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#### JOB SPECIAL PROVISION

# A. <u>General - Federal</u> JSP-09-02K

**1.0 Description.** The Federal Government is participating in the cost of construction of this project. All applicable Federal laws, and the regulations made pursuant to such laws, shall be observed by the contractor, and the work will be subject to the inspection of the appropriate Federal Agency in the same manner as provided in Sec 105.10 of the Missouri Standard Specifications for Highway Construction with all revisions applicable to this bid and contract.

**1.1** This contract requires payment of the prevailing hourly rate of wages for each craft or type of work required to execute the contract as determined by the Missouri Department of Labor and Industrial Relations and requires adherence to a schedule of minimum wages as determined by the United States Department of Labor. For work performed anywhere on this project, the contractor and the contractor's subcontractors shall pay the higher of these two applicable wage rates. State Wage Rates, Information on the Required Federal Aid Provisions, and the current Federal Wage Rates are available on the Missouri Department of Transportation web page at www.modot.org under "Doing Business with MoDOT", "Contractor Resources". Effective Wage Rates will be posted 10 days prior to the applicable bid opening. These supplemental bidding documents have important legal consequences. It shall be conclusively presumed that they are in the bidder's possession, and they have been reviewed and used by the bidder in the preparation of any bid submitted on this project.

**1.2** The following documents are available on the Missouri Department of Transportation web page at <u>www.modot.org</u> under "Doing Business with MoDOT"; "Standards and Specifications". The effective version shall be determined by the letting date of the project.

General Provisions & Supplemental Specifications

Supplemental Plans to July 2024 Missouri Standard Plans For Highway Construction

These supplemental bidding documents contain all current revisions to the published versions and have important legal consequences. It shall be conclusively presumed that they are in the bidder's possession, and they have been reviewed and used by the bidder in the preparation of any bid submitted on this project.

# B. <u>Contract Liquidated Damages</u> JSP- 13-01D

**1.0 Description.** Liquidated Damages for failure or delay in completing the work on time for this contract shall be in accordance with Sec 108.8. The liquidated damages include separate amounts for road user costs and contract administrative costs incurred by the Commission.

**2.0 Period of Performance.** Prosecution of work is expected to begin on the date specified below in accordance with Sec 108.2. Regardless of when the work is begun on this contract, all work on all projects shall be completed on or before the date specified below. Completion by this date shall be in accordance with the requirements of Sec 108.7.1.

Notice to Proceed:July 7, 2025Contract Completion Date:November 1, 2025

**2.1 Calendar Days and Completion Dates.** Completion of the project is required as specified herein. The count of calendar days will begin on the date the contractor starts any construction operations on the project.

Project	Calendar Days	Daily Road User Cost
JNW0152	30	\$7,600

**3.0 Liquidated Damages for Contract Administrative Costs.** Should the contractor fail to complete the work on or before the contract completion date specified in Section 2.0, or within the number of calendar days specified in Section 2.1, whichever occurs first, the contractor will be charged contract administrative liquidated damages in accordance with Sec 108.8 in the amount of **\$750** per calendar day for each calendar day, or partial day thereof, that the work is not fully completed. For projects in combination, these damages will be charged in full for failure to complete one or more projects within the specified contract completion date or calendar days.

**4.0 Liquidated Damages for Road User Costs.** Should the contractor fail to complete the work on or before the contract completion date specified in Section 2.0, or within the number of calendar days specified in Section 2.1, whichever occurs first, the contractor will be charged road user costs in accordance with Sec 108.8 in the amount specified in Section 2.1 for each calendar day, or partial day thereof, that the work is not fully completed. These damages are in addition to the contract administrative damages and any other damages as specified elsewhere in this contract.

# C. <u>Work Zone Traffic Management</u> JSP-02-06N

**1.0 Description.** Work zone traffic management shall be in accordance with applicable portions of Division 100 and Division 600 of the Standard Specifications, and specifically as follows.

**1.1 Maintaining Work Zones and Work Zone Reviews.** The Work Zone Specialist (WZS) shall maintain work zones in accordance with Sec 616.3.3 and as further stated herein. The WZS shall coordinate and implement any changes approved by the engineer. The WZS shall ensure all traffic control devices are maintained in accordance with Sec 616, the work zone is operated within the hours specified by the engineer, and will not deviate from the specified hours without prior approval of the engineer. The WZS is responsible to manage work zone delay in accordance with these project provisions. When requested by the engineer, the WZS shall submit a weekly report that includes a review of work zone operations for the week. The report shall identify any problems encountered and corrective actions taken. Work zones are subject to unannounced inspections by the engineer and other departmental staff to corroborate the validity of the WZS's review and may require immediate corrective measures and/or additional work zone monitoring.

**1.2 Work Zone Deficiencies.** Failure to make corrections on time may result in the engineer suspending work. The suspension will be non-excusable and non-compensable regardless if road user costs are being charged for closures.

# 2.0 Traffic Management Schedule.

**2.1** Traffic management schedules shall be submitted to the engineer for review prior to the start of work and prior to any revisions to the traffic management schedule. The traffic management schedule shall include the proposed traffic control measures, the hours traffic control will be in place, and work hours.

**2.2** The traffic management schedule shall conform to the limitations specified in Sec 616 regarding lane closures, traffic shifts, road closures and other width, height and weight restrictions.

**2.3** The engineer shall be notified as soon as practical of any postponement due to weather, material or other circumstances.

**2.4** In order to ensure minimal traffic interference, the contractor shall schedule lane closures for the absolute minimum amount of time required to complete the work. Lanes shall not be closed until material is available for continuous construction and the contractor is prepared to diligently pursue the work until the closed lane is opened to traffic.

**2.5 Traffic Congestion.** The contractor shall, upon approval of the engineer, take proactive measures to reduce traffic congestion in the work zone. The contractor shall immediately implement appropriate mitigation strategies whenever traffic congestion reaches an excess of <u>15</u> <u>minutes</u> to prevent congestion from escalating beyond this delay threshold. If disruption of the traffic flow occurs and traffic is backed up in queues equal to or greater than the delay time threshold listed above, then the contractor shall immediately review the construction operations which contributed directly to disruption of the traffic flow and make adjustments to the operations to prevent the queues from reoccurring. Traffic delays may be monitored by physical presence on site or by utilizing real-time travel data through the work zone that generate text and/or email notifications where available. The engineer monitoring the work zone may also notify the contractor of delays that require prompt mitigation. The contractor may work with the engineer to determine what other alternative solutions or time periods would be acceptable. When a Work Zone Analysis Spreadsheet is provided, the contractor will find it in the electronic deliverables on MoDOT's Online Plans Room. The contractor may refer to the Work Zone Analysis Spreadsheet for detailed information on traffic delays.

# 2.5.1 Traffic Safety.

**2.5.1.1 Recurring Congestion.** Where traffic queues routinely extend to within 1000 feet of the ROAD WORK AHEAD, or similar, sign on a divided highway or to within 500 feet of the ROAD WORK AHEAD, or similar, sign on an undivided highway, the contractor shall extend the advance warning area, as approved by the engineer.

**2.5.1.2 Non-Recurring Congestion.** When traffic queues extend to within 1000 feet of the ROAD WORK AHEAD, or similar, sign on a divided highway or to within 500 feet of the ROAD WORK AHEAD, or similar, sign on an undivided highway infrequently, the contractor shall deploy a means of providing advance warning of the traffic congestion, as approved by the engineer. The warning location shall be no less than 1000 feet and no more than 0.5 mile in advance of the end

of the traffic queue on divided highways and no less than 500 feet and no more than 0.5 mile in advance of the end of the traffic queue on undivided highways.

**2.6 Traffic Management Center** (TMC) Coordination. The Work Zone Specialist (WZS) or their designee shall contact by phone the MoDOT Traffic Management Center (KC Scout TMC at #816-347-2250 or Gateway Guide TMC at #314-275-1513) within five minutes of a lane or ramp closure beginning and within five minutes of a lane or ramp closure being removed. The WZS shall make this phone call 24 hours a day, 365 days of the year since the MoDOT Traffic Management Centers are always staffed.

#### 3.0 Work Hour Restrictions.

**3.1** Except for emergency work, as determined by the engineer, and long term lane closures required by project phasing, all lanes shall be scheduled to be open to traffic during the five major holiday periods shown below, from 12:00 noon on the last working day preceding the holiday until 6:00 a.m. on the first working day subsequent to the holiday unless otherwise approved by the engineer.

Memorial Day Labor Day Thanksgiving Christmas New Year's Day

**3.1.1 Independence Day.** The lane restrictions specified in Section 3.1 shall also apply to Independence Day, except that the restricted periods shall be as follows:

When Independence Day falls on:	The Holiday is Observed on:	Halt Lane Closures beginning at:	Allow Lane Closures to resume at:
Sunday	Monday	Noon on Friday	6:00 a.m. on Tuesday
Monday	Monday	Noon on Friday	6:00 a.m. on Tuesday
Tuesday	Tuesday	Noon on Monday	6:00 a.m. on Wednesday
Wednesday	Wednesday	Noon on Tuesday	6:00 a.m. on Thursday
Thursday	Thursday	Noon on Wednesday	6:00 a.m. on Friday
Friday	Friday	Noon on Thursday	6:00 a.m. on Monday
Saturday	Friday	Noon on Thursday	6:00 a.m. on Monday

**3.2** The contractor shall not perform any construction operation on the roadway, roadbed or active lanes, including the hauling of material within the project limits, during restricted periods, holiday periods or other special events specified in the contract documents.

**3.3** Any work requiring a reduction in the number of through lanes of traffic shall be completed outside of the following hours:

Route I-29 Northbound: 2:00 p.m. - 4:00 p.m. Monday through Friday

Route I-29 Southbound: 11:00 a.m. - 5:00 p.m. Monday through Friday

**3.5** The contractor shall not alter the start time, ending time, or a reduction in the number of through lanes of traffic or ramp closures without advance notification and approval by the engineer. The only work zone operation approved to begin 30 minutes prior to a reduction in through traffic lanes or ramp closures is the installation of traffic control signs. Should lane closures be placed or remain in place, prior to the approved starting time or after the approved ending time, the Commission, the traveling public, and state and local police and governmental authorities will be damaged in various ways, including but not limited to, increased construction administration cost, potential liability, traffic and traffic flow regulation cost, traffic congestion and motorist delays, with a resulting cost to the traveling public. These damages are not easily computed or quantified. Therefore, the contractor will be charged with liquidated damages specified in the amount of **\$1000 per 15 minute increment** for each 15 minutes that the temporary lane closures are in place and not open to traffic in excess of the limitation as specified elsewhere in this special provision. It shall be the responsibility of the engineer to determine the quantity of unapproved closure time.

**3.5.1** The said liquidated damages specified will be assessed regardless if it would otherwise be charged as liquidated damages under the Missouri Standard Specification for Highway Construction, as amended elsewhere in this contract.

# 4.0 Detours and Lane Closures.

**4.1** When a changeable message sign (CMS) is provided, the contractor shall use the CMS to notify motorists of future traffic disruption and possible traffic delays one week before traffic is shifted to a detour or prior to lane closures. The CMS shall be installed at a location as approved or directed by the engineer. If a CMS with Communication Interface is required, then the CMS shall be capable of communication prior to installation on right of way. All messages planned for use in the work zone shall be approved and authorized by the engineer or its designee prior to deployment. When permanent dynamic message signs (DMS) owned and operated by MoDOT are located near the project, they may also be used to provide warning and information for the work zone. Permanent DMS shall be operated by the TMC, and any messages planned for use on DMS shall be approved and authorized by the TMC at least 72 hours in advance of the work.

**4.2** At least one lane of traffic in each direction shall be maintained at all times except for brief intervals of time required when the movement of the contractor's equipment will seriously hinder the safe movement of traffic. Periods during which the contractor will be allowed to interrupt traffic will be designated by the engineer.

**5.0 Basis of Payment.** No direct payment will be made to the contractor to recover the cost of equipment, labor, materials, or time required to fulfill the above provisions, unless specified elsewhere in the contract document. All authorized changes in the traffic control plan shall be provided for as specified in Sec 616.

