 VAC wiring shall be exposed within or outside of the sign housing. The sign housing shall not be considered as a raceway or control cabinet. There shall be a minimum of three GFI Duplex outlets installed inside the sign housing.

Lighting shall be provided to illuminate the interior of the sign. The lights shall be enclosed in die cast aluminum safety fixtures with twist-on bulb guards secured by a minimum of four set- screws. The lights shall be controlled by an adjustable timer.

The DMS housing shall contain a minimum of one (1) compact fluorescent light (CFL) fixture for every eight (8) feet of DMS housing width. The lamps shall be evenly spaced across the housing ceiling and provide uniform light distribution for maintenance purposes. The light provided by the lamps shall meet the requirements of *ANSI/IESNA RP-7-01, Lighting Industrial Facilities*. Each lamp shall be rated for at least 10,000 hours of operation, have a minimum 30-watt rating, be self-ballasted, and be rated for cold weather operation down to -20° F. Lamp housing shall be heavy duty and enclosed to protect the lamps from damage. The lamps shall and have a color temperature of at least 4100°K.

The pixels shall be amber in color and utilize precision optical performance AlInGaP II LEDs constructed of aluminum indium gallium phosphide. The brightness and color of each pixel shall be uniform over the entire face of the sign.

The brightness and color of each pixel shall be uniform over the entire face of the sign within the 30-degree cone of vision from minimum of 200 feet up to and including 1100 feet in all lighting conditions. The brightness of each LED shall be measured in accordance with CIE Test Method A, as described in CIE 127-1997, Technical Report: measurement of LEDs.

The pixel strings shall be powered from a regulated DC power source and the LED current shall be maintained at 25 plus or minus three milliamperes per string to maximize life of the pixel. The failure of an LED in one string within a pixel shall not affect the operation of any other string or pixel. The LEDs shall be capable of operating in a temperature range of -40 degrees to +100 degrees C. The LEDs shall be moisture resistant epoxy with UV-A and UV-B inhibitors.

-6-

**REVISION OF SECTION 614
VARIABLE MESSAGE SIGN (LED) (OVERHEAD)**

Pixel power drawn from the DC supplies shall not exceed 1.5 watts per pixel, including the driving circuitry. A minimum of three photocells shall be installed on the sign. These devices shall permit automatic light intensity measurement of light conditions at each sign location. These photocells shall be mounted in a manner to measure front, rear and ambient light conditions.

Provisions shall be made to prevent perceivable brightening of the sign due to stray headlights shining upon the photo sensors at night.

The power supplies shall be paralleled in a diode OR configuration such that one supply may completely fail and the sign will still be supplied with enough power to run 40% of all pixels.

All cables shall be securely clamped/tied in the sign housing. No adhesive attachments will be allowed. The signs shall be capable of displaying ASCII characters 32 through 126 (including all upper and lower case letters and digits from 0 to 9) at any location in a message line.

The Contractor shall be responsible for locating the nearest electrical power and telephone sources and connecting those sources to the appropriate terminations with the LED VMS. The Contractor shall cooperate with the local electrical and telephone utilities to establish a service accounts at the direction of the Engineer.

- e) *Communication:* The sign controller shall be capable of being controlled from the central system control software and the controller interface cabinet via RS-232 serial and Ethernet communications.

The sign controller shall include separate interfaces for communication with the central system control software and the controller interface cabinet.

The communications between the sign controller and the central system control software and controller interface cabinet shall comply with the NEMA National Transportation Communications for ITS Protocol (NTCIP). The sign controller shall support all NTCIP conformance levels, conformance groups, objects, and minimum storage sizes and ranges as specified in APPENDIX A.

In addition to the standard Management Information Base (MIB) objects, the sign shall include any additional manufacturer-specific MIB objects required to support all of the sign and central software functionality defined in this specification and in APPENDIX A.

Dial-up or hardwire multi-drop communication lines shall be protected by two stages of transient voltage suppression devices including MOVs and spark gap arrestor.

Protect low voltage communication lines (twisted pair or coaxial) with multi-stage one- pair or two-pair surge suppressors designed for high-exposure applications, providing common mode and differential mode protection, with a maximum clamping voltage of 10 volts greater than peak DC or maximum AC RMS signal voltage and peak surge current rating of 10kA.

The sign controller shall be capable of being remotely reset from the central system control software.

The sign shall provide a minimum of four (4) input and four (4) output contact closures able to receive digital and or analog signals that will allow up to 15 message activations upon contact closure events. These message activations shall permit standard NTCIP operations to occur and also permit contact closure messages to occur without message activation collisions and or message activation errors. Contact closures shall be remotely accessible using standard NTCIP MIB objects. Contact closures shall be capable of issuing NTCIP traps.

The sign controller shall provide software modules that will allow integration with CDOT WIM systems. The sign controller shall allow user-configuration of maximum and minimum temperature in which to turn fans on and off.

-7-

REVISION OF SECTION 614
VARIABLE MESSAGE SIGN (LED) (OVERHEAD)

The sign shall have polling capability and at a minimum shall be capable of reporting the status of the following:

- (1) Pixel operational status that includes every string of every pixel
- (2) Sign and ambient temperature
- (3) DC power supply status
- (4) The current state (on or off) of each pixel, including any pixel errors, in the actual, currently displayed message without disturbing the message in any way. This shall be real time and shall not be based on a previous pixel test.
- (5) Cooling fan status
- (6) Access door alarm
- (7) Communication failure log
- (8) UPS status
- (9) AC surge protector status

The controller software shall be capable of displaying the following types of messages:

- (1) Static messages capable of displaying any character or set of characters
- (2) Full Graphic capabilities.
- (3) Flashing messages with the following ranges of adjustable timing:
 - (a) Message time on from 0.5 to 5.0 seconds in 0.1 second increments.
 - (b) Message time off from 0.5 to 5.0 seconds in 0.1 second increments.
- (4) Alternating messages capable with the following ranges of adjustable timing:
 - (a) Primary message time on from 0.5 to 5.0 seconds in 0.1 second increments.
 - (b) Primary message time off from 0 to 5.0 seconds in 0.1 second increments.
 - (c) Alternate message time on from 0.5 to 5.0 seconds in 0.1 second increments.
 - (d) Alternate message time off from 0 to 5.0 seconds in 0.1 second increments.

It shall be possible to flash any character or set of characters in an alternating message at the adjustable frequencies listed above for flashing messages. The flashing period shall be a sub-multiple of the associated alternating on time. It shall also be possible to flash any character or set of characters in a static message.

The sign controller shall monitor the photo cell circuits in the sign and convert the measured light intensity into the desired pixel brightness.

f) *Uninterruptable Power Supply (UPS)*: The UPS system shall provide "On-Line" dual conversion control.

The UPS shall be rated per the following:

Input Voltage 85 VAC to 135 VAC

The unit will be designed for a hot swap of components and shall not compromise existing DMS wiring. The unit shall provide for RS232 communication and contact closures for alarm functions. The unit shall be temperature rated to operate from 0 degree C to +40 degree C.

The UPS system shall be capable of producing simultaneously-fully regenerated, conditioned power with true sine wave and continuous AC outputs with stand by capability.

The unit shall have a re-settable power event counter to record the number of power utility failures, a battery run-time counter and temperature compensated battery charging.

Input Frequency 48 to 62 Hz

Output Voltage 120 VAC +/- 3%

Output Frequency 60 Hz

Power VA required to run; DMS sign control electronics, communication equipment, and half of the pixels in the LED sign face, allowing for sign functionality during a power outage.

-8-
**REVISION OF SECTION 614
VARIABLE MESSAGE SIGN (LED) (OVERHEAD)**

The UPS System shall be capable of providing continuous, fully conditioned (both voltage and frequency), regulated, sinusoidal (AC) power to selected devices such as controllers, modems, 5 volt power supplies, and sign face drivers.

Wiring shall comply with national electrical code (NEC) standards and approved wiring methods. Properly rated SO/SJO cords shall be allowed to allow easy replacement of the UPS System.

The UPS shall be 19-inch rack mountable and shall be accompanied with 19-inch rack mountable aluminum battery shelves for installation in the DMS.

The UPS shall consist of two major components, the Electronics Module and the Battery System.

- a. The Electronics Module shall consist of the following:
 1. True Sine wave, high frequency inverter.
 2. Minimum 3-stage, temperature compensated, battery charger
 3. For connection from the Electronics Module to the Battery System, a dedicated harness shall be provided with quick-release, keyed, circular connectors, and braided nylon sleeving over all conductors.
 4. Local and remote control of UPS functions
 5. Local and remote communications capabilities

- b. The Battery System shall consist of the following:
 1. Shall run sign electronics, communication equipment, and half of the pixels in the sign face with all LEDs illuminated at daytime brightness levels for a minimum of 8 hours
 2. The batteries shall be comprised of extreme temperature, deep cycle AGM/VRLA (Absorbed Glass Mat/Valve Regulated Lead Acid) batteries that have been field proven and tested by the U.S. military.
 3. Batteries shall be certified to operate at extreme temperatures from -40°C to +74°C.
 4. The batteries shall be provided with appropriate interconnect wiring and a corrosion-resistant mounting trays and/or brackets appropriate for the location into which they will be installed.
 5. The interconnect cable shall be protected with abrasion-resistant nylon sheathing.
 6. Battery construction shall include heavy-duty, inter-cell connections for low-impedance between cells and heavy-duty plates to withstand shock and vibration.

The UPS System shall come standard with software, RS232 interface via a DB-9F connector (optional SNMP Adapter for TCP/IP protocols) allowing full, interactive, remote computer monitoring and control of the UPS functions. The software shall allow the user to set up all operational parameters either locally or remotely and test the functionality of the unit.

