

**JOB SPECIAL PROVISIONS TABLE OF CONTENTS (ROADWAY)**

(Job Special Provisions shall prevail over General Special Provisions whenever in conflict therewith.)


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Job No.: J6S3640

Route: 61/67

County: Jefferson

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 04/02/2024 3:23:29 PM SHIRLEY J. NORRIS - CIVIL MO-PE-28779	<b>MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION</b> 105 W. CAPITOL AVE. JEFFERSON CITY, MO 65102 Phone 1-888-275-6636
	If a seal is present on this sheet, JSP's have been electronically sealed and dated.
	JOB NUMBER: J6S3640 JEFFERSON COUNTY, MO DATE PREPARED:
	ADDENDUM DATE: <b>R001 April 2, 2024</b>
Only the following items of the Job Special Provisions (Roadway) are authenticated by this seal: All	

JOB  
SPECIAL PROVISION

A. General - Federal JSP-09-02J

**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](http://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 [www.modot.org](http://www.modot.org) 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 2023 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. Contract Liquidated Damages JSP-13-01C

**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 (job numbers) shall be completed on or before the Contract Completion date specified below. Completion by this date shall be in accordance with the requirements of Sec 108.7.1.

Job No.: J6S3640  
Route: 61/67  
County: Jefferson

Notice to Proceed Date: June 3, 2024  
Contract Completion Date: August 1, 2025

**2.1 Calendar Days.** The count of calendar days will begin on the date the contractor starts any construction operations on the project.

Job Number	Calendar Days	Daily Road User Cost
J6S3640	N/A	\$3,200

**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 **\$1500** 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 above 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. Liquidated Damages Specified

**1.0 Description.** If the closure and construction of St. Johns Rd. is not complete and open to traffic within 45 days of the initial closure, 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 delay, with its resulting cost to the traveling public. 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 \$3200 per day for each full day that the closure and construction is not complete and 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 excess closure time.

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

D. Work Zone Traffic Management 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 **15 minutes** 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 Transportation Management Plan.** The contractor Work Zone Specialist (WZS) shall review the Transportation Management Plan (TMP), found as an electronic deliverable on MoDOT's Online Plans Room and discuss the TMP with the engineer during the preconstruction conference. Throughout the construction project, the WZS is responsible for updating any changes or modifications to the TMP and getting those changes approved by the engineer a minimum of two weeks in advance of implementation. The WZS shall participate in the post construction conference and provide recommendations on how future TMPs can be improved.

## 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

**3.1.2** The contractor's working hours will be restricted for the Special Events as shown below. All lanes shall be scheduled to be open to traffic during these Special Events.

No Special Events Anticipated.

**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** The contractor shall be aware that traffic volume data indicates construction operations on the roadbed between the following hours will likely result in traffic queues greater than 15 minutes. Based on this, the contractor's operations will be restricted accordingly unless it can be successfully demonstrated the operations can be performed without a 15 minute queue in traffic. It shall be the responsibility of the engineer to determine if the above work hours may be modified. Working hours for evenings, weekends and holidays will be determined by the engineer. The contractor may not work during the following listed hours:

Route 61/67 Southbound:

6:00 a.m. - 8:00 a.m. Monday through Friday

3:00 p.m. - 6:00 p.m. Monday through Friday

Route 61/67 Northbound:

6:00 a.m. - 8:00 a.m. Monday through Friday

3:00 p.m. - 6:00 p.m. Monday through Friday

**3.4** Any work requiring a reduction in the number of through lanes of traffic shall be completed during nighttime hours. Nighttime hours shall be considered to be 6:00 p.m. to 6:00 a.m. for this project.

#### **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.

#### **4.3 For Commercial Entrance Reconstruction at Parcel 6 and 7:**

The contractor shall construct each of the entrances on Parcel 6 and Parcel 7 a half at a time. The contractor shall not work on both entrances at the same time.

**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.

E. Emergency Provisions and Incident Management 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.

<b>Missouri State Highway Patrol</b> 1-800-525-5555                      Cellular: *55 <u>Troop C Headquarters</u> 891 Technology Drive Weldon Spring, MO 63141 (636) 300-2800	
<b>Jefferson County Sheriff's Department</b>	<u>Headquarters</u> 401 1 <sup>st</sup> Street PO Box 100 Hillsboro, MO 63050 Phone: (636) 797-5000
<b>City of Arnold Police Department</b>	2101 Jeffco Blvd. Hillsboro, MO 63010 Phone: (636) 296-3204
<b>Rock Community Fire Protection District House 1</b>	1533 Jeffco Blvd. Arnold, MO 63010 Phone: (636) 296-2226
<b>Rock Community Fire Protection District House 5</b>	3749 Telegraph Rd. Arnold, MO 63010 Phone: (636) 296-2211