# D. <u>Emergency Provisions and Incident Management</u> JSP-90-11A

**1.0** The contractor shall have communication equipment on the construction site or immediate access to other communication systems to request assistance from law enforcement or other emergency agencies for incident management. In case of traffic accidents or the need for law enforcement to direct or restore traffic flow through the job site, the contractor shall notify law

enforcement or other emergency agencies immediately as needed. The area engineer's office shall also be notified when the contractor requests emergency assistance.

**2.0** In addition to the 911 emergency telephone number for ambulance, fire or law enforcement services, the following agencies may also be notified for accident or emergency situation within the project limits.

Missouri Highway Patrol 816-387-2345		
City of Saint Joseph	Buchanan County	
Fire: 816-271-4603	Fire: 816-238-4142	
Police: 816-271-4777	Police: 816-236-8812	

**2.1** This list is not all inclusive. Notification of the need for wrecker or tow truck services will remain the responsibility of the appropriate law enforcement agency.

**2.2** The contractor shall notify law enforcement and emergency agencies before the start of construction to request their cooperation and to provide coordination of services when emergencies arise during the construction at the project site. When the contractor completes this notification with law enforcement and emergency agencies, a report shall be furnished to the engineer on the status of incident management.

**3.0** No direct pay will be made to the contractor to recover the cost of the communication equipment, labor, materials or time required to fulfill the above provisions.

#### E. <u>Project Contact for Contractor/Bidder Questions</u> JSP-96-05

All questions concerning this project during the bidding process shall be forwarded to the project contact listed below.

Timothy Miner, P.E. Project Manager Missouri Department of Transportation - Northwest District 3602 N Belt Hwy Saint Joseph, MO 64506

Telephone Number: 816-387-2455 Email: <u>Timothy.Miner@modot.mo.gov</u>

All questions concerning the bid document preparation can be directed to the Central Office – Design at (573) 751-2876.

# F. Dynamic Message Sign Replacement

**1.0 Description of Work.** Replace existing dynamic message sign (DMS) with a Contractor furnished full color/full matrix display DMS. Install the new DMS on the existing sign structure. The DMS display shall have a pixel pitch of 20 mm. The sign controller shall be installed in an

existing equipment cabinet. Provide a multimode fiber optic communications cable connecting the DMS to the sign controller in the equipment cabinet. Connect the sign and controller to power, communication and ground. The contractor shall install, configure, and test the DMS for proper operation with assistance from the manufacturer's representative.

The existing signs to be replaced are Ledstar full matrix DMS. They are full matrix signs with amber LEDs and 66 mm pixel pitch.

# 2.0 Materials.

**2.1 General.** All materials furnished, assembled, fabricated, or installed shall be new products and approved by the engineer. All internal and external components shall be manufactured from corrosion resistant material. Dissimilar metals shall be separated by an inert dielectric material. Sign components shall be capable of operating without any decrease in performance over a temperature range of -30°F to 165°F (-34°C to 74°C) with a relative humidity of up to 90 percent non-condensing.

**2.2 Display Size.** The sign display shall provide a 96 rows x 304 columns pixel matrix of 20 mm pixels.

**2.3 Housing.** The sign housing shall be front access. The sign housing shall meet the requirements of NEMA TS4 2016, Section 3.2.8.

**2.3.1 Dimensions and Weight.** The maximum exterior dimensions and weight of the DMS shall be as follows:

7'-5" (H) x 21'-7" (W) and 2,600 lbs.

**2.3.2 Enclosure.** The sign housing external skin shall be constructed of aluminum alloy 5052 H32 that is a minimum of 0.125 inch thick. All exterior, excluding the sign face, and all interior housing surfaces shall be natural aluminum mill finish. The interior structure shall be constructed of aluminum. No internal frame connections or external skin attachments shall rely upon adhesive bonding or rivets. The sign enclosure shall meet the requirements of NEMA TS4 2016, Section 3.1.1. All drain holes and other openings in the sign housing shall be screened to prevent the entrance of insects and small animals.

**2.3.3 Design.** The sign housing shall comply with the fatigue resistance requirements of the sixth-edition American Association of State Highway and Transportation Officials (AASHTO) Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals with current addendums. Design and construct the DMS unit for continuous usage of at least 20 years and the sign housing for a 50-year design life.

**2.3.4 Hoist Points.** The top of the housing shall include multiple galvanized or stainless steel lifting eyebolts or equivalent hoisting points. Hoist points shall be positioned such that the sign remains level when lifted. Ensure that the hoist points and sign frame allow the sign to be shipped, handled and installed without damage. Hoist points shall be attached directly to structural frame members by the sign manufacturer.

**2.3.5 Fabrication.** The sign shall be fabricated, welded and inspected in accordance with the requirements of the current American National Standard Institute/American Welding Society (ANSI/AWS) Structural Welding Code-Aluminum. Exterior seams and joints, except the finish

coated face pieces, shall be continuously welded using an inert gas welding method. Limit the number of seams on the top of the housing to a maximum of three. Stitch weld the exterior housing panel material to the internal structural members to form a unitized structure.

**2.3.6 Mounting Assembly.** Exterior mounting assemblies shall be fabricated from aluminum alloy 6061-T6 extrusions a minimum of 0.1875 inch thick. For the DMS, include a minimum of three 6061-T6 structural aluminum Z members on the rear of the sign housing. The number of Z members shall be sufficient for mounting the sign on the two post structure shown in the plans. These structural members shall run parallel to the top and bottom of the sign housing and are each a single piece of material that spans the full length of the sign. These structural members shall be attached to the internal framework of the sign.

**2.3.7 U-Bolts.** Provide galvanized or stainless steel U-bolts of sufficient size to attach the Z member to the DMS structure posts.

**2.4 Housing Face.** The sign face surfaces shall be finished with a matte black coating system that meets or exceeds American Architectural Manufacturers Association (AAMA) Specification No. 2605. Provide certification that the sign face parts are coated with the prescribed thickness. The sign face shall include a contrast border that meets the requirements of NEMA TS 4-2016, Section 3.1.6. No exposed fasteners shall be allowed on the housing face. Display modules shall be easily and rapidly removed from within the sign without disturbing adjacent display modules. If the sign includes external fascia panels, they shall be constructed using aluminum. Finish each fascia panel with a matte black coating system that meets or exceeds AAMA Specification No. 2605. The sign shall be resistant, either by active or passive subsystem, to fog and frost on the front face.

**2.5 Lens Panel Assembly.** If sign includes lens panel assemblies, they shall be modular in design, removable and interchangeable without misalignment of the lens panel and the lightemitting diode (LED) pixels. The lens panel assembly must consist of an environmental shielding layer coating to protect and seal the LEDs and internal electronics. The coating shall be a minimum 90 percent ultraviolet (UV) opaque. Lens panels must have a matte black coating that meets or exceeds AAMA Specification No. 2605. The mask shall be perforated to provide an aperture for each pixel on the display module. The apertures shall not block the LED output at the required viewing angle.

**2.6 Sign Housing Ventilation System.** The ventilation system must meet the requirements of NEMA TS 4-2016, Section 3.1.2. Air drawn into the sign shall be filtered upon entry. The ventilation system shall be testable on command from remote and local control access locations. The sign shall include a sensor or a sensor assembly to monitor airflow volume to predict the need for a filter change. All ventilation system fans shall be new. The ventilation system fans shall have a 60,000-hour, L10-life rating. The sign controller shall continuously measure and monitor the temperature sensors. The sign shall blank when a critical temperature is exceeded and will report this event when polled. All temperature measurements from the sign controller shall be readable remotely. Humidity sensors shall detect from 0 to 100 percent relative humidity in 1 percent or smaller increments. Sensors shall operate and survive in 0 to 100 percent relative humidity. A humidistat is not acceptable.

**2.7 Photo Sensors.** The sign shall meet the requirements of NEMA TS 4-2016, Section 9.1.3.1. The photo sensors shall provide accurate ambient light condition information to the sign controller for automatic light intensity adjustment. The automatic adjustment of the LED driving waveform

duty cycle shall occur in small enough increments that the sign's brightness changes smoothly, with no perceivable brightness change between adjacent levels. Stray headlights shining on the photoelectric sensor at night shall not cause LED brightness changes.

**2.8 Display Modules.** Provide display modules manufactured by one source and fully interchangeable throughout the manufacturer's sign systems. Removal or replacement of a complete display module or LED board can be accomplished without the use of special tools. Removal or failure of any display module shall not affect the operation of any other display module or sign component. Display modules shall contain solid-state electronics needed to control pixel data and read pixel status. The sign shall have a full matrix display area as defined in the glossary of NEMA TS 4-2016. The brightness and color of each pixel shall be uniform over the sign's entire face within a 30-degree viewing angle in all lighting conditions.

**2.9 LED and Pixel.** The LED lamps shall have a minimum viewing angle of 30 degrees. All pixels in all signs in a project shall have equal color and on-axis intensity. The sign display shall meet the luminance requirements of NEMA TS 4-2016, Section 5.4, for light emitting signs connected at full power. Provide LED brightness and color bins that are used in each pixel to the engineer for approval. The LED manufacturer shall demonstrate testing and binning according to the International Commission on Illumination (CIE) 127 (1997) standard. All LEDs shall operate within the LED manufacturer's recommendations for typical forward voltage, peak pulsed forward current and other ratings. Component ratings shall not be exceeded under any operating condition. Provide a pixel test as a form of status feedback to the traffic management center (TMC) from the local sign controller. The operational status of each pixel in the sign can be automatically tested once a day. The pixel status test shall determine the functional status of the pixel as defined by the pixel Failure Status object in National Transportation Communications for ITS Protocol (NTCIP) 1203v0239 and shall not affect the displayed message for more than half a second. The LEDs shall be individually mounted directly on a printed circuit board (PCB).

**2.10 Display Optical, Electrical and Mechanical.** The display modules shall be rectangular and have an identical vertical and horizontal pitch between adjacent pixels. The separation between the last column of one display module and the first column of the next module shall be equal to the horizontal distance between the columns of a single display module. The pitch shall be 20 mm. All components on the LED side of PCBs shall be black. There shall be a minimum of two power supplies that are wired in a parallel configuration for redundancy, so that if one or 25 percent of the supplies in a group, whichever is greater, completely fails, the sign shall still be supplied with enough power to run 40 percent of all pixels at a 100 percent duty cycle with an ambient operating temperature of 165°F. The sign controller shall continuously measure and monitors all LED module power supply voltages and provides the voltage readings to the TMC central ATMS or a laptop computer on command. The LEDs shall be protected from external environmental conditions, including moisture, snow, ice, wind, dust, dirt and UV rays. Do not use epoxy to encapsulate the LEDs. Removal of one or more display modules shall not affect the structural integrity of any part of the sign.

**2.11 Characters, Fonts, and Color.** The display area shall be capable of displaying three lines of 16 characters using an 18-inch font that meets the height-to-width ratio and character spacing in the Manual on Uniform Traffic Control Devices for Streets and Highways 2009 Edition (MUTCD), Section 2L.04, Paragraphs 05, 06, and 08. The signs shall be capable of displaying American Standard Code for Information Interchange (ASCII) characters 32 through 126, including all uppercase and lowercase letters and digits 0 through 9, at any location in the message line. The sign must be loaded (as a factory default) with a font in accordance with or that resembles the standard font set described in NEMA TS 4-2016, Section 5.6. The sign shall

also be loaded (as a factory default) with a font set that resembles the Federal Highway Administration (FHWA) Series E Modified 2000 standard font. Signs shall display the colors prescribed in the MUTCD, Section 1A.12.

**2.12 Power Supply.** The sign shall meet the requirements of NEMA TS 4-2016, Section 10.2 and shall operate from a 120/240 VAC, 60Hz, single-phase power source. Locate all 120 VAC wiring in conduit, pull boxes, raceways or control cabinets as required by the National Electrical Code (NEC). No 120 VAC wiring shall be exposed inside or outside of the sign housing. Do not use the sign housing as a wiring raceway or control cabinet. Provide Type THHN/THWN-2 or XHHW-2 power cables sized as required by the NEC for acceptable voltage drops while supplying alternating current from the existing cabinet to the sign. Provide surge protective devices (SPD) installed or incorporated in the sign system by the manufacturer to guard against lightning, transient voltage surges, and induced current. The SPDs shall protect all electric power and data communication connections.