The UPS Alarm Function Monitoring shall come standard with a DB-9F connector with open collectors (40 V @ 20 mA) indicating:

- Loss of Utility Power
- Inverter Failure
- Low Battery

The UPS Front Panel Controls shall come standard with Power ON, Cold (DC) Start, Alarm Silence, Battery Test, Bypass Breaker and DC/Battery Breaker.

Reliability shall be calculated with mean time between failure (MTBF) of 100,000 hours based on component ratings.

MANUFACTURER QUALIFICATIONS

The manufacturer shall supply experience documentation showing that the manufacturer has been in business, under the current corporate name, designing and manufacturing Interstate LED Variable Message Signs for a minimum of 5 years; and that the manufacturer has in operation a minimum of 100 walk-in LED VMSs. These 100 VMS shall be from 5 separate projects and operational for a minimum of 5 years.

-9-

**REVISION OF SECTION 614
VARIABLE MESSAGE SIGN (LED) (OVERHEAD)**

WARRANTY

The Contractor shall ensure that the manufacturer can warranty the sign and sign controller for a minimum of 3 years for all parts returned to the factory, and full telephone technical support at no additional charge to the Department. The technical support shall include access to a trained service representative who can respond within 24 hours to questions related to all DMS related equipment problems and maintenance issues.

The UPS equipment shall include a minimum two year warranty on parts and labor. Batteries shall include a minimum two year pro rated warranty. Vendor shall be responsible for processing warranty repairs.

A repair option shall be available for UPS equipment no longer covered by the warranty period. Repair cost shall include all labor and materials necessary to complete the repair. Vendor shall be responsible for processing non-warranty repairs.

CONSTRUCTION REQUIREMENTS

Dynamic Message Sign

Contractor shall be fully responsible for the delivery of the sign to the installation site and any damages that occur in the installation delivery process.

The LED VMS shall be installed in accordance with manufacturer's recommendations. A qualified factory representative shall be available on site to ensure proper installation and testing.

The Contractor shall perform a VMS acceptance test procedure for approval and acceptance by the Department in the presence of the Engineer, a representative of the CDOT Colorado Transportation Management Center, and the manufacturer's representative. The test shall include all items addressed in these specifications and any other requirements from the project plans or Engineer. The test shall also include the use of the latest version of the NTCIP Exerciser, or equivalent, to demonstrate that no proprietary protocols have been used and that the local and central software are NTCIP compliant. The Contractor shall notify the Engineer at least two weeks prior to the test date. This notification will contain CDOT Form 1411 and provided to the ITS group in Golden, CO two weeks prior to the acceptance test. Power and

10% upon the completion of the testing

Payment will be made under:

Pay Item

Variable Message Sign (LED) (Overhead)

Pay Unit

Each

All costs associated with having a manufacturer's representative on-site will not be measured and paid for separately, but shall be included in the work.

All costs associated with training and the purchasing of manuals will not be measured and paid for separately, but shall be included in the work.

All costs associated with the delivery of the sign to the installation site will not be measured and paid for separately, but shall be included in the work.

Electrical and telephone demark service connections from the power and telephone sources to the appropriate terminations with the LED VMS will be paid for by Force Account in accordance with subsection 109.04.

METHOD OF MEASUREMENT

The LED VMS will be measured by the actual number that are installed and accepted, and shall include all labor, materials, and equipment necessary to complete the work, including the sign controller, controller interface box, sign housing, electronics, communications equipment, delivery to the installation site and standard warranty.

-10-
REVISION OF SECTION 614
VARIABLE MESSAGE SIGN (LED) (OVERHEAD)

BASIS OF PAYMENT

Payment will be made in accordance with the following:
90% upon completion of the installation and provision of all certifications

Appendix A

NTCIP Requirements

This portion of the specification defines the detailed NTCIP requirements for the Dynamic Message Signs covered by the project specifications.

This specification references several standards through their NTCIP designated names. The following list provides the full reference to the current version of each of these standards. In many cases, the standard is more widely known by its original NEMA assigned number, in these cases, the NEMA number is also identified. The content of the NEMA standard is identical to that of the NTCIP standard.

Each NTCIP Component covered by these project specifications shall implement the most recent version of the standard that is at the stage of Recommended or higher as of January, 01, 2011, including any and all Approved or Recommended Amendments to these standards as of the same date. It is the ultimate responsibility of the vendor to monitor NTCIP activities to discover any more recent documents.

General Requirements:

Subnet Level

NTCIP Components may support additional Subnet Profiles at the vendor's option. At any one time, only one Subnet Profiles shall be active on a given serial port of the NTCIP Component. If the NTCIP Component has a serial port that supports multiple Subnet Profiles, the NTCIP Component shall be configurable to allow the field technician to activate the desired Subnet Profile and shall provide a visual indication of the currently selected Subnet Profile.

Transport Level

Each NTCIP Component shall comply with NTCIP 2202, (NEMA TS 3.Internet). NTCIP Components may support additional Transport Profiles at the manufacturer's option. Response datagrams shall use the same Transport Profile used in the request. Each NTCIP Component shall support the receipt of datagrams conforming to any of the identified Transport Profiles at any time.

Application Level

Each LED DMS shall comply with NTCIP 2301, (NEMA TS 3.AP-STMF), as a Managed Agent and shall meet the requirements for Conformance Level 1 (NOTE – See Amendment to standard). Simple network management protocol (SNMP) shall be required and simple transportation management protocol (STMP) shall not be required. An NTCIP Component may support additional Application Profiles at the manufacturer's option. Responses shall use the same Application Profile used by the request. Each NTCIP Component shall support the receipt of Application data packets at any time allowed by the subject standards.

Information Level

Each NTCIP Component shall provide Full, Standardized Object Range Support of all objects required by these procurement specifications, unless otherwise indicated below. The maximum Response Time for any object or group of objects shall be 200 milliseconds.

The vendor's software shall implement all mandatory objects of the mandatory conformance group defined in NTCIP 1201, (NEMA TS 3.4) Global Object Definitions:

- Configuration Conformance Group – Section 3.1
- Security Conformance Group (new in Amendment 1)

-11-
REVISION OF SECTION 614
VARIABLE MESSAGE SIGN (LED) (OVERHEAD)

The vendor's software shall implement the mandatory objects of the optional conformance groups defined in NTCIP 1201, (NEMA TS 3.4), Global Object Definitions:

- Time Management Conformance Group – Section 3.3
- TimeBase Event Schedule Conformance Group – Section 3.4
- Report Conformance Group – Section 3.5

The vendor's software shall implement all mandatory objects of all mandatory conformance groups defined in NTCIP 1203, (NEMA TS 3.6) Object Definitions for DYNAMIC MESSAGE SIGN (LED) (OVERHEAD)s:

- Sign Configuration Conformance Group – Section 4.1
- Message Table Conformance Group – Section 4.6
- Sign Control Conformance Group – Section 4.7

The vendor's software shall implement all mandatory objects of the optional conformance groups defined in NTCIP 1203, (NEMA TS 3.6), Object Definitions for DYNAMIC MESSAGE SIGN (LED) (OVERHEAD)s:

- GUI Appearance – Section 4.2
- Font Definition – Section 4.3
- DMS Sign Configuration – Section 4.4
- MULTI Configuration – Section 4.5
- Default Message – Section 4.8
- MULTI Error – Section 4.10
- Illumination/Brightness – Section 4.11
- Scheduling – Section 4.12
- Auxiliary I/O – Section 4.13
- Sign Status – Section 4.14
- Status Error – Section 4.15
- Pixel Error Status – Section 4.16
- Fan Error Status – Section 4.18
- Temperature Status – Section 4.17

The vendor's software shall implement the following optional objects defined in NTCIP 1203, (NEMA TS 3.6):

- dmsMessageBeacon – Section 2.6.1.1.1.8.6
- dmsSWReset – Section 2.7.1.1.1.1
- dmsMessageTimeRemaining – Section 2.7.1.1.1.4
- dmsShortPowerRecoveryMessage – Section 2.7.1.1.1.8
- dmsLongPowerRecoveryMessage – Section 2.7.1.1.1.9
- dmsShortPowerLossTime – Section 2.7.1.1.1.10
- dmsResetMessage – Section 2.7.1.1.1.11
- dmsCommunicationsLossMessage – Section 2.7.1.1.1.12
- dmsTimeCommLoss – Section 2.7.1.1.1.13
- dmsPowerLossMessage – Section 2.7.1.1.1.14
- dmsEndDurationMessage – Section 2.7.1.1.1.15
- dmsMultiOtherErrorDescription – Section 2.7.1.1.1.20
- dmsStatDoorOpen – Section 2.11.1.1.1.6
- fanFailures – Section 2.11.2.1.1.8
- fanTestActivation – Section 2.11.2.1.1.9
- tempMinCtrlCabinet – Section 2.11.4.1.1.1
- tempMaxCtrlCabinet – Section 2.11.4.1.1.2
- tempMinAmbient – Section 2.11.4.1.1.3
- tempMaxAmbient – Section 2.11.4.1.1.4
- tempMinSignHousing – Section 2.11.4.1.1.5
- tempMaxSignHousing – Section 2.11.4.1.1.6

-12-
 REVISION OF SECTION 614
 VARIABLE MESSAGE SIGN (LED) (OVERHEAD)

The vendor's software shall implement the following tags (opening and closing where defined) of MULTI as defined in NTCIP 1203, (NEMA TS 3.6), Object Definitions for DYNAMIC MESSAGE SIGN (LED) (OVERHEAD)s:

MULTI Tag

- 1 Field
- 2 Flash
- 3 Font
- 4 Hexadecimal Character
- 5 Justification Line
- 6 Justification Page
- 7 Moving Text
- 8 New Line
- 9 New Page
- 10 Page Time
- 11 Spacing – Character

The Field Tag shall support the following field ID's:

<u>Field Tag ID</u>	<u>Description</u>
1	1 Time, 12-hour format (no AM/PM indicator)
2	2 Time, 24-hour format
3	3 Temperature in degrees Celsius
4	4 Temperature in degrees Fahrenheit
5	7 Day of week
6	8 Day of month
7	9 Month of year
8	10 Year, 2-digits
9	11 Year, 4-digits

Sizes and Ranges

All objects required by these procurement specifications shall support all values within its standardized range. The standardized range is defined by a size, range, or enumerated listing indicated in the object's SYNTAX field and/or through descriptive text in the object's DESCRIPTION field of the relevant standard. The following provides the current listing of known variances for this project:

Object Reference Minimum Project Requirements

<u>Object</u>	<u>Reference</u>	<u>Minimum Project Requirements</u>
NTCIP 1201 (TS 3.4)		
moduleTableEntry	2.2.3	Shall contain at least one row with moduleType equal to 3 (software). The moduleMake shall specify the name of the manufacturer; the moduleModel shall specify the manufacturer's name of the component and the modelVersion shall indicate the model version number of the component.
communityNamesMax	2.8.2	Shall be at least 4.
maxTimeBaseScheduleEntries	2.4.3.1	7
maxDayPlans	2.4.4.1	7
maxDayPlanEvents	2.4.4.2	7
maxEventLogConfigs	2.5.1	50
eventConfigMode	2.5.2.3	2,3,and 4
maxEventLogSize	2.5.3	200
maxEventClasses	2.5.5	7
maxGroupAddress	2.7.1	1
maxEventLogSize	2.5.3	200

-13-
 REVISION OF SECTION 614
 VARIABLE MESSAGE SIGN (LED) (OVERHEAD)

maxEventClasses	2.5.5	7
maxGroupAddress	2.7.1	1

NTCIP 1203 v0239b (TS 3.6)

dmsNumPermanentMsg	5.6.1	100
dmsMaxChangeableMsg	5.6.3	100
dmsFreeChangeableMemory	5.6.4	500 MB
dmsMaxVolatileMsg	5.6.6	100
dmsFreeVolatileMemory	5.6.7	500 MB
dmsMsgMultiString	5.6.8.3	See attached table
dmsControlMode	5.7.1	2,4,5
numFonts	5.4.1	10
maxFontCharacters	5.4.3	127
DMSCharacterHeightPixels	5.3.1	7
DMSCharacterWidthPixels	5.3.2	5
DMSSignHeightPixels	5.3.3	27
DMSSignWidthPixels	2.3.1.1.1.4	105
DMSHorizontalPitch	5.3.5	66-70 mm
DMSVerticalPitch	5.3.6	66-70 mm
defaultBackgroundColor	5.5.1	0 (black)
defaultJustificationLine	5.5.9	2,3,4
defaultJustificationPage	5.5.11	2,3,4
defaultFlashOn	5.5.3	0.5 to 5.0
defaultFlashOff	5.5.5	0.5 to 5.0
defaultPageOnTime	5.5.13	0.5 to 5.0
defaultPageOffTime	5.5.15	0.5 to 5.0
defaultCharacterSet	5.5.21	eightBit (2)
dmsMaxNumberPages	5.5.24	6
dmsColorScheme	5.5.22	1 (monochrome 1 bit)
dmsSupportedMultiTags	5.5.23	See Section 614 more Multi Tags details.

Documentation

The Software shall be supplied with full documentation and a CD-Rom containing ASCII versions of the following Management Information Base (MIB) files in Abstract Syntax Notation 1 (ASN.1) format:

- Relevant version of each official standard MIB Module referenced by the device functionality.
- If the device does not support the full range of any given object within a Standard MIB Module, a vendor specific version of the official Standard MIB Module with the supported range indicated in ASN.1 format in the SYNTAX and/or DESCRIPTION fields of the associated OBJECT TYPE macro. The filename of this file shall be identical to the standard MIB Module, except that it will have the extension “.man”.
- A MIB Module in ASN.1 format containing any and all manufacturer-specific objects supported by the device with accurate and meaningful DESCRIPTION fields and supported ranges indicated in the SYNTAX field of the OBJECT-TYPE macros.
- A MIB containing any other objects supported by the device.

The vendor shall allow the use of any and all of this documentation by any party authorized by CDOT for systems integration purposes at any time initially or in the future, regardless of what parties are involved in the systems integration effort.

**REVISION OF SECTION 614
INTERSECTION DETECTION SYSTEM (CAMERA RESET)**

Section 614 of the Standard Specifications is hereby revised for this project as follows:

Subsection 614.01 shall include the following:

The Contractor shall carefully remove the existing cameras from the existing master arms and reset them to the new signal master arms. Wiring from individual cameras to the controller cabinet VDP shall be included in the cost of Wiring. The VDP shall be provided by CDOT in the Controller Cabinet.

Subsection 614.08 shall include the following:

The camera shall be powered by 120 VAC 60 Hz. Power consumption shall be less than 40 watts under all conditions.

Recommended camera placement shall be 33 feet (or 10 meters) above the roadway, and over the traveled way on which vehicles are to be detected. The camera shall view approaching vehicles at a distance not to exceed 350 feet for reliable detection.

The camera enclosure shall be equipped with separate, weather-tight connections for power and video cables at the rear of the enclosure to allow diagnostic testing and viewing of video at the camera while the camera is installed on a mast arm or pole. Video and power shall not be connected with the same connector.

The video signal output by the camera shall be in RS170 format.

The video signal shall be fully isolated from the camera enclosure and power cabling.

Subsection 614.10 shall include the following:

INSTALLATION

Coaxial cable for transmission of video signals shall be Belden #8281 or equivalent. This cable shall be suitable for installation in conduit or overhead with appropriate span wire.

BNC plug connectors should be used at both the Camera and Cabinet ends. The coaxial cable, BNC connector and crimping tool shall be approved by the supplier of the video detection system and the manufacturer's instructions must be followed to ensure proper connection.

The power cabling shall be 16 AWG minimum three conductor cable. The cabling shall comply with the National Electric Code, as well as local electrical codes.

The video detection system shall be installed as recommended by the supplier and as documented in installation materials provided by the supplier.

Subsection 614.13 shall include the following:

-2-

**REVISION OF SECTION 715
LIGHTING AND ELECTRICAL MATERIALS**

Section 715.05 Ballasts, LED Drivers, and Induction Lamp Power Generators shall be amended to include the following:

LED power supplies: LED power supplies shall have an input voltage of 240VAC/60Hz and the output voltage shall be per LED manufacturer's specifications. The output voltage shall be regulated automatically and continuously by an integral electronic voltage regulator to maintain the LED voltage within a tolerance of +/- 5%. The output current shall be regulated automatically and continuously by an integral electronic current regulator to maintain the current within a tolerance of +/- 5%. All electronics of the power supply and the LEDs shall be protected from all electrical surges, including but not limited to lightning strikes and stray current in rebar and concrete. Surge protection shall be integral to the LED power supply.

FORCE ACCOUNT ITEMS

DESCRIPTION

This special provision contains the Department's estimate for force account items included in the Contract. The estimated amounts marked with an asterisk will be added to the total bid to determine the amount of the performance and payment bonds. Force Account work shall be performed as directed by the Engineer.

BASIS OF PAYMENT

Payment will be made in accordance with subsection 109.04. Payment will constitute full compensation for all work necessary to complete the item.

Force account work valued at \$5,000 or less, that must be performed by a licensed journeyman in order to comply with federal, state, or local codes, may be paid for after receipt of an itemized statement endorsed by the Contractor.

<u>Force Account Item</u>	<u>Estimated Quantity</u>		<u>Amount</u>
F/A 01 Minor Contract Revisions	F.A.	\$	239,600*
F/A 02 Partnering	F.A.	\$	10,000
F/A 03 Asphalt Pavement Incentive	F.A.	\$	85,000
F/A 04 Fuel-cost Adjustment	F.A.	\$	70,000
F/A 05 Roadway Smoothness Incentive	F.A.	\$	45,000
F/A 06 Asphalt Cement Cost Adjustment	F.A.	\$	87,000
F/A 07 OJT Colorado Training Program	Hour		1,920
F/A 08 Interim Surface Repair	F.A.	\$	1,000
F/A 09 Furnish and Install Electric Service	F.A.	\$	5,000
F/A 10 Erosion Control	F.A.	\$	7,500
F/A 11 DRB Standing Committee	F.A.	\$	5,000
F/A 12 Removal of Asbestos and	F.A.	\$	15,000
F/A 13 Adjust Utility	F.A.	\$	5,000
F/A 14 Prairie Dog Management (Burrowing Owl)	F.A.	\$	5,000

*To be included in the bond amount

F/A 01 Minor Contract Revision

This work consists of minor work authorized and approved by the Engineer which is not included in the contract drawings or specifications and which is necessary to accomplish the scope of the work on this contract.

F/A 02 Partnering

This work consists of Partnering activities as described in the Standard Special Provision titled "Partnering Program."

F/A 03 Asphalt Pavement Incentive

Asphalt Incentive Payments will be made in accordance with the Standard Specification Section 105.05 Conformity to the Contract of Hot Mix Asphalt.

F/A 04 Fuel Cost Adjustment

This force account item makes adjustments to pay items for changes in fuel costs in accordance with the Standard Special Provision "Revision of Section 109 – Fuel Cost Adjustment."