**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.

F. Project Contact for Contractor/Bidder Questions JSP-96-05

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

Shirley Norris, Project Contact  
St. Louis District  
1590 Woodlake Drive  
Chesterfield, MO 63017

Telephone Number: 314-453-5032  
Email: [Shirley.Norris@modot.mo.gov](mailto:Shirley.Norris@modot.mo.gov)

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

G. Supplemental Revisions JSP-18-01AB

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. The Contractor is responsible for obtaining its own separate 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 pre-activity 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.

#### Anti-Discrimination Against Israel Certification

By signing this contract, the Company certifies it is not currently engaged in and shall not, for the duration of the contract, engage in a boycott of goods or services from the State of Israel,

companies doing business in or with Israel or authorized by, licensed by, or organized under the laws of the State of Israel, or persons or entities doing business in the State of Israel as defined by Section 34.600 RSMo. This certification shall not apply to contracts with a total potential value of less than One Hundred Thousand Dollars (\$100,000) or to contractors with fewer than ten (10) employees.

#### Ground Tire Rubber (GTR) Dry Process Modification of Bituminous Pavement Material

**1.0 Description.** This work shall consist of the dry process of adding ground tire rubber (GTR) to modify bituminous material to be used in highway construction. Existing GTR requirements in Section 1015 pertain to the wet process method of GTR modification that blends GTR with the asphalt binder (terminal blending or blending at HMA plant). The following requirements shall govern for dry process GTR modification. The dry process method adds GTR as a fine aggregate or mineral filler during mix production. All GTR modified asphalt mixtures shall be in accordance with Secs 401, 402, or 403 as specified in the contract; except as revised by this specification.

**2.0 Materials.** The contractor shall furnish a manufacturer's certification to the engineer for each shipment of GTR furnished stating the name of the manufacturer, the chemical composition, workability additives, and certifying that the GTR supplied is in accordance with this specification.

**2.1 Product Approval.** The GTR product shall contain a Trans-Polyoctenamer (TOR) added at 4.5 % of the weight of the crumb rubber or an engineered crumb rubber (ECR) workability additive that has proven performance in Missouri. Other GTR additives shall be demonstrated and proven prior to use such as a five-year field performance history in other states or performance on a federal or state-sanctioned accelerated loading facility.

**2.2 General.** GTR shall be produced from processing automobile or truck tires by ambient or cryogenic grinding methods. Heavy equipment tires, uncured or de-vulcanized rubber will not be permitted. GTR shall also meet the following material requirements:

Table 1 – GTR Material Properties		
Property	Test Method	Criteria
Specific Gravity	ASTM D1817	1.02 to 1.20
Metal Contaminates	ASTM D5603	≤ 0.01%
Fiber Content	ASTM D5603	≤ 0.5%
Moisture Content	ASTM D1509	≤ 1.0%*
Mineral Filler	AASHTO M17	≤ 4.0%

\*Moisture content of the GTR shall not cause foaming when combined with asphalt binder and aggregate during mix production

**2.3 Gradation.** The GTR material prior to TOR or ECR workability additives shall meet the following gradation and shall be tested in accordance with ASTM D5603 and ASTM D5644.

Table 2 – GTR Gradation	
Sieve	Percent Passing by Weight
No. 20	100
No. 30	98-100
No. 40	50-70
No. 100	5-15

**3.0 Delivery, Storage, and Handling.** The GTR shall be supplied in moisture-proof packaging or other appropriate bulk containers. GTR shall be stored in a dry location protected from rain before use. Each bag or container shall be properly labeled with the manufacturer's designation for the GTR and specific type, mesh size, weight and manufacturer's batch or Lot designation.

**4.0 Feeder System.** Dry Process GTR shall be controlled with a feeder system using a proportioning device that is accurate to within  $\pm 3$  percent of the amount required. The system shall automatically adjust the feed rate to always maintain the material within this tolerance and shall have a convenient and accurate means of calibration. The system shall provide in-process monitoring, consisting of either a digital display of output or a printout of feed rate, in pounds per minute, to verify feed rate. The supply system shall report the feed in 1-pound increments using load cells that will enable the user to monitor the depletion of the GTR. Monitoring the system volumetrically will not be allowed. The feeder shall interlock with the aggregate weight system and asphalt binder pump to maintain correct mixture proportions at all production rates.