**2.13 Sign Controller.** The sign controller shall monitor the sign in accordance with NEMA TS 4-2016, Section 9. The sign shall monitor the status of any photocells, LED power supplies, humidity and airflow sensors. The sign controllers shall use fiber optic cables for data connections between the sign housing and ground-level cabinet. The sign controller within ground cabinets shall be rack-mountable, designed for a standard EIA-310 19-inch rack and include a keypad and display.

**2.14 Sign Controller Communications Interface.** The sign controller shall have communication interfaces in accordance with NEMA TS 4-2016, Section 8.3.2. The sign controller shall have a 10/100 Base TX 8P8C port and EIA-232 serial interface. The EIA-232 serial interface shall support the following:

- Data Bits 7 or 8 bits
- Parity Even, Odd, or None
- Number Stop Bits or 2 bit

Switching between Ethernet and serial operation shall not require sign controller software or hardware modifications. The TMC central ATMS or a laptop computer shall be able to remotely reset the sign controller.

**2.15 Message and Status Monitoring.** The DMS shall provide two modes of operation: (1) remote operation, where the TMC central ATMS commands and controls the sign and determines the appropriate message or test pattern; and (2) local operation, where the sign controller or a laptop computer commands and controls the sign and determines the appropriate message or test pattern. The sign shall provide for local or remote sign control to be selected. There shall be a visual indicator on the controller that identifies whether the sign is under local or remote control. The sign controller shall be able to select a blank message or any one of the messages stored in the sign controller's nonvolatile memory when the control mode is set to local. The sign controller shall activate the selected message. The sign shall be programable to display a user-defined message, including a blank page, in the event of power loss. Remotely from the TMC central ATMS or from a local laptop computer message additions, deletions and sign controller changes can be made. Each font shall be customizable, and modifications to a font may be downloaded to the sign controller from the TMC central ATMS or a local laptop computer at any time without any software or hardware modifications. No perceivable flicker or ghosting of the pixels during sign erasure and writing periods shall be visible.

**2.16 TMC Communications.** The sign controller shall be addressable by the TMC central ATMS through the Ethernet communications network using software that complies with the NTCIP 1101 base standard (formerly the NEMA TS 3.2 -1996 standard), including all amendments as published at the time of contract letting, the NTCIP Simple Transportation Management Framework, and conforms to Compliance Level 1. The sign shall comply with the NTCIP 1102v01.15, 2101 v01.19, 2103v02.07, 2201v01.15, 2202 v01.05 and 2301v02.19 standards. The sign shall also comply with NTCIP 1103v02.17, Section 3. The controller's internal time clock shall be configurable to synchronize to a time server using the network time protocol (NTP). NTP synchronization frequency must be user-configurable and permit polling intervals from once per minute to once per week in one-minute increments. The controller shall allow the user to define the NTP server by internet protocol (IP) address.

**2.17 Central Software Compatibility.** The sign controller shall be compatible with the central ATMS software protocol for sign functionality, which is compliant with NTCIP 1203 version 3.

**2.18 Sign Control Software.** Computer software from the manufacturer shall be provided that allows an operator to program, operate, exercise, diagnose and read current status of all sign features and functions using a laptop computer. The sign control software shall provide a graphical representation that visibly depicts the sign face and the current ON/OFF state of all pixels, as well as allows messages to be created and displayed on the sign. The laptop computer and sign shall be able to communicate when connected directly by an EIA-232 cable and via Ethernet. The software shall allow communication between multiple users and multiple signs across the same communication network.

**2.19** Use an AWG # 6 wire or equivalent bonding straps to bond the sign to the structure.

**2.20** The Contractor shall furnish any other miscellaneous hardware required to complete this task per manufacturer and MoDOT specifications.

#### 3.0 Construction Requirements.

**3.1** Examine DMS carefully to verify that the materials, design, construction, markings, and workmanship comply with all applicable standards, specifications and requirements.

**3.2** Remove the existing DMS from the structure and install the new DMS on the same day. The DMS shall not be removed until the contractor has the new DMS delivered and ready for installation. Transport the existing DMS to an off-site indoor facility for the salvaging of components. The contractor is responsible for any damage occurring during existing DMS removal and new DMS installation.

**3.3** The contractor shall mount the DMS to the sign structure in accordance with the manufacturer's recommendations. The manufacturer shall have an on-site representative for sign commissioning. Do not provide initial power to the sign without the permission of the manufacturer's representative.

**3.4** Use a device that measures resistance to ground using the three-point fall-of-potential method to ensure that the resistance from the sign's ground bar to ground does not exceed 10 ohms. If resistance exceeds 10 ohms check and repair grounding system to meet the requirement.

**3.5** Install new sign controller in existing cabinet. Make needed power and network connections within the cabinet.

**3.6** Install the new power conductor and fiber optic communications cables between the new roadside cabinet and the sign housing. Connect the new and existing cabling in the sign.

# 4.0 Testing.

**4.1 Site Testing.** Conduct stand-alone equipment installation tests at the field site following an engineer approved test plan. Test all stand-alone (i.e., non-network) functions of the DMS equipment using equipment installed as detailed in the plans and as approved by the engineer. Complete approved testing documentation forms and turn them over to the engineer for review and as a basis for rejection or acceptance. Provide a minimum notice of 15 calendar days prior to all tests to permit the engineer or his representative to observe each test.

**4.2 System Testing.** Conduct DMS system tests on the field equipment with the master equipment including, at a minimum, all remote-control functions. Testing shall follow an engineer approved test plan. Display the return status codes from the sign controller for a minimum of 72 hours. Demonstrate the sign's ability to display the proper predefined message or remain blank when power is restored following an AC power interruption. Complete approved testing documentation forms and turn them over to the engineer for review, and as a basis for rejection or acceptance.

**4.3 Testing Failure.** If any component fails during either site or system testing, the component shall be corrected or another component substituted in its place and the test repeated. If a component has been modified as a result of a failure, a report shall be prepared and delivered to the engineer. The report shall describe the nature of the failure and the corrective action taken. If a failure pattern develops, the engineer may direct that design and construction modifications be made to all signs without additional cost to the Department or an extension of the contract period.

**4.4 Acceptance Testing.** Conduct a 60-day acceptance test after the successful completion of the system test. During the 60-day test period, limit downtime due to mechanical, electrical, or other malfunctions to a maximum total of five calendar days. If the equipment fails to operate for a total of five or more calendar days, testing will be restarted. The engineer may select to pause and extend the 60-day test period by the number of days lost by failure and repair time in lieu of restarting the full 60-day test. The engineer will furnish the contractor with a letter of approval and completion stating the first and last day of the 60 day test period.

#### 5.0 Warranty.

**5.1** Provide a one year manufacture warranty for parts and material that begins when the project is accepted.

#### 6.0 Documentation.

**6.1 Electronic Equipment.** Provide documentation for electronic equipment. Provide operational manuals, troubleshooting and service manuals, assembly and installation instructions and warranty information. The manufacturer shall grant MoDOT a license that allows for use and internal distribution of any and all sign communications protocols, operating systems, drivers and documentation.

**6.2** As-Built Drawings. Provide drawings illustrating the equipment locations, conduit routing and display module attachment. A wiring diagram shall also be provided for the new electrical and communications wiring.

**7.0 Basis of Payment.** Measurement and payment for replacing existing DMSs with new color DMS includes all miscellaneous hardware required for a safe, fully operational color DMS along with removal, transport, testing and documentation. Payment will be made as follows:

Item No.	Туре	Description
910-99.02	Each	3-Line Roadside Dynamic Message Sign Replacement

### G. <u>DMS Training</u>

**1.0 Description.** Conduct a training course for MoDOT operations and maintenance staff on operating and maintaining the new DMS. Design the training course to ensure that MoDOT staff achieves a full knowledge and appreciation of the design, operation and maintenance of equipment. Training may consist of field device operations and maintenance training, field communications operations and maintenance training and system operations and maintenance training.

**2.0 Materials.** Provide all training documentation, and coordination with the sign vendor to provide teaching staff. Provide the training to consist of lectures and demonstrations that shall provide practical (hands-on) training and experience. Provide five hard copies of the training manual and one electronic copy of the training manual.

Provide a detailed training plan and a syllabus for the course for the approval of the engineer. Include in the information: tentative dates for course, location, and an outline of topics and names of instructors. Provide this information to the engineer at least 30 days in advance of the training course.

**3.0 Construction Requirements.** Provide up to a two-day training class to train operations and field maintenance personnel. Include in-field demonstrations.

**4.0 Basis of Payment.** Payment for work covered by this specification includes equipment and materials, necessary to prepare for and conduct the training. Payment will be made as follows:

Item No.	Туре	Description
910-99.01	Lump Sum	DMS Training

# H. <u>DMS Control Cable</u>

**1.0 Description.** Furnish and install DMS control cable that is recommended by DMS vendor.

**2.0 Materials.** Provide DMS control cable that is recommended by the DMS vendor.

**3.0 Construction Requirements.** Install and terminate the DMS control cable between the cabinet and the new DMS in a manner recommended the sign vendor.

**4.0 Basis of Payment.** Measurement and payment for work covered by this specification includes equipment, tools, and materials, necessary to furnish and install DMS Control Cable. Payment will be made as follows:

Item No.	Туре	Description
910-99.03	Linear Foot	DMS Communication Cable

#### I. <u>General Electrical Requirements</u>

**1.0 Dissimilar Metals.** To prevent galvanic corrosion, avoid connections between dissimilar metals. Where this is not practical, connections between dissimilar metals shall incorporate a means of keeping moisture out of the connection. Where the connection need not conduct electricity, interpose a non-absorbing, inert material or washer between the dissimilar metals. Use nonconductive liners and washers to insulate fasteners from dissimilar metals. Where the connection must conduct electricity, use a conductive sealant between the dissimilar metals. Alternatively, use an insulating gasket and a bond wire connecting the two metal parts.

**2.0 Wiring.** Every conductor, except a conductor contained entirely within a single piece of equipment, must terminate either in a connector or on a terminal block. Provide and install the connectors and terminal blocks where needed, without separate payment. Approved splice kits shall be used instead of connectors and terminal blocks for underground power cable splices.

**2.1** All connectors must be permanently labeled and keyed to preclude improper connection. The labeling method(s) shall be approved by the engineer prior to use.

**2.2** Terminal blocks shall be affixed to panels that permanently identify the block and which wire connects to each terminal. This may be accomplished by silk screening or by installing a laminated printed card under the terminal block, with the labels on portions of the card that extend beyond the block. Installation of terminal blocks by drilling holes in the exterior wall of the cabinet is not acceptable.

**2.3** Do not install conductors carrying AC power in the same wiring harness as conductors carrying control or communication signals.

**2.4** Arrange wiring, including jumpers, so that any removable assembly can be removed without disturbing wiring that is not associated with the assembly being removed.

**2.5** Use wire saddles to guide and protect bundles of wires, jumpers and cables. Affix the wire saddles to the wall of the cabinet or vertical member of the rack and keep power and signal cables separated.

**3.0 Labeling Cables.** Label every cable immediately upon installation. Label the cables at every point of access, including pull boxes, and termination points. Use self-laminating vinyl labels at least 1.5" wide and long enough that the translucent portion of the label completely covers the white area bearing the legend. The vinyl shall have a layer of pressure sensitive acrylic adhesive. The labels shall resist oil, water and solvents and shall be self-extinguishing. The legend shall be machine printed in letters at least 3/32" high. Consult with the engineer concerning the desired method of identifying each cable. Labeling cables is incidental to the installation of cable and will not be paid separately.

**4.0 Basis of Payment.** No direct payment will be made for any materials, equipment or labor which is performed under this provision. All costs of compliance with this provision shall be considered included in the bid unit prices of the pay items included in the contract.