-2-
FORCE ACCOUNT ITEMS

F/A 05 Roadway Smoothness Incentive

Roadway Smoothness incentive payments will be made in accordance with the Standard Specification 105.07 Conformity to Roadway Smoothness Criteria of HMA.

F/A 06 Asphalt Cement Cost Adjustment

Contract cost adjustments will be made to reflect increases or decreases in the monthly average price of asphalt cement from the average price for the month proceeding the month in which bids were received for the Contract. These cost adjustments are not a change to the contract unit prices bid.

F/A 07 OJT Colorado Training Program

This work includes the cost of maintaining the on-the-job training program in compliance with the Standard Special Provision "On the Job Training."

F/A 08 Interim Surface Repair

F/A 09 Furnish and Install Electric Service

This work consists of furnishing and installing electric service to traffic signals and the roundabout lighting controller.

F/A 10 Erosion Control

This force account item will be utilized at the Engineer's discretion to protect existing facilities and prevent erosion from impacting areas outside of the right-of-way.

F/A 11 DRB Standing Committee

This force account item is used to reimburse the Contractor for CDOT's portion of Dispute Review Board Costs in accordance with the Standard Special Provision "Revision of Section 105 – Disputes and Claims for Contract Adjustments."

F/A 12 Removal of Asbestos and Lead Based Paint

Structure K-18-CW may contain either asbestos and/or lead based materials, and shall be handled as per Section 250 of the Standard Specifications. This force account item is to reimburse the Contractor for work associated these materials.

F/A 13 Adjust Utility

This work consists of the adjustment (relocation) of the fiber optic line as necessary on page 41 of the plans.

F/A 14 Prairie Dog Management (Burrow Owl)

This work consists of protection of the Black Tail Prairie Dog and Burrowing Owls in accordance to Revision of Section 240 – Black Tailed Prairie Dog Management (Western Burrowing Owl).

TRAFFIC CONTROL PLAN – GENERAL

The key elements of the Contractor's method of handling traffic (MHT) are outlined in subsection 630.09.

The components of the TCP for this project are included in the following:

- (1) Subsection 104.04 and Section 630 of the Standard Specifications.
- (2) Schedule of Construction Traffic Control Devices.
- (3) Latest revised Standard Plan S-630-1 (02/27/2013), Traffic Controls for Highway Construction and Standard Plan S-630_2
- (4) Construction Traffic Control and Phasing Plans, included in Plans

Unless otherwise approved by the Engineer, the Contractor's equipment shall follow normal and legal traffic movements. The Contractor's ingress and egress of the work area shall be accomplished with as little disruption to traffic as possible. Traffic control devices shall be removed by picking up the devices in a reverse sequence to that used for installation. This may require moving backwards through the work zone. When located behind barrier or at other locations shown on approved traffic control plans, equipment may operate in a direction opposite to adjacent traffic.

Special Traffic Control Plan requirements for this project are as follows:

1. During the construction of this project, traffic shall use the present or reconstructed traveled roadway.
2. The Contractor shall not have construction equipment or materials in the lanes open to traffic at any time, unless directed to do so.
3. During construction, only one lane may be closed to traffic at any time in either direction. Traffic shall not be delayed for more than 10 minutes or as directed by the Engineer.
4. The schedule for traffic control signing and devices are totaled to allow the Contractor to work at two locations at one time for a maximum length of one half mile per location.
5. Advance notice of the construction shall be provided to the traveling public. The VMS shall be set up a minimum of one week in advance of the beginning of construction.
6. Prior to starting construction, the Contractor shall notify the CDOT R2 Traffic Engineer, Local Jurisdiction traffic engineer, State Patrol, City of Pueblo, Pueblo West Metro District and Pueblo County, and the local media of the date the Contractor intends to start construction and the expected duration of Construction activities.
7. The Contractor shall coordinate all work with major sporting events and graduation ceremonies through the University and special events through the City of Pueblo.
8. Traffic control devices shall not be stored on the shoulder or slopes of any roadway except behind guardrail unless laid flat outside of the approved clear zone; nor shall traffic control devices be stored in any landscaped area unless otherwise designated or permitted.
9. The Contractor may propose an alternative method of maintaining traffic for the project. Alternative proposals shall be submitted in writing to the Engineer for consideration. Written approval from the Engineer shall be obtained prior to beginning any work using the proposed alternative.
10. The Contractor shall perform work Monday thru Friday, 7 am to 7 pm, unless otherwise approved by the Engineer. If any night work is approved by the Engineer, all costs associated with this work, including but not limited to, lighting for the work, lighting for flagging stations, additional Traffic Control Supervisor, etc., shall not be paid for separately but shall be included in the cost of the work.

-2-

**REVISION OF SECTION 240
BLACK-TAILED PRAIRIE DOG MANAGEMENT (WESTERN BURROWING OWL)**

Work in adjacent to prairie dog colonies. Prairie dog colonies are known to occur in or adjacent to CDOT ROW within the project area, as shown on the Environmental Plan Sheets. Western burrowing owls occupy prairie dog colonies. Therefore any work occurring within these limits during the nesting season (March 15 – October 31) will require a burrowing owl survey prior to work commencing. A minimum of 10 business days prior to any work in areas with Prairie Dog colonies, the Contractor shall request, through the CDOT Project Engineer, that a Western Burrowing Owl Survey be performed by a qualified biologist. If prairie construction activities are initiated during the nesting season for burrowing owls (March 15 to October 31), a burrowing owl survey is required. If burrowing owls are identified, the qualified biologist shall assist the Contractor in locating and installing safety barrier fencing (silt fencing) within 150 feet of the work zone to protect active burrows from construction activities during the nesting season (March 15 – October 31). Work shall not proceed within the 150 foot buffer until the young have fledged or the nests have become inactive.

Contractor shall contact CDOT Environmental Manager one week prior to onsite prairie dog management. If prairie dog trapping is required, the Contractor shall also contact the CDOT Project Engineer and CDOT Region 2 Public Relations 30 days prior to onsite prairie dog management.

240.03 Measurement and Payment

Measurement and payment for Prairie Dog Management will be paid for under the items F/A – Prairie Dog Management (Burrowing Owl). Included in the items is all labor, materials, and equipment and permits required to complete the work.

Applying for and obtaining permits, hiring licensed specialists, trapping, transporting, euthanizing, parasite and disease management (including pesticides and other chemicals), and all other activities necessary to properly remove the BTPD in accordance with all of the requirements of the CDOT BTPD policy will not be measured and paid for separately, but shall be included in the work.

Partial payments for Prairie Dog management will made according to the following schedule:

- 50 percent of the bid amount will be paid on the first pay request that work associated with Prairie Dog Management is required for construction
- When 50 percent of the original contract amount is earned, 75 percent of the bid amount will be paid
- 100 percent of the bid amount will be paid on the final pay request upon request acceptance

Payment will be made under:

Pay Item	Pay Unit
F/A – Prairie Dog Management (Burrowing Owls)	F.A.

**REVISION OF SECTION 606
TENSIONED CABLE BARRIER (TL-4)**

Section 606 of the Standard Specifications is hereby revised for this project to include the following:

DESCRIPTION

This work consists of the installation of Tensioned Cable Barrier at locations shown on the plans.

MATERIALS

The tensioned cable barrier system shall meet NCHRP Report 350, Test Level 4 (TL-4), and shall be one of the following:

- (1) Brifen Wire Rope Safety Fence (Brifen WRSF) supplied by Brifen USA Inc., 12501 N. Sante Fe Ave., Oklahoma City, OK 73114, Phone: (405) 751-8062, Fax: (405) 751-8338.
- (2) Trinity Cable Safety System (Trinity CASS) supplied by Trinity Industries, Inc., 2525 Stemmons Freeway, Dallas, TX 75207, Phone: (800) 772-7976, Fax: (801) 292-9138.
- (3) Safence Cable Barrier System (Safence) supplied by Gregory Industries, 4100 13th St., SW, Canton, Ohio, 44710, Phone 330-477-4800, Fax: 330-477-0626.
- (4) Gibraltar Cable Barrier Systems (Gibraltar) supplied by Gibraltar Cable Barrier Systems, L.P. 4303 Innovation Loop, Marble Falls, TX, 78654, Phone 800-495-8957, Fax: 830-798-5445

The system shall have four cables. The cable shall be pre-stretched during manufacture in accordance with the manufacturer's specifications.

All posts shall be socketed posts. Concrete for posts and anchorages shall be Class B. End Anchorages (Tensioned Cable Barrier) shall meet NCHRP 350 TL-3.

CONSTRUCTION REQUIREMENTS

Tensioned Cable Barrier shall be installed in accordance with the details shown on the plans and in accordance with manufacturer's recommendations. The post spacing for the system used shall be no greater than that tested in accordance with NCHRP 350 for an impact deflection not to exceed nine feet and must be approved by the FHWA. The maximum post spacing shall be 20 feet.

The Contractor shall arrange for a qualified representative from the cable barrier manufacturer to be on site for the following:

- (1) The Contractor shall be adequately trained by the manufacturer's representative to ensure proper installation of the Cable Barrier.
- (2) The Manufacturer's representative shall check installation and tensioning after completion.

The Contractor shall obtain documentation from the manufacturer confirming the most recent detailed drawings are provided for the materials to be installed, and that these materials conform to the requirements of the NCHRP 350. Three weeks prior to start of work, the Contractor shall submit three copies of the submittal drawings and specifications to the Engineer. Work shall not begin until approval of these drawings has been received from the Engineer.

Installation of the cable barrier shall be performed in the presence of the Engineer and a qualified representative of the manufacturer.