Flow indicators or sensing devices for the system shall be interlocked with the plant controls to interrupt mixture production if GTR introduction rate is not within  $\pm 3$  percent. This interlock will immediately notify the operator if GTR introduction rate exceeds introduction tolerances. All plant production will cease if the introduction rate is not brought back within tolerance after 30 seconds. When the interlock system interrupts production and the plant has to be restarted, upon restarting operations; the modifier system shall run until a uniform feed can be observed on the output display. All mix produced prior to obtaining a uniform feed shall be rejected.

**4.1 Batch Plants.** GTR shall be added to aggregate in the weigh hopper. Mixing times shall be increased per GTR manufacturer recommendations.

**4.2 Drum Plants.** The feeder system shall add GTR to aggregate and liquid binder during mixing and provide sufficient mixing time to produce a uniform mixture. The feeder system shall ensure GTR does not become entrained in the exhaust system of the drier or plant and is not exposed to the drier flame at any point after introduction.

**5.0 Testing During Mixture Production.** Testing of asphalt mixes containing GTR shall not begin until at least 30 minutes after production or per additive supplier's recommendation.

**6.0 Construction Requirements.** Mixes containing GTR shall have a target mixing temperature of 325 F or as directed by the GTR additive supplier. The additive supplier's recommendations shall be followed to allow for GTR binder absorption/reaction. This may include holding mix in the silo to allow time for binder to absorb into the GTR. Rolling operations may need to be modified.

**7.0 Mix Design Test Method Modification.** A formal mixing procedure from the additive supplier shall be provided to the contractor and engineer that details the proper sample preparation, including blending GTR with the binder or other additives. Samples shall be prepared and

fabricated in accordance with this procedure by the engineer and contractor throughout the duration of the project.

**8.0 Mix design Volumetrics.** Mix design volumetric equations shall be modified as follows:

**8.1** Additional virgin binder added to offset GTR absorption of binder shall be counted as part of the mix virgin binder

**8.2** GTR shall be included as part of the aggregate when calculating VMA of the mix.

**8.2.1** GTR SPG shall be 1.15

**8.3** Mix  $G_{sb}$  used to determine VMA shall be calculated as follows:

$$G_{sb(JMF)} = \frac{(100 - P_{bmv})}{\left(\frac{P_s}{G_{sb}} + \frac{P_{GTR}}{G_{GTR}}\right)}$$

where:

$G_{sb(JMF)}$  = bulk specific gravity of the combined aggregate including GTR

$P_{bmv}$  = percent virgin binder by total mixture weight

$P_s$  = percent aggregate by total mixture weight (not including GTR)

$P_{GTR}$  = percent GTR by total mixture weight

$G_{sb}$  = bulk specific gravity of the combined aggregate (not including GTR)

$G_{GTR}$  = GTR specific gravity

**8.4**  $G_{se}$  shall be calculated as follows:

$$G_{se} = \frac{(100 - P_b - P_{GTR})}{\left(\frac{100}{G_{mm}} - \frac{P_b}{G_b} - \frac{P_{GTR}}{G_{GTR}}\right)}$$

**8.5**  $P_{be}$  shall be calculated as follows:

$$P_{be} = P_b - \frac{P_{ba}}{100} * (P_s + P_{GTR})$$

**9.0 Minimum GTR Amount.** The minimum dosage rate for GTR shall be 5 % by weight of total binder for an acceptable one bump grade or 10 % by weight of total binder for an acceptable two bump grade as detailed in the following table. Varying percentage blends of GTR and approved additives may be used as approved by the engineer with proven performance and meeting the specified requirements of the contract grade.

Contract Binder Grade	Percent Effective Virgin Binder Replacement Limits	Required Virgin Binder Grade	Minimum GTR Dosage Rate
PG 76-22	0 - 20	PG 70-22	5 %
		PG 64-22	10 %

PG 70-22	0 - 30	PG 64-22	5 %
		PG 58-28	10 %
PG 64-22	0 – 40*	PG 58-28	5 %
		PG 52-34	10 %
PG 58-28	0 – 40*	PG 52-34	5 %
		PG 46-34	10 %

\* Reclaimed Asphalt Shingles (RAS) may be used when the contract grade is PG 64-22 or PG 58-28. RAS replacement shall follow the 2 x RAS criteria when calculating percent effective binder replacement in accordance Sec 401.