# J. <u>Site Restoration</u>

**1.0 Description.** Restore to its original condition any disturbed areas at sites including, but not limited to, pull box, conduit and pole base installations. Restoration shall be accomplished by placing material equivalent to that of the adjacent undisturbed area. Disturbed unpaved areas shall be fertilized and either seeded and mulched or sodded as directed by the engineer. The engineer will have the final authority in determining the acceptability of the restoration work.

**2.0 Basis of Payment.** The cost of restoration of disturbed areas will be incidental to the unit price of pole base, conduit and/or pull box. No direct payment will be made for any materials or labor, which is performed under this provision.

# K. <u>Conduit</u>

**1.0** Furnish and install conduits as shown on the plans and as described within this section. The plans depict conduit routing in schematic form only. Determine final routing based on actual field conditions at each site, including utility locator service markings, to assure no conflicts with existing utilities.

#### 2.0 Materials.

**2.1** Use PVC conduit meeting the requirements of Sec 1060.

**2.2** Use HDPE conduit meeting the requirements of Sec 1060. Use orange conduit for communication cable and black for power cable.

**2.3** Pull ropes or tapes shall be polypropylene with a minimum tensile strength of 600 pounds.

#### **3.0** Construction Requirements.

**3.1 General.** The contractor shall comply with Sec 902.16, except as noted in this special provision.

**3.1.2** Pull ropes shall be furnished and installed in all empty conduit cells.

**3.1.3** HDPE duct shall not be spliced. All runs shall be continuous.

**3.1.4** Use an impact mole to install conduit under existing sidewalk unless otherwise indicated, or unless the crossing is part of a longer bore or unless otherwise indicated in the plans. The portion installed using a mole will be paid for at the same price per foot as trenched conduit.

# 3.2 Directional Drilling.

**3.2.1 Preliminary Site Work.** Determine all utility locations near the path of the proposed bore, including depth. Use this information to avoid damage to utilities and/or facilities within the work

area. Provide this information, including the sources, to the engineer a minimum of five working days prior to boring. Do not bore until the engineer approves that submittal. Prior to boring, expose all utilities for which it is customary and safe to do so.

**3.2.2 Boring.** The diameter of the drilled hole shall conform to the outside diameter of the conduit as closely as practical. Pressure grout as directed by the engineer, to fill any voids, which develop during the installation operation. Remove and replace any conduit damaged in directional drilling operations at no expense to the project.

**3.2.3 Drilling Fluid ("Slurry").** The use of water and other fluids in connection with the drilling operation will be permitted only to the extent necessary to lubricate cuttings. Jetting will not be permitted, and the use of water alone as a drilling fluid will not be permitted. Use a drilling fluid consisting of at least 10 percent high grade, processed Bentonite to consolidate excavated material, seal the walls of the hole, and furnish lubrication for subsequent removal of material and immediate installation of the pipe.

Provide a means of collecting and containing drilling fluid that returns to the surface, such as slurry pit, or a method approved by the engineer. Provide measures to prevent drilling fluids from entering storm sewer systems. Prevent drilling fluid from accumulating on or flowing onto sidewalks, other pedestrian walkways, driveways or streets. Immediately remove any slurry that is inadvertently deposited on pedestrian walkways. Transport waste drilling slurry from the site and dispose of it. Do not allow slurry to enter wetlands. Protect wetlands using appropriate soil erosion control measures approved by the engineer. This requirement also applies to slurry resulting from vacuum excavation to locate underground utilities.

**3.2.4 Drilling Control.** Use a digital walkover locating system to track the drill head during the bore. At minimum, the locating system shall be capable of determining the pitch, roll, heading, depth and horizontal position of the drill head at any point along the bore. During each drilling operation, locate the drill head every 10 feet along the bore and prior to crossing any underground utility or structure. Upon completion of the drilling operation and conduit installation, furnish the engineer with an as-built profile drawing and plan drawing for the drilled conduit showing the horizontal and vertical locations of the installed conduit.

# 3.3 Install Conduit into Existing Pull Box.

**3.3.1** Carefully expose the outside of the existing pull box without disturbing any existing conduits or cabling.

**3.3.2** Make the appropriate sized hole for the entering conduit at a location within the pull box that will not disturb the existing cabling and that will not hinder the installation of new cabling within the installed conduit.

**3.3.3** Install the conduit.

**3.3.4** Fill any void area between the drilled hole and the conduit with an engineer-approved filling material to protect against conduit movement and the entry of fill material.

**3.3.5** Backfill shall be carefully tamped in place. All disturbed areas shall be restored.

# 4.0 Basis of Payment.

**4.1** Conduit may be installed by directional boring at locations shown as trenched on the plans. Such conduit will be paid for as if it had been installed by trenching.

**4.2** Measurement and payment for work covered by this specification includes equipment, tools and materials, necessary to install conduit. It includes excavation and site restoration. Payment will be made as follows:

Item No.	Туре	Description
910-52.00	Linear Foot	Conduit, 2 in., Rigid, In Trench
910-99.02	Each	Install Conduit Into Existing Pull Box

#### L. <u>Cabinet Base</u>

**1.0 Description.** Provide a concrete base for an uninterruptable power supply (UPS) cabinet. See the detail in the plans.

**2.0 Basis of Payment.** Payment for Cabinet Base includes all excavation, foundation construction, ground rod, anchor bolts, materials, equipment, tools, labor and work incidental thereto. Payment will be made as follows:

Item No.	Туре	Description
910-91.00	Cu. Yd.	Base, Concrete

#### M. Pad Mounted 120/240V Uninterruptible Power Supply (UPS)

**1.0 Description.** This work shall consist of furnishing and installing 120/240 volt uninterruptible power supply (UPS).

**2.0 Materials.** An Uninterruptible Power Supply specifically constructed and NEMA approved for traffic control systems shall meet the following requirements.

**2.1 UPS Location and Cabling.** The UPS shall be installed in a standalone UPS cabinet, separate from the DMS controller cabinet, herein referred to as the DMS cabinet. In addition to the power cables from the UPS to the DMS cabinet, the contractor will route and connect an outdoor rated CAT-5 cable between the UPS RJ-45 port and the Ethernet switch in the DMS cabinet if there is an existing Ethernet switch. The CAT-5 cable will be run in a separate conduit from the power cables into the cabinet. All conduits will be internal and not visible from the exterior of either the UPS or controls cabinet.

The UPS shall transmit to the Department alarms when 1) line power is lost and equipment is operating on battery power, 2) the UPS drops below a preset voltage level (Set at 40%), and 3) the UPS is in inverter mode for 3 hours.

#### 2.2 UPS Input Specifications. Each UPS system shall have the following input requirements:

- (a) A nominal input voltage of 120 VAC.
- (b) An input voltage range of 85 to 175 VAC.
- (c) Two (2) input voltage boost modes.
- (d) Boost-1 shall increase the input voltage from 94 to 115 VAC.

- (e) Boost-2 shall increase the input voltage from 85 to 101 VAC.
- (f) Two (2) input voltages buck modes.
- (g) Buck-1 shall decrease the input voltage from 154 to 124 VAC.
- (h) Buck-2 shall decrease the input voltage from 175 to 142 VAC.

A user configurable power quality (PQ) option with default values of:

- (a) High line disqualify shall be 130 VAC.
- (b) High line qualify shall be 128 VAC.
- (c) Low line qualify shall be 105 VAC.
- (d) Low line disqualify shall be 100 VAC.

(e) Input current shall be less than 16A with nominal voltage, full load on the output and charger set at 10A.

(f) 50/60Hz automatic frequency detection with built-in class A EMI filter and transient suppression.

#### 2.3 UPS Output Specifications. Each UPS system shall have the following output requirements:

- (a) The output voltage of the UPS shall be 120 VAC ±10% in line mode.
- (b) The output voltage of the UPS shall be 120 VAC  $\pm 6\%$  in backup mode.
- (c) The output frequency of the UPS shall be  $60Hz \pm 5\%$  in line mode.
- (d) The output frequency of the UPS shall be  $60Hz \pm 5\%$  in backup mode.
- (e) The output waveform of the UPS shall be sinusoidal.

(f) The output voltage total harmonic distortion (THD) shall be less than 3% with a resistive load.

(g) The efficiency of the UPS at nominal line voltage shall be greater than 98%.

(h) The efficiency of the UPS in backup mode shall be greater than 82%.

(i) The step-load response of the UPS shall be full recovery in ½-cycle @ 50% change with a resistive load.

(j) The transfer time of the UPS line to backup and backup to line shall be 5ms typical.

(k) The line qualification time of the UPS shall be user selectable at 3, 10, 20, 30, 40 and 50 seconds.

(I) The line qualification time of the UPS default shall be three (3) seconds.

**2.4 UPS Battery and Charger Specifications.** Each UPS system shall have the following specifications for the battery and charger:

- (a) The nominal battery voltage of the UPS shall be 48 VDC.
- (b) The battery charger current of the UPS shall be user programmable for 3, 6, and 10 A.
- (c) The battery charger current default setting for the UPS shall be 6A.
- (d) The battery charger in the UPS shall turn OFF when the battery temperature is 50°C.

(e) The UPS shall have a user programmable temperature compensated battery charger with setting for -2.5, -4, -5 and -6 mV/°C/Cell.

(f) The UPS shall have a temperature compensated battery charger with a default setting of -5 mV/°C/Cell.

- (g) The UPS shall have a battery charge with a float voltage of 56VDC maximum.
- (h) The UPS shall have a user configurable low battery warning.

(i) The UPS shall have a default low battery warning set at 47VDC to indication 40% remaining battery capacity.

(j) The UPS shall have a low battery shutdown set for 42VDC (10.5VDC per battery).

# **2.5 UPS Protection Specifications.** Each UPS system shall have the following specifications for protection:

(a) The UPS shall have a 120VAC @ 20A input circuit breaker.

(b) The UPS shall have a 50A battery circuit breaker.

(c) The UPS shall have electronic short circuit protection when operating in backup mode.

(d) The UPS shall indicate an overload warning with a flashing alarm LED when the load is between 95% and 105% of the rated output for the UPS.

(e) The UPS shall shutdown in two (2) minutes when operating in backup mode when the load is between 106% and 115% of the rated output for the UPS, and the fault LED shall turn ON. The fault LED shall clear when the overload is removed and the utility line power returns.

(f) The UPS shall shutdown in one (1) minute when operating in backup mode when the load is greater than 115% and the fault LED shall turn ON. The fault LED shall clear when the overload is removed and the utility line power returns.

(g) The UPS shall disable the backup mode function when operating in line mode if the load exceeds 115% of the rated output for the UPS. The alarm shall be reset when the overload condition is removed.

(h) The UPS shall display an alarm LED if the battery ambient temperature is greater than 75°C and disable the backup mode function. The alarm shall clear when the battery ambient temperature is less than 70°C.

(i) The UPS shall display a fault LED when operating in backup mode and shutdown the inverter if the internal temperature is greater than 110°C. The fault shall clear when the utility power returns and the internal temperature is less than 90°C.

(j) The UPS shall have output over-voltage protection to electronically shutdown the UPS if the output voltage exceeds 132VAC.

(k) The UPS shall disable the battery charger in two (2) seconds and display an alarm LED if the battery voltage exceeds 59VDC. The alarm shall be cleared and charge enabled when the battery voltage drops to less than 57VDC.

(I) The UPS shall limit the charger voltage to 52VDC in the event the battery probe is not installed.

(m) The UPS shall have a battery circuit breaker with reverse polarity protection. The battery circuit breaker shall trip in the event the battery polarity is wired incorrectly.

(n) The UPS shall have protection for electrical backfeed to the utility that meets UL 1778 and CSA C22.2 No. 107.1.3 requirements.

(o) The UPS shall have user-selectable settings that are password protected.

(p) The UPS shall be cooled by a variable speed fan that is microprocessor and PWM controlled.

(q) The fan shall be OFF when the ambient temperature is less than 40°C.

(r) The UPS shall display an alarm LED to indicate the fan is enabled but not turning.

(s) The UPS shall have a fan that is field replaceable.