-2-

**REVISION OF SECTION 606
TENSIONED CABLE BARRIER (TL-4)**

The Contractor shall obtain a signed statement from the manufacturer's representative confirming that the cable barrier has been installed correctly and is operational.

Sections of wire cable shall be connected using turnbuckles, with thread connector swaged on the cable. Concrete foundations for end anchorages and line posts shall be constructed with appropriate rebar based on the size of the foundations. The Contractor shall conduct a soil survey based on at least one test boring every mile and at anchor sites to identify the soil type, classification, and load bearing capacity. The Contractor shall submit the results of the soil survey to the manufacturer so that adjustments can be made to the size or type of footing used. A copy of this survey shall also be submitted to the Engineer for the project records.

The minimum concrete post footing size shall be 14 inches in diameter and 3 feet in depth.

The minimum concrete anchor footing shape may vary according to the manufacturer's recommendations but shall contain at least two cubic yards of concrete per anchor for systems with a single anchor for all cables. For systems having a separate anchor for each cable the footing shall contain at least one half cubic yard of concrete.

The Contractor shall install larger post and anchor footings than the minimum when soil conditions warrant. All size footings shall be constructed using Concrete Class B.

The Contractor shall maintain the cable barrier until CDOT Final Acceptance upon project completion. Cable barrier tensioning shall be checked within six weeks prior to project Final Acceptance.

Tensioned Cable Barrier and End Anchorage (Tensioned Cable Barrier) spare parts shall be provided and become the property of CDOT Maintenance. Spare parts shall include one complete end anchorage and all supplies needed for repairs for 1500 linear feet of Tensioned Cable Barrier, including, but not limited to: tension meter, standard socketed line posts, transition posts, post caps, excluders, locating pegs, cable clamp and prismatic reflectors. Spare parts shall include a cable spreader for weaved type cable installations. Spare parts shall be delivered to the CDOT maintenance yard at 4105 Pueblo Blvd., Pueblo, Colorado, 81007. The Contractor shall coordinate delivery of the spare parts with CDOT Maintenance personnel Chuck Klien at (719) 2768428.

METHOD OF MEASUREMENT

Tensioned Cable Barrier will be measured by the linear foot of barrier that is installed and accepted, excluding end anchorage.

End Anchorage (Tensioned Cable Barrier) will be measured by the actual number of anchorages that are installed and accepted. End Anchorage (Tensioned Cable Barrier) shall include concrete for standard foundation, cables, posts, and all necessary parts and fittings.



Oversight / NHS

FHWA REGION VIII OVERSIGHT? NO YES
 NATIONAL HIGHWAY SYSTEM? NO YES

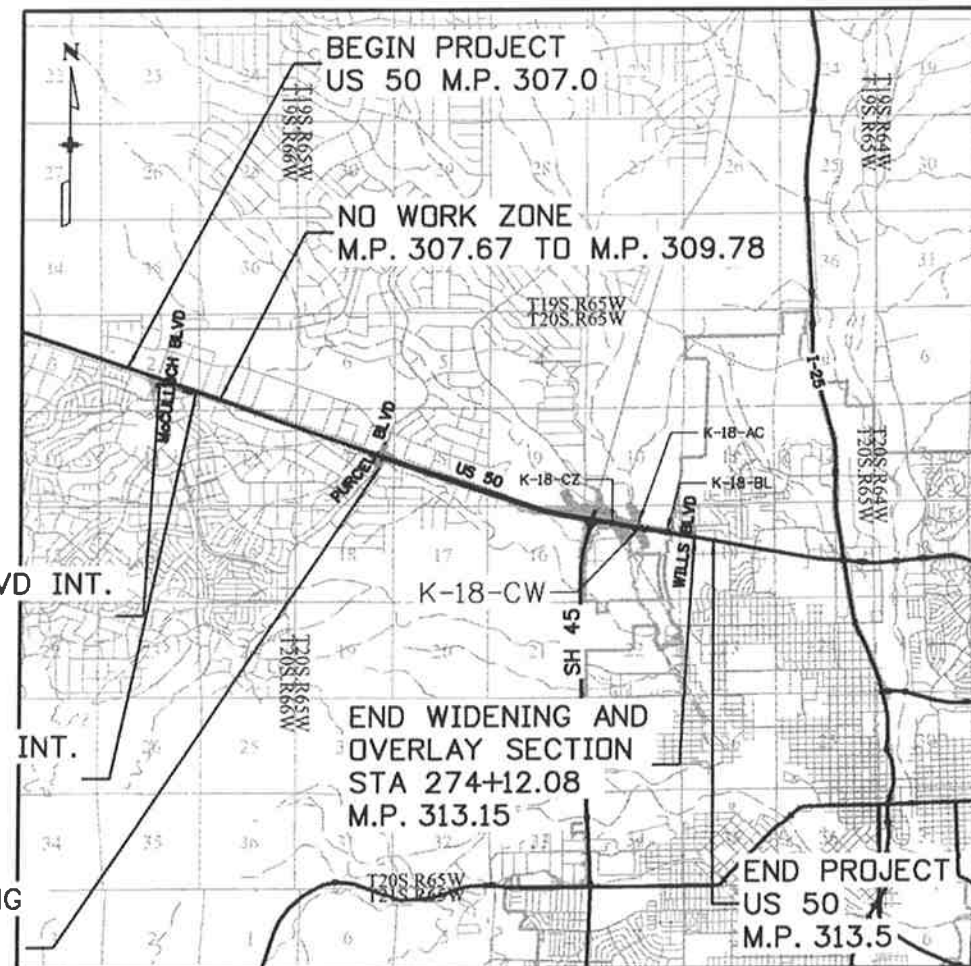
DEPARTMENT OF TRANSPORTATION STATE OF COLORADO

Related Projects:
 P. E. UNDER PROJECT: FSA 0503-081
 Project Number: 19751
 Project Code:
R.O.W. Projects:
 R.O.W. Project Description: FSA 0503-081
 19751

TABULATION OF LENGTH & DESIGN DATA

STATION	FEET	
	ROADWAY	MAJOR STR.
BEGIN FSA 0503-081 ON US 50		
BEGIN APPROACH TO PROJECT ON US 50 = M.P. 307.0		
BEGIN McCULLOCH BLVD INTERSECTION IMPROVEMENTS STA. 700+37.13 = MP 307.34		
END McCULLOCH BLVD INTERSECTION IMPROVEMENTS STA. 721+41.51 = MP 307.67	1,754.0	
NO WORK ZONE MP 307.67 TO 309.78		
BEGIN US 50 WIDENING AND OVERLAY STA. 97+13.10 = MP 309.78	14,560.5	
BEGIN STRUCTURE K-18-CW STA. 242+73.64 = M.P. 312.56		233.1
END STRUCTURE K-18-CW STA. 245+06.76 = MP 312.60		
END US 50 WIDENING AND OVERLAY STA. 274+12.08 = MP 313.15	2,901.6	
BEGIN APPROACH TO PROJECT = MP 313.5 END FSA 0503-081 ON US 50		
TOTAL	19,216.2	233.1
SUMMARY OF PROJECT LENGTH	FEET	MILES
MAJOR STRUCTURE	233.1	0.04
PROJECT GROSS LENGTH	19,449.3	3.7

HIGHWAY CONSTRUCTION BID PLANS OF PROPOSED FEDERAL AID PROJECT NO. FSA 0503-081 UNITED STATES HIGHWAY NO. 50 PUEBLO COUNTY CONSTRUCTION PROJECT CODE NO.19751



SHEET NO.	INDEX OF SHEETS
(R-2) (R-1) 1b	TITLE SHEET
2	STANDARD PLANS LIST
3	GENERAL NOTES
4-9	TYPICAL SECTIONS
10-11	SUMMARY OF APPROXIMATE QUANTITIES
(R-1) 12a	SUMMARY OF APPROXIMATE QUANTITIES
13	SUMMARY OF APPROXIMATE QUANTITIES
(R-2) 14b	SUMMARY OF APPROXIMATE QUANTITIES
15	SUMMARY OF APPROXIMATE QUANTITIES
(R-2) (R-1) 16b	SUMMARY OF APPROXIMATE QUANTITIES
(R-1) 17a	SUMMARY OF APPROXIMATE QUANTITIES
18-20	TABULATIONS
(R-2) 21b	TABULATIONS
22-27	TABULATIONS
28-43	UTILITY PLAN
44-45	GEOMETRY PLAN
46-53	REMOVALS AND RESETS
54-70	ROADWAY PLAN AND PROFILE
71-77	INTERSECTION DETAILS
78-89	GEOTECHNICAL/BORING SHEETS
90-91	ENGINEERING GEOLOGY
92-96	SURVEY CONTROL DIAGRAM
97-101	RIGHT OF WAY PLANS
102-117	GRADING AND DRAINAGE PLANS
118-119	POND DETAILS
120-128	DRAINAGE DETAILS
129-140	CROSS PIPE PLAN AND PROFILES
141-144	STORM SYSTEM PLAN AND PROFILE
145-146	STORM SYSTEM LATERAL PROFILES
147-178	BRIDGE PLANS
179	RAILROAD BRIDGE SLOPE PAVING MODIFICATIONS
180	HEADWALL DETAIL
(R-1) 181a-182a	ENVIRONMENTAL PLAN
183-200	ENVIRONMENTAL PLAN
200-204	STORMWATER MANAGEMENT NOTES
205-220	STORMWATER MANAGEMENT PLAN - INITIAL
221-236	STORMWATER MANAGEMENT PLAN - FINAL
(R-2) (R-1) 237b	TABULATION OF TRAFFIC ENGINEERING ITEMS
238-245	CONSTRUCTION PHASING
246-278	CONSTRUCTION TRAFFIC CONTROL (CTC)
279-282	TRAFFIC SIGNAL PLANS AND TABULATION
283-285	SIGNING AND PAVEMENT MARKING TABULATION
286-301	SIGNING AND STRIPING PLAN
302-303	CLASS III CROSS SECTIONS
(R-2) 304b	ITS PLAN AND TABULATION

DESIGN DATA	US 50 (EB)
MAXIMUM RADIUS OF CURVE	6,844 FT.
MAXIMUM GRADE	5.20%
MINIMUM S.S.D. HORIZONTAL	495 FT.
MINIMUM S.S.D. VERTICAL	495 FT.
MAXIMUM DESIGN SPEED	65 MPH
2035 DESIGN TRAFFIC	DHV = 4,493 vph ADT = 43,425 vpd
DHV TRUCK %	6.40%
CLEAR ZONE DISTANCE (TANGENT)	24 FT.
CLEAR ZONE DISTANCE (XXX MIN. RADIUS)	24 FT.
CONSTRUCTION CLEAR ZONE (MIN 18')	18 FT.