**2.6 UPS Displays, Controls and Diagnostics Specifications.** Each UPS system shall have the following specifications for the noted features:

(a) The UPS shall have a two (2) line/20-character LCD display and control panel that can be rotated for easy user interface.

(b) The UPS shall have event and alarm logging with time/date stamping for up to 100 historical events.

(c) The UPS shall have six (6) independently programmable control relays for control and report functions.

(d) The UPS shall have two (2) independently programmable timers 0 to 8hr with two (2) timeof-day restrictions on each timer.

(e) The UPS shall be equipped with a RS-232 port, which can be connected to a laptop.

(f) The UPS shall be equipped with a SNMP Ethernet card.

2.7 Programmable Dry Contacts. Each UPS system shall have the following requirements for

the noted features relating to dry contacts:

(a) The UPS shall have six (6) sets of normally open (NO) and normally closed (NC) single pole double-throw (SPDT) dry contact relays rated for 250VAC @1A.

(b) The UPS shall have five (5) sets of dry contact relays that are user programmable, C1 through C5, and one relay contact that is factory configured, C6.

(c) The UPS shall have dry contact relays that are user programmable via either the RS-232 or (optional) Ethernet communication ports to activate under the following conditions:

(i) ON BATTERY. The relay is energized whenever the UPS switches to battery power.

(ii) LOW BATTERY. The relay is energized when the battery has reached a user defined low battery level of remaining useful capacity. This alarm is latched when a qualified line returns or the inverter shuts down. The default setting is 47VDC (~40%) of remaining useful battery capacity.

(iii) TIMER 1. The relay is energized after being in backup mode for a given amount of time. This timer is adjustable from 0 to 8hr. The default setting is two (2) hours.

(iv) ALARM. The relay is activated after a specific or general alarm is detected. The alarm conditions include: line frequency, low output voltage, no temperature probe, overload, unconnected batteries, high temperature (>55°C) and low temperature (<-20°C).

(v) FAULT. The relay is activated after a specific or general fault is detected. These faults include: short circuit, low battery voltage (<41VDC), high battery voltage (> 59VDC), overload and over temperature (>75°C).

(vi) OFF. The relay is disabled and will not activate under any condition.

(viii) TIMER 2. Same as TIMER 1.

(ix) TIMER 3. Same as TIMER 1.

(x) AC/DC FAN CONTROL. The relay is activated when the battery ambient temperature is greater than 35°C or at a user programmable threshold from 25 to 55°C @ 5°C increments. (xi) The UPS shall have a default dry contact relay configuration of:

ON BATT
LOW BATT
LOW BATT
TIMER
ALARM
48VDC

**2.8 Mechanical.** Each UPS system shall have the following mechanical requirements:

(a) The UPS shall have AC input and AC output terminal blocks mounted on the front panel. The terminal blocks shall be Weco p/n 324-HDS/03 or equivalent.

(b) The UPS shall have six (6) user programmable dry contact relay terminal blocks on the front panel. The terminal blocks shall be JITE p/n PTB750B-03-1-03-3 or equivalent.

(c) The UPS shall have one (1) user input and one (1) Automatic Transfer Switch (ATS) terminal block on the front panel. The terminal blocks shall be JITE p/n PTB750B-03-1-03-3 or equivalent.

(d) The UPS shall have a DE-9 RS-232 connector on the front panel.

(e) The UPS shall have an RJ45 Ethernet connector on the front panel.

(f) The UPS shall have a battery connector on the front panel. The battery connector shall be an Anderson p/n SB50 or equivalent.

(g) The UPS shall have a RJ14 battery temperature probe connector on the front panel.

2.9 Environmental. Each UPS system shall have the following environmental requirements:

(a) The operating temperature range of the UPS shall be -40° to 55°C with the capability of operating @ 800W for up to 2hr at 74°C ambient.

(b) The storage temperature range of the UPS shall be -40° to 75°C.

(c) The operating and storage humidity (non-condensing) range of the UPS is up to 95% RH.(d) The altitude operating range of the UPS is up to 12,000ft with a de-rating of 2°C per 1000ft above 4500ft.

(e) The UPS shall be shipped in materials designed to meet requirements for ISTA program.

(f) The UPS shall pass electrical safety standards UL1778, CSA 22.2 No. 107.3, EN50091-1-1-2 and EN60950.

(g) The UPS shall pass emission standards FCC Subpart J Level A for conducted and radiated EMI CISPR22, EN55022 Level A for conducted and radiated EMI.

(h) The UPS shall pass Immunity standards:

EN61000-4-2: ESD (Electrostatic discharge).

EN61000-4-3: Radiated immunity.

EN61000-4-4: EFT (Electrical fast transient).

EN61000-4-5: Surge.

EN61000-4-6: Conducted (Power and signal lines).

EN61000-4-8: Power frequency magnetic.

EN61000-3-2: Harmonic distortion.

(i) The UPS shall display agency approval mark "cCSAus" on the manufacturer's nameplate label.

**2.10 Manual Bypass Switch.** Each UPS system shall include a manual bypass switch (MPS). UATS assemblies that include items referenced individually need not be duplicated. The MPS shall have the following specifications:

(a) The MPS shall be a self-contained module separate from the UPS

(b) The MPS shall be shelf or rack mountable.

(c) The MPS shall have terminal blocks labeled "AC Input", AC Output", "To UPS" and "From UPS".

(d) The MPS shall be a Break-Before-Make rotary switch.

(e) The MPS shall be rated at 120VAC @ 20A.

(f) The MPS shall have a 5-15R duplex receptacle connected to utility line.

(g) The MPS shall have a 5-15R receptacle labeled "Optional LA-P" to facilitate a plug-in surge suppressor.

(h) The MPS shall have a 5-15R receptacle labeled "Optional Battery Heater Mat" to provide non-standby power to a battery heater mat.

(i) The MPS shall have two (2) positions: one labeled "UPS" to connect the utility line to the UPS, and one labeled "Bypass" to connect the utility line to the load.

(j) The MPS shall have a 15A circuit breaker labeled "AC Input".

(k) The MPS shall have a 15A circuit breaker labeled "AC Output".

**2.11 Automatic Transfer Switch.** Each UPS system shall include an automatic transfer switch (ATS) with the following requirements:

(a) The ATS shall be rated for 120VAC @ 40A.

(b) The ATS shall be shelf or rack mountable.

(c) The ATS shall transfer the load to UPS when the utility line fails or is unqualified.

(d) The ATS shall transfer the load to utility line when the utility line is available and qualified.

(e) The ATS shall be activated by a 48VDC input from the UPS.

(f) The ATS shall have a terminal block labeled "L IN", "NEUT", "GRD" and "L OUT".

(g) The ATS shall have a six (6) foot line cord labeled "UPS IN".

(h) The ATS shall have a six (6) foot line cord labeled "UPS OUT".

(i) The ATS shall have a 5-15R duplex receptacle connected to utility line.

(j) The ATS shall have a 5-15R receptacle labeled "Optional LA-P" to facilitate a plug-in surge suppressor.

(k) The ATS shall have a 5-15R receptacle labeled "Optional Battery Heater Mat" to provide non-standby power to a battery heater mat.

**2.12 Automatic Bypass Switch.** Each UPS system shall include an automatic bypass switch (ABS) with the following requirements:

(a) The ABS shall be rated for 120VAC @ 20 amps.

(b) The ABS shall be shelf or rack mountable.

(c) The ABS shall connect the UPS to the load to allow the UPS to continuously power the load.

(d) The ABS shall transfer the load to utility line when there is no UPS output voltage.

(e) The ABS shall be activated by the 120VAC from the UPS.

(f) The ABS shall have a terminal block labeled "L IN", "NEUT", "GRD" and "L OUT".

(g) The ABS shall have a six (6) foot line cord labeled "UPS IN".

(h) The ABS shall have a six (6) foot line cord labeled "UPS OUT".

(i) The ABS shall have a 5-15R duplex receptacle connected to utility line.

(j) The ABS shall have a 5-15R receptacle labeled "Optional LA-P" to facilitate a plug-in surge suppressor.

(k) The ABS shall have a 5-15R receptacle labeled "Optional Battery Heater Mat" to provide non-standby power to a battery heater mat.

(I) The ABS dimensions shall be 4.6"H x 4.75"W x 6.5"D.

(m) The ABS weight shall be 4lbs.

**2.13 Generator Transfer Switch.** Each UPS system shall include a generator transfer switch (GTS) with the following requirements:

(a) The GTS shall sense when a portable generator is connected and transfer the load to the generator after a 30s delay.

(b) The GTS shall be rated for 120VAC @ 20A.

(c) The GTS shall be shelf or rack mountable.

(d) The GTS shall have a terminal block labeled "AC INPUT", "AC OUTPUT" and "GENERATOR INPUT".

2.14 UPS Batteries. The batteries for the UPS system shall meet the following requirements:

(a) The batteries shall be Gel Cell Valve Regulated Lead Acid (VRLA) type specifically designed for outdoor use.

(b) The batteries shall be designed for "Float Service" to provide 100% out-of-box runtime capacity.

(c) The batteries shall have Silver Alloy positive plates.

(d) The batteries shall have a five (5) year full replacement, non-prorated warranty.

(e) The battery capacity rating at 20hr shall be 56Ah.

(f) The battery shall be 12VDC.

(g) The number of batteries in the system shall be four (4) or eight (8).

(h) The batteries shall be connected to provide 48VDC.

(i) Batteries for each location shall provide full power for devices indicated on the plans that are powered through the controls cabinet for two (2) hours .

#### 2.15 Battery Heater Mat.

(a) The battery heater mats shall be available in four (4) battery and single (1) battery sizes.

(b) The single battery heater mat shall allow for a Master-Slave configuration so two (2) or more mats can be ganged together.

(c) The battery heater mats shall plug into a 120VAC/5-15 receptacle.

(d) The battery mats shall be thermally controlled, turning ON at 5°C and turning OFF at 15°C.

(e) The battery mats shall be thermally fused for 82°C to prevent thermal runaway.

**2.16 Battery Charge Management System.** Each UPS system shall have a battery charge management system with the following requirements:

(a) The battery charge management system shall spread the charge voltage equally across all batteries.

(b) The battery charge management system shall compensate for batteries with different internal resistances.

(c) The battery charge management system shall have a quality of final balance of  $\pm 100$  mV maximum between any two (2) batteries in the string.

(d) The battery charge management system shall have reversed polarity protection.

(e) The battery charge management system shall be designed to CSA C22.2 No. 107.1 and

UL 1778 Standards for safe unattended operation.

**2.17 Surge Suppression.** Each UPS system shall have the following requirements for surge suppression:

(a) The surge suppression shall provide protection from voltage transients appearing on the utility line.

(b) The surge suppression shall be a plug-in module that is field replaceable.

(c) The surge suppression shall have a LED indicator that turns OFF when the module is no longer providing protection.

(d) The surge suppression shall have a clamping voltage of 150VAC.

(e) The surge suppression shall have a response time of less than one (1) nanosecond.

**2.18 UPS Cabinet.** Each UPS system shall have the following requirements for the cabinet which houses the UPS, transfer switches, batteries, surge suppression, and additional accessories and wiring as noted.

- (a) The cabinet size and internal layout shall be as noted in the plans.
- (b) The cabinet shall be furnished with the UPS system from the same manufacturer; manufacturer shall confirm cabinet size and layout.
- (c) The cabinet shall be NEMA 3R rated, all-aluminum construction. Main body 0.125" thick 5052-H32 aluminum, with all welds internal to the cabinet.
- (d) The cabinet shall be equipped with louvered vents at the door and vent slots at the top front, with an air inlet filter installed at the door louvers. The air filter shall be re-usable and washable, 9.75"W x 8"H x 0.875" thick. The vent slots at the top of the cabinet shall be equipped with a bug screen.
- (e) The cabinet shall be furnished with a 48VDC fan, 100 CFM or better. The thermostat shall turn the fan on at 49°C (120°F) and turn the fan off at 32°C (90°F).
- (f) The cabinet door shall have a stainless steel handle, with a 3-point latch with #2 Corbin slam latch integrated with the handle. The door shall have a two position prop, with holes located at the front of the bottom pan for 90° and 150° hold open positions.
- (g) The cabinet door shall have a stainless steel piano hinge, reverse swagged, 1.5"W x 0.075" thick, with a 0.188" diameter pin and 0.5" knuckles.
- (h) The cabinet shall be equipped with a 120V, 9W internal fluorescent lamp. The lamp shall turn on upon opening the door through a door switch.