BEGIN McCULLOCH BLVD INT. IMPROVEMENTS
M.P. 307.34

END McCULLOCH BLVD INT. IMPROVEMENTS
M.P. 307.67

BEGIN US 50 WIDENING AND OVERLAY
STA 97+13.10
M.P. 309.78

PROJECT LOCATION MAP



Print Date: 11/25/2014
 File Name: 19056DES_TitleSht_Revision_2.dgn
 Horiz. Scale: 1:1 Vert. Scale: As Noted
 Unit Information DTD
JFS&A
 J. F. SATO AND ASSOCIATES
 5898 South Rapp Street
 Littleton, Colorado 80120

Sheet Revisions		
Date:	Comments	Init.
11/20/14	Revision 1	GV
11/26/14	Revision 2	GV

Colorado Department of Transportation
 902 Erie Avenue
 Pueblo, CO 81001
 Phone: 719-562-5509 FAX: 719-546-5702
Region 2 DTD

As Constructed
 No Revisions:
 Revised:
 Void:

Contract Information
 Contractor:
 Resident Engineer:
 Project Engineer:
 PROJECT STARTED: / / ACCEPTED: / /
 Comments:


Project No./Code
 FSA 0503-081
 19751
 Sheet Number 1b

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INDEX			CONTRACT ITEM NO.	CONTRACT ITEM	UNIT	ROADWAY										STRUCTURE K-18-CW		PROJECT TOTALS	
BOOK	PAGE	SHEET				PLAN	AS CONST.											PLAN	AS CONST.
			614-87011	Fiber Optic Cable (Single Mode) (24 Fiber)	LF	50												50	
			614-87524	Splice Fiber Optic Cable (24 Strand)	EACH	1												1	
			618-00142	Prestressed Concrete I (BT42)	LF										730			730	
			620-00002	Field Office (Class 2)	EACH	1												1	
			620-00012	Field Laboratory (Class 2)	EACH	1												1	
			620-00020	Sanitary Facility	EACH	1												1	
			621-00450	Detour Pavement	SY	611												611	
			625-00000	Construction Surveying	L S	1												1	
			626-00000	Mobilization	L S	1												1	
			626-01000	Public Information Services	L S	1												1	
			627-00007	Epoxy Pavement Marking (Special)	GAL	179												179	
			627-00011	Pavement Marking Paint (Waterborne)	GAL	400												400	
			627-30205	Thermoplastic Pavement Marking (Word-Symbol)	SF	93												93	
			627-30210	Thermoplastic Pavement Marking (Xwalk-Stopline)	SF	903												903	
			630-00000	Flagging	HOUR	3,808												3,808	
			630-00007	Traffic Control Inspection	DAY	127												127	
			630-00012	Traffic Control Management	DAY	238												238	
			630-80001	Flashing Beacon (Portable)	EACH	10												10	
			630-80335	Barricade (Type 3 M-A) (Temporary)	EACH	3												3	
			630-80341	Construction Traffic Sign (Panel Size A)	EACH	43												43	
			630-80342	Construction Traffic Sign (Panel Size B)	EACH	91												91	
			630-80344	Construction Traffic Sign (Special)	SF	165												165	
			630-80358	Advance Warning Flashing or Sequencing Arrow Panel (C Type)	EACH	6												6	
			R-2 630-80355	Portable Message Sign Panel	EACH	4												4	
			R-1 630-80359	Portable Message Sign Panel	DAY														
			R-1 630-80363	Drum Channelizing Device (With Light) (Flashing)	EACH	75 200												75 200	
			630-80370	Concrete Barrier (Temporary)	LF	3,000												3,000	
			630-80380	Traffic Cone	EACH	100												100	
			R-2 630-85040	Mobile Attenuator	EACH	2												2	
			R-2 630-85011	Impact Attenuator (Temporary)	DAY	50 200												50 200	
				FORCE ACCOUNT =====															
			700-70010	F/A Minor Contract Revisions	F A	1												1	
			700-70011	F/A Partnering	F A	1												1	
			700-70012	F/A Asphalt Pavement Incentive	F A	1												1	


Print Date: 11/24/2014
 File Name: Rev_1_19056DES_SAQ.dgn
 Horiz. Scale: 1:200 Vert. Scale: As Noted



J. F. SATO AND ASSOCIATES
 5898 South Ropp Street
 Littleton, Colorado 80120

Sheet Revisions		
Date:	Comments	Init.
11/20/14	Quantity Change	GV
11/26/14	Qty & Code Change	GV

Colorado Department of Transportation



902 Erie Avenue
 Pueblo, CO 81001
 Phone: 719-562-5509 FAX: 719-546-5702

Region 2 DTD

As Constructed
No Revisions:
Revised:
Void:

US 50 WEST
 PURCELL BLVD. TO WILLS BLVD.

Designer:
 Detailer:
 Subset:

Structure Numbers
 Subset Sheets: of

Project No./Code
 FSA 0503-081

19751

Sheet Number 16b

606-00301 606-00716 606-01370 ~~606-01460~~ 606-02005 **606-21010** 606-20014

Tabulation of Guardrail

Location	Side	Guardrail Type 3 (6'-3" Post Spacing)	Guardrail Type 7 (Style CA) (Special)	Transition Type 3G	Median Terminal	End Anchorage (Flared)	End Anchorage (Tensioned Cable Barrier)	Tensioned Cable Barrier (TL-4)	Comment
		LF	LF	EA	Each	Each	Each	LF	
US 50									
113+58.81 TO 185+00	LT				2		2	7,142	MEDIAN TERMINAL FOR CABLE BARRIER
241+41.94 TO 242+92.98	RT	162.50		1		1			BRIDGE APPROACH
258+28.10 TO 259+43.45	RT	162.50	115	1		1			RR BRIDGE UNDERPASS
PROJECT TOTALS		325	115	2	2	2	2	7,142	


Note: The guardrail blocks shall be synthetic and the post shall be steel.

612-00001 612-00002 612-00003

Tabulation of Delineators

Location	Side	Spacing (FT)	Curve Radius (FT)	Type I		Type II		Type III		Notes
				Crystal	Yellow	Crystal	Yellow	Yellow	Blue/Yellow	
				Each	Each	Each	Each	Each	Each	
US 50										
100+00 TO 185+79.29		8579.29	Lt.&Rt.	528	17	17				4
185+79.29 TO 196+14.94		1035.65	Lt.&Rt.	247	7	7				
196+14.94 TO 206+43.45		1028.51	Lt.&Rt.	528	4	4				
206+43.45 TO 216+97.00		543	Lt.&Rt.	100	11	11	8	8		
217+80.11 TO 231+50.82		896	Lt.&Rt.	100	9	9	11	11		
231+50.82 TO 241+00		949.18	Lt.&Rt.	528	4	4			2	
241+00 TO 242+92.46		192.46	Lt.&Rt.	37.5	3	3				
256+77.58 TO 259+43.08			Rt.	37.5	3					
SUBTOTALS					58	55	19	19	2	4
PROJECT TOTALS					113	55	19	19	2	4

For Information Only: It is Estimated that 108 Each, Removal of Delineators, will be required.

Print Date: 11/25/2014	Sheet Revisions	Colorado Department of Transportation	As Constructed	US 50 WEST PURCELL BLVD. TO WILLS BLVD. TAB OF GUARDRAIL & DELINEATORS	Project No./Code
File Name: 19056DES_Guardrail_n_Delineators.dgn	Date: 11/26/14	 902 Erie Avenue Pueblo, CO 81001 Phone: 719-562-5509 FAX: 719-546-5702 Region 2	No Revisions:	Designer: GV	FSA 0503-081
Horiz. Scale: 1:1 Vert. Scale: As Noted	Item Del. & Added		Revised:	Detailer: GV	19751
JFS&A			Void:	Subset: TAB	Structure Numbers
J. F. SATO AND ASSOCIATES 5898 South Rapp Street Littleton, Colorado 80120		DTD	Subset Sheets: TAB4 of 10		