**3.0 Construction.** Construction requirements shall conform to Sec 902. Any

exceptions to these requirements will be approved by the engineer before system installation.

4.0 Method of Measurement. Method of measurement shall conform to Sec 902.

**5.0 Basis of Payment.** Payment for furnishing and installing pad mounted units shall include all excavation, materials, equipment, tools, labor, CAT-5 cable and work incidental thereto, and shall be considered to be completely covered by the contract unit price for:

Item No.	Туре	Description
910-99.02	Each	Pad Mounted 120/240V UPS
910-99.03	LF	CAT 5 Cable in Conduit

### N. <u>Power Supply Pedestal and DMS Controller Cabinet Rewiring</u>

**1.0 Description.** This work shall consist of rewiring between and within the power supply pedestal (PSP) and the dynamic message sign (DMS) controller cabinet (DCC) in order to provide 120/240V power to the DCC as well as preparing the DCC for UPS power. It shall include furnishing and installing new circuit breakers, terminals, and mounting accessories as indicated. Work required for the UPS is covered in the pay item Pad Mounted 120V/240V Uninterruptible Power Supply (UPS).

**2.0 Requirements.** The DMS being replaced at all locations shall include rewiring of the existing PSP and DCC.

**2.1 Power Supply Pedestal.** The PSP is an existing, outdoor cabinet with 120/240V three-wire service supplied from the local utility. It is equipped with a 100A/2P main breaker and a 40A/2P breaker that feeds the DCC. The existing feeder from the 40A/2P breaker to the DCC is a 120V two-wire circuit with equipment grounding conductor (2W+G), with varying conductor sizes to accommodate voltage drop.

This work shall include adding a third wire to the existing feeder in order to provide three-wire with ground (3W+G), 120/240V power to the DCC. The third wire shall connect to the unused pole of the existing 40A/2P breaker and shall extend to the DCC.

Due to voltage drop issues with the existing wire size, some sites shall require the removal of the entire 2W+G feeder feeding the DCC and replacement with a new, larger-gauge 3W+G feeder.

Included in this work shall be the replacement of terminal blocks, as needed, within the PSP due to increased wire size.

Refer to the site-specific layout plans for wiring requirements between the PSP and the DCC, including wire size, addition of a third wire vs. replacement of the entire circuit, and circuit lengths.

**2.2 DMS Controller Cabinet.** The DCC is an existing, outdoor cabinet with 120V 2W+G power fed from the PSP. It houses network gear equipment and the DMS controller. It also contains a service receptacle, internal lighting, surge suppression equipment, and is equipped with an internal fan and heater. The fan and heater are each individually controlled by a thermostat.

This work shall include rewiring of the DCC to accommodate the new 120/240V 3W+G circuit from the PSP. A new 40A/2P breaker shall be provided within the DCC to distribute power to two terminal blocks within the DCC; one terminal block per phase. New terminal blocks shall be installed for neutral and ground terminations. The ground terminal block shall be reconnected to the existing grounding electrode conductor. The neutral terminal block shall be bonded as necessary.

New breakers shall be provided to feed internal and external loads. Breakers configuration and size shall be as shown in the wiring diagram. Breakers shall be din-rail mounted.

The existing surge suppression device shall be replaced with an equivalent module suitable for protecting a 120/240V 3W+G circuit.

The existing service receptacle shall be reinstalled and reconnected as shown in the wiring diagram. The existing fan, heater, and lighting, inclusive of thermostats and switches, shall remain in place and be reconnected to the new terminal blocks as shown in the wiring diagram.

Included in this work shall be an outgoing 120V 2W+G circuit to feed the new UPS module, as well as an incoming 120V 2W UPS-backed circuit, and wiring of UPS-backed loads in the DCC. The 2W+G circuit shall be routed from the breaker within the DCC to the UPS cabinet. The 2W UPS-backed circuit shall return to the DCC and land on dedicated terminal blocks for UPS loads. UPS-backed loads shall be installed and connected as shown in the wiring diagram.

**2.3 Construction Requirements.** Construction requirements shall conform to Sec 902. Any exceptions to these requirements will be approved by the engineer before system installation.

3.0 Method of Measurement. Method of measurement shall conform to Sec 902.

**4.0 Basis of Payment.** Payment for rewiring shall include all excavation, materials, equipment, tools, labor, and work incidental thereto, and shall be considered to be completely covered by the contract unit price for:

Item No.	Туре	Description
910-99.02	Each	Power Supply Pedestal and DMS Controller Cabinet
		Rewiring

#### O. <u>Utilities</u> JSP-93-26F

**1.0** The existence and approximate location of utility facilities known to exist, as shown on the plans, are based upon the best information available to the Commission at this time. This information is provided by the Commission "as-is" and the Commission expressly disclaims any representation or warranty as to the completeness, accuracy, or suitability of the information for any use. Reliance upon this information is done at the risk and peril of the user, and the Commission shall not be liable for any damages that may arise from any error in the information. It is, therefore, the responsibility of the contractor to verify the below listing information indicating existence, location and status of any facility. Such verification includes direct contact with the listed utilities.

<u>Utility Name</u>	<u>Known</u> <u>Required</u> <u>Adjustment</u>	<u>Түре</u>
ATT Distribution	None	Communications
Saint Joseph, MO 64501		
(314) 275-0020		

MoDOT Northwest District 3602 N Belt Hwy	None	Communications/Power
Saint Joseph, MO 64506		
Phone: (888) 275-6636		
Evergy	None	Power
613 Atchison Street		
Saint Joseph, MO 64501		
Phone: (816) 471-5275		
Lumen	None	Communications
100 CenturyLink Drive		
Monroe, LA 71203		
(877) 366-8344		

**2.0** The contractor shall be aware the listed utilities listed above is the best information available at the time; however, the extent of conflicts with utilities are unknown.

**2.1** There may be underground utilities that run parallel or cross the route that are in close proximity to the proposed work locations. The contractor shall take necessary precautions and measures to verify locations and depths of utilities by any necessary means to determine exact impacts to their work.

**2.2** If utility facilities are found and discovered, the engineer will determine whether relocation of the utility is necessary to accommodate construction or if the work can be installed in accordance with Missouri Standard Plans for Highway Construction for the item of work specified.

**3.0 Basis of Payment.** There is no direct pay for complying with this provision.

### P. Location Adjustment for Utilities

**1.0 Description.** The Contractor shall be aware there are numerous utilities present along the route in this contract. The exact utility locations were not surveyed during the design phase of the project. Therefore, the extent of conflicts with utilities, including MoDOT Facilities, are unknown.

**2.0 Construction Requirements.** Prior to any in-ground work, the Contractor shall request for utility locates by contacting Missouri One Call (1-800 DIG-RITE or mo1call.com) for any in-ground installation locations as per plans. The contractor may, at the discretion of the engineer, adjust the placement of the in-ground installation to avoid existing utilities.

**2.1** If there are any conflicts with MoDOT ITS In-Ground Facilities, the Contractor shall field-verify those locations with the MoDOT Construction Inspector and shall be responsible for relocation to the satisfaction of the Engineer prior to any in-ground work.

**2.2** Damage to any MoDOT facilities within the area of work caused by the contractor will be performed as follows:

a) Non-Emergency: Contractor will have 4 hours to propose a repair plan to the Engineer for a complete repair within 3 business days.

**2.3** The contractor shall restore those areas disturbed by this work or installation according to specifications herein.

**3.0 Basis of Payment.** There shall be no direct pay for compliance with this provision

# Q. <u>Coordination with ITS Staff and Utility Locates</u>

**1.0 Description.** Any work that will impact the existing communications network must be coordinated with the SCOUT's Kansas City District ITS staff. This includes but not limited to removal and replacement of any existing communications equipment, adding new devices and changes to power sources or disconnects. Minor modifications to the existing communications network can have significant impacts on the system and operation of other ITS and traffic signal systems.

**1.1** MoDOT is a member of MO-One-Call System. Prior to any excavation or work within MoDOT Right-Of-way, the contractor must contact MO-One Call at 1-800-DIG-RITE and request for Utility Locates within noted project limits. If the scope of work contains modification, addition and/or expansion of existing underground MoDOT ITS, lighting, or signal facilities, the contractor must notify the MoDOT Utilities Locate staff prior to any work, in order for MoDOT to update MoDOT utility location records with Missouri One Call.

**2.0 Contact.** Initial contact must be made at least seven calendar days before work that may impact the existing communications network commences. Please contact Karsten Sommerhauser (816-607-2243) or Kelly Alvarez (816-282-4385).

**4.0 Basis of Payment.** No direct payment shall be made for compliance with this provision.

# R. <u>Contractor Quality Control</u> NJSP-15-42

**1.0** The contractor shall perform Quality Control (QC) testing in accordance with the specifications and as specified herein. The contractor shall submit a Quality Control Plan (QC Plan) to the engineer for approval that includes all items listed in Section 2.0, prior to beginning work.

# 2.0 Quality Control Plan.

- (a) The name and contact information of the person in responsible charge of the QC testing.
- (b) A list of the QC technicians who will perform testing on the project, including the fields in which they are certified to perform testing.
- (c) A proposed independent third party testing firm for dispute resolution, including all contact information.
- (d) A list of Hold Points, when specified by the engineer.
- (e) The MoDOT Standard Inspection and Testing Plan (ITP). This shall be the version that is posted at the time of bid on the MoDOT website (<u>www.modot.org/quality</u>).

**3.0 Quality Control Testing and Reporting.** Testing shall be performed per the test method and frequency specified in the ITP. All personnel who perform sampling or testing shall be certified in the MoDOT Technician Certification Program for each test that they perform.

**3.1 Reporting of Test Results.** All QC test reports shall be submitted as soon as practical, but no later than the day following the test. Test data shall be immediately provided to the engineer upon request at any time, including prior to the submission of the test report. No payment will be made for the work performed until acceptable QC test results have been received by the engineer and confirmed by QA test results.

**3.1.1** Test results shall be reported on electronic forms provided by MoDOT. Forms and Contractor Reporting Excel2Oracle Reports (CRE2O) can be found on the MoDOT website. All required forms, reports and material certifications shall be uploaded to a Microsoft SharePoint® site provided by MoDOT, and organized in the file structure established by MoDOT.

**3.2 Non-Conformance Reporting.** A Non-Conformance Report (NCR) shall be submitted by the contractor when the contractor proposes to incorporate material into the work that does not meet the testing requirements or for any work that does not comply with the contract terms or specifications.

**3.2.1** Non-Conformance Reporting shall be submitted electronically on the Non-Conformance Report form provided on the MoDOT Website. The NCR shall be uploaded to the MoDOT SharePoint® site and an email notification sent to the engineer.

**3.2.2** The contractor shall propose a resolution to the non-conforming material or work. Acceptance of a resolution by the engineer is required before closure of the non-conformance report.

# 4.0 Work Planning and Scheduling.

**4.1 Two-week Schedule.** Each week, the contractor shall submit to the engineer a schedule that outlines the planned project activities for the following two-week period. The two-week schedule shall detail all work and traffic control events planned for that period and any Hold Points specified by the engineer.

**4.2 Weekly Meeting.** When work is active, the contractor shall hold a weekly project meeting with the engineer to review the planned activities for the following week and to resolve any outstanding issues. Attendees shall include the engineer, the contractor superintendent or project manager and any foreman leading major activities. This meeting may be waived when, in the opinion of the engineer, a meeting is not necessary. Attendees may join the meeting in person, by phone or video conference.

**4.3 Pre-Activity Meeting.** A pre-activity meeting is required in advance of the start of each new activity, except when waived by the engineer. The purpose of this meeting is to review construction details of the new activity. At a minimum, the discussion topics shall include: safety precautions, QC testing, traffic impacts, and any required Hold Points. Attendees shall include the engineer, the contractor superintendent and the foreman who will be leading the new activity. Pre-activity meetings may be held in conjunction with the weekly project meeting.

**4.4 Hold Points.** Hold Points are events that require approval by the engineer prior to continuation of work. Hold Points occur at definable stages of work when, in the opinion of the engineer, a review of the preceding work is necessary before continuation to the next stage.

**4.4.1** A list of typical Hold Point events is available on the MoDOT website. Use of the Hold Point process will only be required for the project-specific list of Hold Points, if any, that the engineer

submits to the contractor in advance of the work. The engineer may make changes to the Hold Point list at any time.

**4.4.2** Prior to all Hold Point inspections, the contractor shall verify the work has been completed in accordance with the contract and specifications. If the engineer identifies any corrective actions needed during a Hold Point inspection, the corrections shall be completed prior to continuing work. The engineer may require a new Hold Point to be scheduled if the corrections require a follow-up inspection. Re-scheduling of Hold Points require a minimum 24-hour advance notification from the contractor unless otherwise allowed by the engineer.

**5.0 Quality Assurance Testing and Inspection.** MoDOT will perform quality assurance testing and inspection of the work, except as specified herein. The contractor shall utilize the inspection checklists provided in the ITP as a guide to minimize findings by MoDOT inspection staff. Submittal of completed checklists is not required, except as specified in 5.1.

**5.1** Inspection and testing required in the production of concrete for the project shall be the responsibility of the contractor. Submittal of the 501 Concrete Plant Checklist is required.

6.0 Basis of Payment. No direct payment will be made for compliance with this provision.

# S. <u>Lump Sum Temporary Traffic Control</u> JSP-22-01

### 1.0 Delete Sec 616.11 and insert the following:

**616.11 Method of Measurement.** Measurement for relocation of post-mounted signs will be made to the nearest square foot of sign area only for the signs designated for payment on the plans. All other sign relocations shall be incidental. Measurement for construction signs will be made to the nearest square foot of sign area. Measurement will be made per each for each of the temporary traffic control items provided in the contract.

**616.11.1 Lump Sum Temporary Traffic Control.** No measurement will be made for temporary traffic control items grouped and designated to be paid per lump sum. The list of lump sum items provided in the plans or contract is considered an approximation and may be subject to change based on field conditions. This is not a complete list and may exclude quantities for duplicate work zone packages used in simultaneous operations. The contractor shall provide all traffic control devices required to execute the provided traffic control plans for each applicable operation, stage, or phase. No measurement will be made for any additional signs or devices needed except for changes in the traffic control plan directed by the engineer.

# 2.0 Delete Sec 616.12 and insert the following:

**616.12 Basis of Payment.** All temporary traffic control devices authorized for installation by the engineer will be paid for at the contract unit price for each of the pay items included in the contract. Whether the devices are paid individually, or per lump sum, no direct payment will be made for the following:

(a) Incidental items necessary to complete the work, unless specifically provided as a pay item in the contract.

(b) Installing, operating, maintaining, cleaning, repairing, removing, or replacing traffic control devices.

(c) Covering and uncovering existing signs and other traffic control devices.

(d) Relocating temporary traffic control devices, including permanent traffic control devices temporarily relocated, unless specifically included as a pay item in the contract.

(e) Worker apparel.

(f) Flaggers, AFADs, PFDs, pilot vehicles, and appurtenances at flagging stations.

(g) Furnishing, installing, operating, maintaining, and removing construction-related vehicle and equipment lighting.

(h) Construction and removal of temporary equipment crossovers, including restoring preexisting crossovers.

(i) Provide and maintaining work zone lighting and work area lighting.

**616.12.1 Lump Sum Temporary Traffic Control.** Traffic control items grouped together in the contract or plans for lump sum payment shall be paid incrementally per Sec 616.12.1.1. Alternately, upon request from the contractor, the engineer will consider a modified payment schedule that more accurately reflects completion of traffic control work. No payment will be made for any additional signs or devices needed except for changes in the traffic control plan directed by the engineer. Additional items directed by the engineer will be paid for in accordance with Sec 109.4. No adjustment to the price will be made for overruns or underruns of other work or for added work that is completed within existing work zones.

**616.12.1.1 Partial payments**. For purposes of determining partial payments, the original contract amount will be the total dollar value of all original contract line items less the price for Lump Sum Temporary Traffic Control (LSTTC). If the contract includes multiple projects, this determination will be made for each project. Partial payments will be made as follows:

(a) The first payment will be made when five percent of the original contract amount is earned. The payment will be 50 percent of the price for LSTTC, or five percent of the original contract amount, whichever is less.

(b) The second payment will be made when 50 percent of the original contract amount is earned. The payment will be 25 percent of the price for LSTTC, or 2.5 percent of the original contract amount, whichever is less.

(c) The third payment will be made when 75 percent of the original contract amount is earned. The payment will be 20 percent of the price for LSTTC, or two percent of the original contract amount, whichever is less.

(d) Payment for the remaining balance due for LSTTC will be made when the contract has been accepted for maintenance or earlier as approved by the engineer.

**616.12.1.2** Temporary traffic control will be paid for at the contract lump sum price for Item:

Item No.	Unit	Description
616-99.01	Lump Sum	Misc. Lump Sum Temporary Traffic Control

- T. <u>Supplemental Revisions</u> JSP-18-01FF
- Compliance with 2 CFR 200.216 Prohibition on Certain Telecommunications and Video Surveillance Services or Equipment.

The Missouri Highways and Transportation Commission shall not enter into a contract (or extend or renew a contract) using federal funds to procure or obtain equipment, services, or systems that uses covered telecommunications equipment or services as substantial or as critical technology as part of any system where the video surveillance and telecommunications equipment was produced by Huawei Technologies Company, ZTE Corporation, Hytera Communications Corporation, Hangzhou Hikvision Digital Technology Company, or Dahua Technology Company (or any subsidiary or affiliate of such entities).

• Stormwater Compliance Requirements

**1.0 Description.** This provision requires the contractor to provide a Water Pollution Control Manager (WPCM) for any project that includes land disturbance on the project site and the total area of land disturbance, both on the project site, and all Off-site support areas, is one (1) acre or more. Regardless of the area of Off-site disturbance, if no land disturbance occurs on the project site, these provisions do not apply. When a WPCM is required, all sections within this provision shall be applicable, including assessment of specified Liquidated Damages for failure to correct Stormwater Deficiencies, as specified herein. This provision is in addition to any other stormwater, environmental, and land disturbance requirements specified elsewhere in the contract.

**1.1 Definitions.** The project site is defined as all areas designated on the plans, including temporary and permanent easements. The project site is equivalent to the "permitted site", as defined in MoDOT's State Operating Permit. An Off-site area is defined as any location off the project site the contractor utilizes for a dedicated project support function, such as, but not limited to, staging area, plant site, borrow area, or waste area.

**1.2 Reporting of Off-Site Land Disturbance.** If the project includes any planned land disturbance on the project site, prior to the start of work, the contractor shall submit a written report to the engineer that discloses all Off-site support areas where land disturbance is planned, the total acreage of anticipated land disturbance on those sites, and the land disturbance permit number(s). Upon request by the engineer, the contractor shall submit a copy of its land disturbance permit(s) for Off-site locations. Based on the total acreage of land disturbance, both on and Off-site, the engineer shall determine if these Stormwater Compliance Requirements shall apply. The Contractor shall immediately report any changes to the planned area of Off-site land disturbance permit for Off-site areas.

**2.0 Water Pollution Control Manager (WPCM).** The Contractor shall designate a competent person to serve as the Water Pollution Control Manager (WPCM) for projects meeting the description in Section 1.0. The Contractor shall ensure the WPCM completes all duties listed in Section 2.1.

### 2.1 Duties of the WPCM:

- (a) Be familiar with the stormwater requirements including the current MoDOT State Operating Permit for construction stormwater discharges/land disturbance activities; MoDOT's statewide Stormwater Pollution Prevention Plan (SWPPP); the Corps of Engineers Section 404 Permit, when applicable; the project specific SWPPP, the Project's Erosion & Sediment Control Plan; all applicable special provisions, specifications, and standard drawings; and this provision;
- (b) Successfully complete the MoDOT Stormwater Training Course within the last 4 years. The MoDOT Stormwater Training is a free online course available at MoDOT.org;
- (c) Attend the Pre-Activity Meeting for Grading and Land Disturbance and all subsequent Weekly Meetings in which grading activities are discussed;
- (d) Oversee and ensure all work is performed in accordance with the Project-specific SWPPP and all updates thereto, or as designated by the engineer;
- (e) Review the project site for compliance with the Project SWPPP, as needed, from the start of any grading operations until final stabilization is achieved, and take necessary actions to correct any known deficiencies to prevent pollution of the waters of the state or adjacent property owners prior to the engineer's weekly inspections;
- (f) Review and acknowledge receipt of each MoDOT Inspection Report (Land Disturbance Inspection Record) for the Project within forty eight (48) hours of receiving the report and ensure that all Stormwater Deficiencies noted on the report are corrected as soon as possible, but no later than stated in Section 5.0.

**3.0 Pre-Activity Meeting for Grading/Land Disturbance and Required Hold Point.** A Pre-Activity meeting for grading/land disturbance shall be held prior to the start of any land disturbance operations. No land disturbance operations shall commence prior to the Pre-Activity meeting except work necessary to install perimeter controls and entrances. Discussion items at the preactivity meeting shall include a review of the Project SWPPP, the planned order of grading operations, proposed areas of initial disturbance, identification of all necessary BMPs that shall be installed prior to commencement of grading operations, and any issues relating to compliance with the Stormwater requirements that could arise in the course of construction activity at the project.

**3.1 Hold Point.** Following the pre-activity meeting for grading/land disturbance and subsequent installation of the initial BMPs identified at the pre-activity meeting, a Hold Point shall occur prior to the start of any land disturbance operations to allow the engineer and WPCM the time needed to perform an on-site review of the installation of the BMPs to ensure compliance with the SWPPP is met. Land disturbance operations shall not begin until authorization is given by the engineer.

**4.0 Inspection Reports.** Weekly and post run-off inspections will be performed by the engineer and each Inspection Report (Land Disturbance Inspection Record) will be entered into a web-based Stormwater Compliance database. The WPCM will be granted access to this database and shall promptly review all reports, including any noted deficiencies, and shall acknowledge receipt of the report as required in Section 2.1 (f.).

**5.0 Stormwater Deficiency Corrections.** All stormwater deficiencies identified in the Inspection Report shall be corrected by the contractor within 7 days of the inspection date or any extended period granted by the engineer when weather or field conditions prohibit the corrective work. If the contractor does not initiate corrective measures within 5 calendar days of the inspection date or any extended period granted by the engineer, all work shall cease on the project except for work to correct these deficiencies, unless otherwise allowed by the engineer. All impact costs related to this halting of work, including, but not limited to stand-by time for equipment, shall be borne by the Contractor. Work shall not resume until the engineer approves the corrective work.

**5.1 Liquidated Damages.** If the Contractor fails to complete the correction of all Stormwater Deficiencies listed on the MoDOT Inspection Report within the specified time limit, the Commission will be damaged in various ways, including but not limited to, potential liability, required mitigation, environmental clean-up, fines, and penalties. These damages are not reasonably capable of being computed or quantified. Therefore, the contractor will be charged with liquidated damages specified in the amount of \$2,000 per day for failure to correct one or more of the Stormwater Deficiencies listed on the Inspection Report within the specified time limit. In addition to the stipulated damages, the stoppage of work shall remain in effect until all corrections are complete.

6.0 Basis of Payment. No direct payment will be made for compliance with this provision.

• Delete Sec 106.9 in its entirety and substitute the following:

# 106.9 Buy America Requirements.

Buy America Requirements are waived if the total amount of Federal financial assistance applied to the project, through awards or subawards, is below \$500,000.