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 11/27/14 1:37:47 PM

TABULATION OF TRAFFIC ENGINEERING ITEMS

ITEM NUMBER	ITEM DESCRIPTION	UNIT	PROJECT TOTALS
202-00040	REMOVAL OF ELECTRICAL CONDUIT *	LF	30
202-00250	REMOVAL OF PAVEMENT MARKING *	SF	12,700
202-00720	REMOVAL OF CCTV CAMERA	EA	1
202-00750	REMOVAL OF LUMINAIRE	EA	4
202-00805	REMOVAL OF OVERHEAD SIGN STRUCTURE *	EA	1
202-00810	REMOVE OF GROUND SIGN	EA	46
202-00825	REMOVAL OF FLASING BEACON	EA	2
202-00827	REMOVAL OF PULL BOX *	EA	6
202-00831	REMOVAL OF TRAFFIC SIGNAL HEAD	EA	2
202-00840	REMOVAL OF TRAFFIC SIGNAL POLE	EA	3
202-00858	REMOVAL OF PEDESTAL POLE	EA	1
202-00860	REMOVAL OF PEDESTRIAN PUSH BUTTON	EA	2
210-00476	RESET MICROWAVE VEHICLE RADAR DETECTOR (MVRD)	EA	3
210-00750	RESET LIGHT STANDARD *	EA	1
210-00815	RESET SIGN PANEL	EA	1
210-00825	RESET FLASHING BEACON	EA	2
210-00858	RESET PEDESTAL POLE	EA	1
210-00890	RESET INTERSECTION DETECTION SYSTEM (CAMERA)	EA	6
503-00012	DRILLED CAISSON (12 INCH)	LF	7
503-00018	DRILLED CAISSON (18 INCH)	LF	4
503-00036	DRILLED CAISSON (36 INCH)	LF	19
503-00048	DRILLED CAISSON (48 INCH)	LF	74
604-39050	MANHOLE (TRAFFIC MANAGEMENT SYSTEM)	EA	4
613-00200	2 INCH ELECTRICAL CONDUIT	LF	90
613-00206	2 INCH ELECTRICAL CONDUIT (BORED)	LF	659
613-00306	3 INCH ELECTRICAL CONDUIT (BORED)	LF	800
613-07023	PULL BOX (24"X36"X24")	EA	8
613-07039	PULL BOX (30"X48"X18")	EA	1
613-10000	WIRING	LS	1
613-13006	LUMINAIRE (LED) (8500 LUMENS)	EA	4
613-40010	LIGHT STANDARD FOUNDATION *	EA	1
614-00011	SIGN PANEL (CLASS I)	SF	131
614-00012	SIGN PANEL (CLASS II)	SF	335
614-00013	SIGN PANEL (CLASS III)	SF	385
614-00615	STEEL SIGN POST (W6X15)	LF	128
614-01502	STEEL SIGN SUPPORT (2 IN RD) (POST AND SOCKET)	LF	70
614-01572	STEEL SIGN SUPPORT (2-1/2 IN RD SCH 40) (POST AND SLIP BASE)	LF	290
614-03002	CONCRETE FOOTING (TYPE 2)	EA	8
614-10147	VARIABLE MESSAGE SIGN LED (OVERHEAD)	EA	1
614-32400	MONOTUBE OVERHEAD SIGN CANTILEVER (24 INCH DIAMETER)	EA	1
614-70150	PEDESTRIAN SIGNAL FACE (16) (COUNTDOWN)	EA	8
614-70336	TRAFFIC SIGNAL FACE (12-12-12)	EA	11
614-70448	TRAFFIC SIGNAL FACE (12-12-12-12)	EA	3
614-72860	PEDESTRIAN PUSH BUTTON	EA	7
614-72863	PEDESTRIAN PUSH BUTTON POST ASSEMBLY	EA	1
614-81150	TRAFFIC SIGNAL-LIGHT POLE STEEL (1-50 FOOT MAST ARM)	EA	1
614-81160	TRAFFIC SIGNAL-LIGHT POLE STEEL (1-60 FOOT MAST ARM)	EA	2
614-87011	FIBER OPTIC CABLE (SINGLE MODE) (24 STRAND)	LF	50
614-87524	SPLICE FIBER OPTIC CABLE (24 STRAND)	EA	1
621-00450	DETOUR PAVEMENT	SY	611

* FOR INFO ONLY

NOTE: SCHEDULE OF TRAFFIC CONTROL DEVICES PROVIDED FOR INFORMATION ONLY.

TABULATION OF TRAFFIC ENGINEERING ITEMS

ITEM NUMBER	ITEM DESCRIPTION	UNIT	PROJECT TOTALS
627-00007	EPOXY PAVEMENT MARKING (SPECIAL)	GAL	179
627-00011	PAVEMENT MARKING PAINT (WATERBORNE)	GAL	400
627-30405	PERFORMED THERMOPLASTIC PAVEMENT MARKING (WORD-SYMBOL)	SF	93
627-30410	PERFORMED THERMOPLASTIC PAVEMENT MARKING (XWALK-STOPLINE)	SF	903
630-00000	FLAGGING	HR	3,808
630-00007	TRAFFIC CONTROL INSPECTION	DAY	127
630-00012	TRAFFIC CONTROL MANAGEMENT	DAY	238
630-80001	FLASHING BEACON (PORTABLE)	EA	10
630-80335	BARRICADE (TYPE 3 M-A) (TEMPORARY)	EA	3
630-80341	CONSTRUCTION TRAFFIC SIGN (PANEL SIZE A)	EA	43
630-80342	CONSTRUCTION TRAFFIC SIGN (PANEL SIZE B)	EA	91
630-80344	CONSTRUCTION TRAFFIC SIGN (SPECIAL)	SF	165
630-80358	ADVANCE WARNING FLASHING OR SEQUENCING ARROW PANEL (C TYPE)	EA	6
R-2 630-80355	PORTABLE MESSAGE SIGN	EA	4
630-80363	DRUM CHANNELIZING DEVICE (WITH LIGHT) (FLASHING)	EA	75
630-80370	CONCRETE BARRIER (TEMPORARY)	LF	3,000
630-80380	TRAFFIC CONE	EA	100
R-2 630-85011	IMPACT ATTENUATOR (TEMPORARY)	DAY	56
630-85041	MOBILE ATTENUATOR	EA	2

SCHEDULE OF TRAFFIC CONTROL DEVICES

SIGNS					
SIGN CODE	LEGEND	DIMENSION	PANEL SIZE		
			A	B	Special
			EA	EA	SF
FASTER	COLORADO AT WORK SIGN (SPECIAL)	66X60			165
G20-5	WORK ZONE	36X24	20		
G20-10	XYZ/CONSTRUCTION/THANKS YOU/555-555-5555	48X48		8	
G20-11	ROAD WORK INFORMATION	48X48		7	
M1-4	U.S. ROUTE SIGN	36X36	1		
M1-5A	STATE ROUTE SIGN	36X36	1		
M3-3	CARDINAL DIRECTION	36X18	1		
M3-4	CARDINAL DIRECTION	36X18	1		
M5-1L	ADVANCE TURN ARROW	30X21	2		
R1-2	YIELD	36X36	1		
R2-1	SPEED LIMIT	36X48		21	
R2-6(ap)	FINES/DOUBLE	36X24	6		
R3-7r	MANDATORY MOVEMENT RIGHT	30X30	1		
R4-1	DO NOT PASS	36X48		2	
R11-2	ROAD/CLOSED	48X30		4	
R52-6a	BEGIN FINES DOUBLE IN WORK ZONE	36X48		7	
R52-6b	END FINES DOUBLE IN WORK ZONE	36X48		8	
W1-2I	HORIZONTAL ALIGNMENT LEFT	48X48		2	
W1-4BL	REVERSE CURVE	48X48		2	
W1-4I	REVERSE CURVE	48X48		1	
W1-6r	ONE-DIRECTION LARGE ARROW RIGHT	60X30		2	
W1-9-3a	MIDDLE LANE CLOSED	48X48		2	
W3-3	SIGNAL AHEAD	48X48		2	
W4-1r	MERGE RIGHT	48X48		1	
W5-1	ROAD NARROWS	48X48		2	
W5-2	BRIDGE NARROWS	48X48		2	
W9-2I	LANE ENDS MERGE LEFT	48X48		1	
W12-1	DOUBLE ARROW	36X36	1		
W16-2a	ADVANCE DISTANCE	30X24	8		
W20-1	ROAD WORK	48X48		8	
W21-5	SHOULDER WORK	48X48		2	
W24-1aL	DOUBLE REVERSE CURVE LEFT	48X48		5	
W24-1aR	DOUBLE REVERSE CURVE RIGHT	48X48		2	
PROJECT TOTALS			43	91	165

Print Date: 11/25/2014

File Name: I9056_Traffic_Engineering_Items.dgn

Horiz. Scale: 1:30

Vert. Scale: As Noted



Sheet Revisions

Date:	Comments	Init.
11/20/14	Qty Change	GV
11/26/14	Qty & Code Change	GV

Colorado Department of Transportation



902 Erie Avenue
Pueblo, CO 81001
Phone: 719-562-5509 FAX: 719-546-5702

Region 2

DTD

As Constructed

No Revisions:

Revised:

Void:

US 50 WEST
McCULLOCH BLVD. TO WILLS BLVD.
TRAFFIC ENGINEERING ITEMS

Designer: ACE
Detailer: ACE
Subset: TR

Structure
Numbers

Subset Sheets: TR1 of 1

Project No./Code

FSA 0503-081

19751

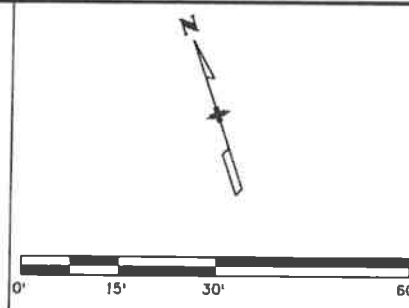
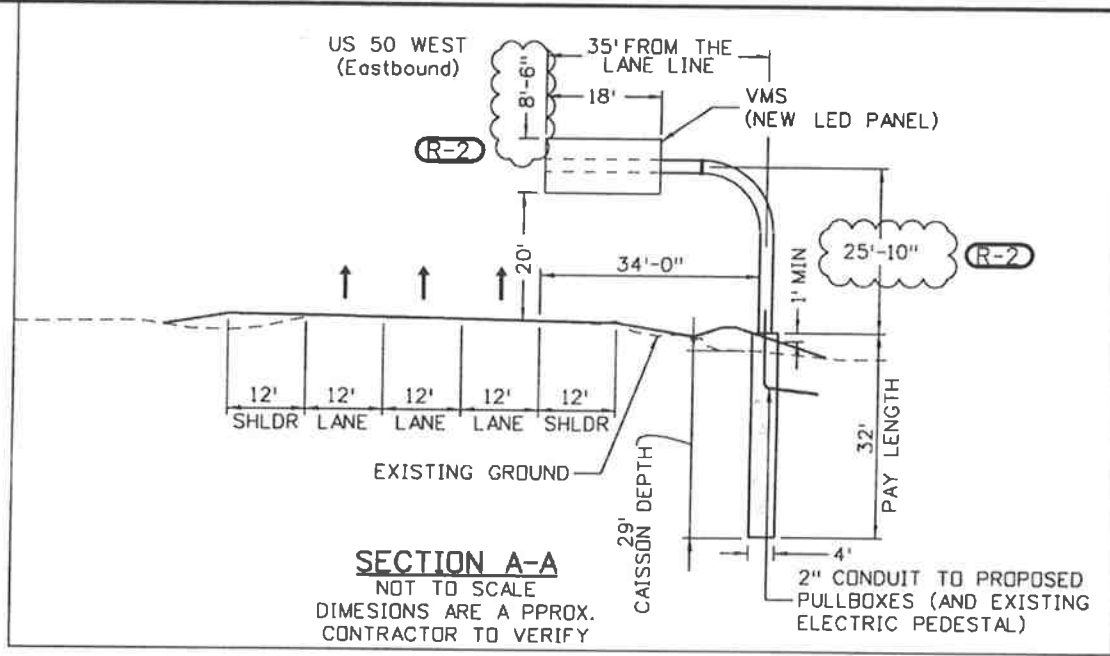
Sheet Number 237b



J. F. SATO AND ASSOCIATES
5898 South Rapp Street
Littleton, Colorado 80120



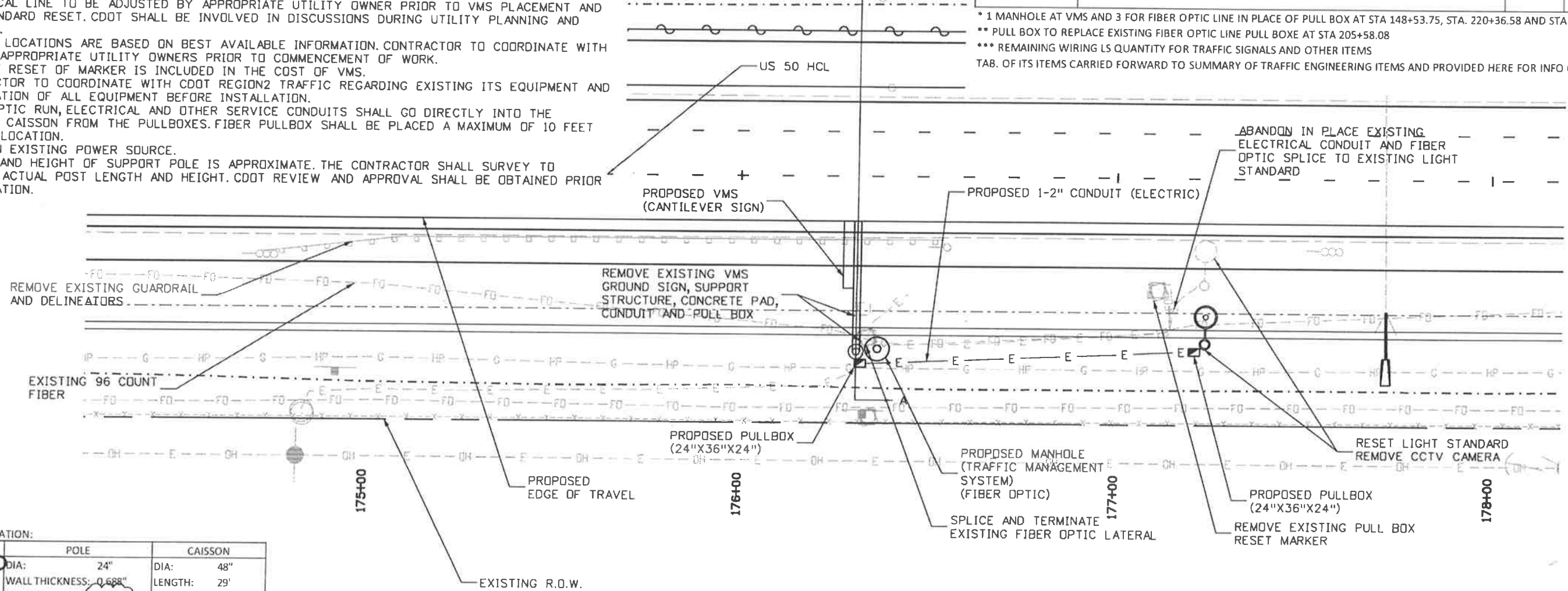
Know what's below. Call before you dig.



TABULATION OF ITS ENGINEERING ITEMS			
ITEM NO.	DESCRIPTION	UNIT	QTY.
202-00720	REMOVAL OF CCTV CAMERA	EA	1
202-00750	REMOVAL OF LUMINAIRE	EA	1
202-00805	REMOVAL OF OVERHEAD SIGN STRUCTURE	EA	1
202-00827	REMOVAL OF PULL BOX	EA	2
210-00750	RESET LIGHT STANDARD	EA	1
503-00048	DRILLED CAISSON (48 INCH)	LF	32
604-39050	MANHOLE (TRAFFIC MANAGEMENT SYSTEM) *	EA	4
613-00200	2 INCH ELECTRICAL CONDUIT	LF	90
613-07023	PULL BOX (24"X36"X24")	EA	2
613-07039	PULL BOX (30"X48"X18")**	EA	1
613-10000	WIRING***	LS	0.25
613-13006	LUMINARE (LED) (8500 LUMENS)	EA	1
613-40010	LIGHT STANDARD FOUNDATION	EA	1
614-10147	VARIABLE MESSAGE SIGN LED (OVERHEAD)	EA	1
614-32400	MONOTUBE OVERHEAD SIGN CANTILEVER (24 INCH DIAMETER)	EA	1
614-87011	FIBER OPTIC CABLE (SINGLE MODE) (24 STRAND)	LF	50
614-87524	SPLICE FIBER OPTIC CABLE (24 STRAND)	EA	1

* 1 MANHOLE AT VMS AND 3 FOR FIBER OPTIC LINE IN PLACE OF PULL BOX AT STA 148+53.75, STA. 220+36.58 AND STA 246+42.57
 ** PULL BOX TO REPLACE EXISTING FIBER OPTIC LINE PULL BOX AT STA 205+58.08
 *** REMAINING WIRING LS QUANTITY FOR TRAFFIC SIGNALS AND OTHER ITEMS
 TAB. OF ITS ITEMS CARRIED FORWARD TO SUMMARY OF TRAFFIC ENGINEERING ITEMS AND PROVIDED HERE FOR INFO ONLY

- NOTE:
- 1) ELECTRICAL LINE TO BE ADJUSTED BY APPROPRIATE UTILITY OWNER PRIOR TO VMS PLACEMENT AND LIGHT STANDARD RESET. CDOT SHALL BE INVOLVED IN DISCUSSIONS DURING UTILITY PLANNING AND PLACEMENT.
 - 2) UTILITY LOCATIONS ARE BASED ON BEST AVAILABLE INFORMATION. CONTRACTOR TO COORDINATE WITH CDOT AND APPROPRIATE UTILITY OWNERS PRIOR TO COMMENCEMENT OF WORK.
 - 3) COST OF RESET OF MARKER IS INCLUDED IN THE COST OF VMS.
 - 4) CONTRACTOR TO COORDINATE WITH CDOT REGION2 TRAFFIC REGARDING EXISTING ITS EQUIPMENT AND FINAL LOCATION OF ALL EQUIPMENT BEFORE INSTALLATION.
 - 5) FIBER OPTIC RUN, ELECTRICAL AND OTHER SERVICE CONDUITS SHALL GO DIRECTLY INTO THE STRUCTURE CAISSON FROM THE PULLBOXES. FIBER PULLBOX SHALL BE PLACED A MAXIMUM OF 10 FEET FROM VMS LOCATION.
 - 6) MAINTAIN EXISTING POWER SOURCE.
 - 7) LENGTH AND HEIGHT OF SUPPORT POLE IS APPROXIMATE. THE CONTRACTOR SHALL SURVEY TO DETERMINE ACTUAL POST LENGTH AND HEIGHT. CDOT REVIEW AND APPROVAL SHALL BE OBTAINED PRIOR TO FABRICATION.



STRUCTURE INFORMATION:

VMS	POLE	CAISSON
LENGTH: 18' (R-2)	DIA: 24"	DIA: 48"
WIDTH: 8'-6"	WALL THICKNESS: 0.688"	LENGTH: 29'
DEPTH: 46"	HEIGHT: 25'-10"	PAY LENGTH 32'
WEIGHT: 3000 LBS	LENGTH: 35' (R-2)	

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Sheet Revisions			
Date:	Comments	Init.	
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As Constructed
No Revisions:
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Void:

US 50 WEST
 ITS
 VMS

Designer: GV
 Detailer: ACE
 Subset: ITS

Structure Numbers
 Subset Sheets: ITS1 of 1

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