# 106.9.1 Buy America Requirements for Iron and Steel.

On all federal-aid projects, the contractor's attention is directed to Title 23 CFR 635.410 *Buy America Requirements*. Where steel or iron products are to be permanently incorporated into the contract work, steel and iron material shall be manufactured, from the initial melting stage through the application of coatings, in the USA except for "minimal use" as described herein. Furthermore, any coating process of the steel or iron shall be performed in the USA. Under a general waiver from FHWA the use of pig iron and processed, pelletized, and reduced iron ore manufactured outside of the USA will be permitted in the domestic manufacturing process for steel or iron material.

# 106.9.1.1 Buy America Requirements for Iron and Steel for Manufactured items.

A manufactured item will be considered iron and steel if it is "predominantly" iron or steel. Predominantly iron or steel means that the cost of iron or steel content of a product is more than 50 percent of the total cost of all its components.

**106.9.2** Any sources other than the USA as defined will be considered foreign. The required domestic manufacturing process shall include formation of ingots and any subsequent process. Coatings shall include any surface finish that protects or adds value to the product.

**106.9.3** "Minimal use" of foreign steel, iron or coating processes will be permitted, provided the cost of such products does not exceed 1/10 of one percent (0.1 percent) of the total contract cost or \$2,500.00, whichever is greater. If foreign steel, iron, or coating processes are used, invoices

to document the cost of the foreign portion, as delivered to the project, shall be provided and the engineer's written approval obtained prior to placing the material in any work.

**106.9.4** Buy America requirements include a step certification for all fabrication processes of all steel or iron materials that are accepted per Sec 1000. The AASHTO Product Evaluation and Audit Solutions compliance program verifies that all steel and iron products fabrication processes conform to 23 CFR 635.410 Buy America Requirements and is an acceptable standard per 23 CFR 635.410(d). AASHTO Product Evaluation and Audit Solutions compliant suppliers will not be required to submit step certification documentation with the shipment for some selected steel and iron materials. The AASHTO Product Evaluation and Audit Solutions compliant supplier shall maintain the step certification documentation on file and shall provide this documentation to the engineer upon request.

**106.9.4.1** Items designated as Category 1 will consist of steel girders, piling, and reinforcing steel installed on site. Category 1 items require supporting documentation prior to incorporation into the project showing all steps of manufacturing, including coating, as being completed in the United States and in accordance with CFR Title 23 Section 635.410 Buy America Requirements. This includes the Mill Test Report from the original producing steel mill and certifications documenting the manufacturing process for all subsequent fabrication, including coatings. The certification shall include language that certifies the following. That all steel and iron materials permanently incorporated in this project was procured and processed domestically and all manufacturing processes, including coating, as being completed in the United States and in accordance with CFR Title 23 Section 635.410.

**106.9.4.2** Items designated as Category 2 will include all other steel or iron products not in Category 1 and permanently incorporated in the project. Category 2 items shall consist of, but not be limited to items such as fencing, guardrail, signing, lighting and signal supports. The prime contractor is required to submit a material of origin form certification prior to incorporation into the project from the fabricator for each item that the product is domestic. The Certificate of Materials Origin form (<u>link to certificate form</u>) from the fabricator must show all steps of manufacturing, including coating, as being completed in the United States and in accordance with CFR Title 23 Section 635.410 Buy America Requirements and be signed by a fabricator representative. The engineer reserves the right to request additional information and documentation to verify that all Buy America requirements have been satisfied. These documents shall be submitted upon request by the engineer and retained for a period of 3 years after the last reimbursement of the material.

**106.9.4.3** Any minor miscellaneous steel or iron items that are not included in the materials specifications shall be certified by the prime contractor as being procured domestically. Examples of these items would be bolts for sign posts, anchorage inserts, etc. The certification shall read "I certify that all steel and iron materials permanently incorporated in this project during all manufacturing processes, including coating, as being completed in the United States and in accordance with CFR Title 23 Section 635.410 Buy America Requirements procured and processed domestically in accordance with CFR Title 23 Section 635.410 Buy America Requirements. Any foreign steel used was submitted and accepted under minor usage". The certification shall be signed by an authorized representative of the prime contractor.

**106.9.5** When permitted in the contract, alternate bids may be submitted for foreign steel and iron products. The award of the contract when alternate bids are permitted will be based on the lowest total bid of the contract based on furnishing domestic steel or iron products or 125 percent of the lowest total bid based on furnishing foreign steel or iron products. If foreign steel or iron

products are awarded in the contract, domestic steel or iron products may be used; however, payment will be at the contract unit price for foreign steel or iron products.

**106.9.6 Buy America Requirements for Construction Materials other than iron and steel materials.** Construction materials means articles, materials, or supplies that consist of only one of the items listed. Minor additions of articles, materials, supplies, or binding agents to a construction material do not change the categorization of the construction material. Upon request by the engineer, the contractor shall submit a domestic certification for all construction materials listed that are incorporated into the project.

- (a) Non-ferrous metals
- (b) Plastic and Polymer-based products (including polyvinylchloride, composite building materials, and polymers used in fiber optic cables)
- (c) Glass (including optic glass)
- (d) Fiber optic cable (including drop cable)
- (e) Optical fiber
- (f) Lumber
- (g) Engineered wood
- (h) Drywall

#### 106.9.6.1 Minimal Use allowance for Construction Materials other than iron or steel.

"The total value of the non-compliant products is no more than the lesser of \$1,000,000 or 5% of total applicable costs for the project." The contractor shall submit to the engineer any non-domestic materials and their total material cost to the engineer. The contractor and the engineer will both track these totals to assure that the minimal usage allowance is not exceeded.

#### 106.9.7 Buy America Requirements for Manufactured Products.

Manufactured products means:

- (a) Articles, materials, or supplies that have been:
  - (i) Processed into a specific form and shape; or
  - (ii) Combined with other articles, materials, or supplies to create a product with different properties than the individual articles, materials, or supplies.
- (b) If an item is classified as an iron or steel product, a construction material, or a section 70917(c) material under § 184.4(e) and the definitions set forth in this section, then it is not a manufactured product. However, an article, material, or supply classified as a manufactured product under § 184.4(e) and paragraph (1) of this definition may include components that are construction materials, iron or steel products, or section 70917(c) materials.

**106.9.7.1** Manufactured products are exempt from Buy America requirements. To qualify as a manufactured product, items that consist of two or more of the listed construction materials that have been combined together through a manufacturing process, and items that include at least one of the listed materials combined with a material that is not listed through a manufacturing process, should be treated as manufactured products, rather than as construction materials.

**106.9.7.2** Manufactured items are covered under a general waiver to exclude them from Buy America Requirements. To qualify for the exemption the components must comprise of 55% of the value of materials in the item. The final assembly must also be performed domestically.

• Pavement Marking Paint Requirements for Standard Waterborne and Temporary

**1.0 Description.** High Build acrylic waterborne pavement marking paint shall be used in lieu of standard acrylic waterborne pavement marking paint for all Standard Waterborne Pavement Marking Paint items and all Temporary Pavement Marking Paint items. Paint thickness, bead type, bead application rate, retroreflectivity requirements, and all other specifications shall remain as stated in the Missouri Standard Specifications for Highway Construction, except as otherwise amended in the contract documents.

**2.0 Material Requirements.** Material requirements for Sec 620.20.2.5 Standard Waterborne Paint, and Sec 620.10.2 Temporary Pavement Marking Paint shall be per Sec 1048.20.1.2 High Build Acrylic Waterborne Pavement Marking Paint.

• Third-Party Test Waiver for Concrete Aggregate

**1.0 Description.** Third party tests may be allowed for determining the durability factor for concrete pavement and concrete masonry aggregate.

**2.0 Material.** All aggregate for concrete shall be in accordance with Sec 1005.

**2.1** MoDOT personnel shall be present at the time of sampling at the quarry. The aggregate sample shall be placed in an approved tamper-evident container (provided by the quarry) for shipment to the third-party testing facility.

**2.2** AASHTO T 161 Method B Resistance of Concrete to Rapid Freezing and Thawing, shall be used to determine the aggregate durability factor. All concrete beams for testing shall be 3-inch wide by 4-inch deep by 16-inch long or 3.5-inch wide by 4.5-inch deep by 16-inch long. All beams for testing shall receive a 35-day wet cure fully immersed in saturated lime water prior to initiating the testing process.

**2.3** Concrete test beams shall be made using a MoDOT approved concrete pavement mix design.

**3.0 Testing Facility Requirements.** All third-party test facilities shall meet the requirements outlined in this provision.

**3.1** The testing facility shall be AASHTO accredited.

**3.1.1** For tests ran after January 1, 2025, accreditation documentation shall be on file with the Construction and Materials Division prior to any tests being performed.

**3.1.2** Construction and Materials Division may consider tests completed prior to January 1, 2025, to be acceptable if all sections of this provision are met, with the exception of 3.1.1. Accreditation documentation shall be provided with the test results for tests completed prior to January 1, 2025. No tests completed prior to September 1, 2024, will be accepted.

**3.2** The testing facility shall provide their testing process, list of equipment, equipment calibration documentation, and testing certifications or qualifications of technicians performing the AASHTO T 161 Procedure B tests. The testing facility shall provide details on their freezing and thawing apparatus including the time and temperature profile of their freeze-thaw chamber. The profile shall include the temperature set points throughout the entirety of the freeze-thaw cycle. The

profile shall show the cycle time at which the apparatus drains/fills with water and the cycle time at which the apparatus begins cooling the specimens.

**3.3** Results, no more than five years old, from the third-party test facility shall compare within  $\pm 2.0$  percent of an independent test from another AASHTO accredited test facility or with MoDOT test records, in order to be approved for use (e.g. test facility results in a durability factor of 79, MoDOT's recent durability test factor is 81; this compared within +2 percent). The independent testing facility shall be in accordance with this provision. The comparison test can be from a different sample of the same ledge combination.

**3.4** When there is a dispute between the third party durability test results and MoDOT durability test results, the MoDOT durability test result shall govern.

**3.5** Test results shall be submitted to MoDOT's Construction and Materials division electronically for final approval. Test results shall include raw data for all measurements of relative modulus of elasticity and percent length change for each individual concrete specimen. Raw data shall include initial measurements made at zero cycles and every subsequent measurement of concrete specimens. Raw data shall include the cycle count and date each measurement was taken. Test results shall also include properties of the concrete mixture as required by AASHTO T 161. This shall include the gradation of the coarse aggregate sample. If AASHTO T 152 is used to measure fresh air content, then the aggregate correction factor for the mix determined in accordance with AASHTO T 152 shall also be included.

**4.0 Method of Measurement.** There is no method of measurement for this provision. The testing requirements and number of specimens shall be in accordance with AASHTO T 161 Procedure B.

**5.0 Basis of Payment.** No direct payment will be made to the contractor or quarry to recover the cost of aggregate samples, sample shipments, testing equipment, labor to prepare samples or test samples, or developing the durability report.

# • Delete paragraph 15.0 of the General Provision Disadvantaged Business Enterprise (DBE) Program Requirements and substitute the following:

**15.0 Bidder's List Quote Summary.** MoDOT is a recipient of federal funds and is required by 49 CFR 26.11 to provide data about its DBE program. All bidders who seek to work on federally assisted contracts must submit data about all DBE and non-DBEs in accordance with Sec 102.7.9. MoDOT will not compare the submitted Bidder's List Quote Summary to any other documents or submittals, pre or post award. All information will be used by MoDOT in accordance with 49 CFR 26.11 for reporting to USDOT and to aid in overall DBE goal setting.

# • Add Sec 102.7.9 to include the following:

**102.7.9 Bidder's List Quote Summary.** Each bidder shall submit with each bid a summary of all subcontractors, suppliers, manufacturers, and truckers considered on federally funded projects pursuant to 49 CFR 26.11. The bidder will provide the firm's name, the corresponding North American Industry Classification System (NAICS) code(s) the firm(s) were considered for, and whether or not they were used in the bid. The information submitted should be the most complete information available at the time of bid. The information shall

be disclosed on the Bidder's List Quote Summary form provided in the bidding documents and submitted in accordance with Sec 102.10. Failure to disclose this information may result in a bid being declared irregular.