**Delete Sec 403.19.2 and substitute the following:**

**403.19.2 Lots.** The lot size shall be designated in the contractor's QC Plan. Each lot shall contain no less than four sublots and the maximum sublot size shall be 1,000 tons. The maximum lot size shall be 4,000 tons for determination of pay factors. Sublots from incomplete lots shall be combined with the previous complete lot for determination of pay factors. When no previous lot exists, the mixture shall be treated in accordance with [Sec 403.23.7.4.1](#). A new lot shall begin when the asphalt content of a mixture is adjusted in accordance with [Sec 403.11](#).

**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 ([link to certificate form](#)) 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.

**Delete Sec 109.14.1 thru Sec 109.14.8 and substitute the following:**

**109.14.1 Monthly Fuel Index.** Each month, the Monthly Fuel Index will be established as the average retail price per gallon for Ultra Low Sulfur Diesel for the Midwest (PADD 2) area as posted on the first Monday of the month by the U.S. Energy Information Administration (EIA). Should the posted price not be available for any reason, the MoDOT State Construction and Materials Engineer will use reasonable methods, at their sole discretion, to establish the Monthly Fuel Index on an interim basis until the EIA resumes its publication.

**109.14.2 Fuel Adjustment Calculation.**

B = Base Fuel Index = Monthly Fuel Index in the month in which the project was let  
C = Current Index = Monthly Fuel Index in the month in which the work was performed  
U = Units of work performed within the current pay estimate period (applicable pay units)  
F = Total Fuel Usage Factor (gal./applicable pay units)

Fuel Adjustment (Dollars) =  $(C - B) \times U \times F$

**109.14.3** Each pay estimate period, a fuel adjustment payment or deduction will be applied for the quantity of work performed that period on each qualifying pay item. For calculation of the fuel adjustment, work performed on the first day of a month will generally be included with the second estimate in the previous month to keep fuel adjustments in sync with MoDOT's normal payment estimate period schedule. The Commission reserves the right to include work performed on the first day of the month with the current month to accommodate financial accounting termini, such as the beginning of the state and federal fiscal years (July 1 and October 1).

**109.14.4** If the bidder wishes to be bound by these specifications, the bidder shall execute the acceptance form in the proposal. Failure by the bidder to execute the acceptance form will be interpreted to mean election to not participate in the price adjustment for fuel.

**Disposal of Blast Media and Paint Residue**

**1.0 Description.** Whereas Sec 1081.10 requires delivery of Blast Media and Paint Residue (BMPR) produced from bridge coating activities to The Doe Run Company for recycling, and considering the amount of BMPR produced on all active MoDOT projects statewide at any given point in time may exceed the recycling capacity of Doe Run, this provision allows for an alternate method of disposal of BMPR. The contractor, at its discretion, can choose this disposal option or the Doe Run recycle option, when both are available. When Doe Run is not currently capable or agreeable to accept the BMPR, this alternate disposal option shall be considered mandatory, and at no additional cost to the Commission.

**2.0 Disposal in Landfill.** In lieu of delivery to Doe Run for recycling, BMPR material shall be disposed in the appropriate type of approved landfill, as determined by Toxicity Characteristic Leaching Procedure (TCLP) testing. The material must be TCLP tested to determine if it contains a level of hazardous waste such that requires disposal in a hazardous waste landfill. A sampling plan for testing shall be submitted to MoDOT for review and concurrence. Sampling shall be performed by the contractor. MoDOT will witness the sampling to ensure it is conducted per the plan submitted.

**2.1** The contractor shall submit the collected samples to a qualified third-party testing facility to perform TCLP testing. If the sample indicates that the BMPR material qualifies as hazardous waste, then the materials represented by that sample shall be delivered to a licensed hazardous waste landfill for disposal. The contractor shall be responsible for hiring a licensed hazardous waste transporter to transport the hazardous waste to the landfill. The contractor shall comply with all applicable laws and regulations for storage and shipping of the hazardous waste material. If the testing indicates that the BMPR material qualifies as a special waste, it shall be taken to a certified landfill for disposal. The contractor shall be responsible for the transportation of the special waste material to the certified landfill. The requirement to ship the BMPR material by barrels will be waived. Any alternate containers utilized shall comply with all applicable laws and regulations for shipping this type of special waste material. Copies of all shipping manifests, landfill disposal agreements, and any other legally required documentation shall be provided to the engineer.

**3.0 Basis of Payment.** No payment will be made for any costs associated with this landfill disposal option, including, but not limited to, sampling, testing, delivery, temporary storage, or disposal fees.

H. Contractor Quality Control 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 ([www.modot.org/quality](http://www.modot.org/quality)).

**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.

I. Property Owner Notification

**1.0 Description.** It shall be the contractor's responsibility to inform and notify the adjacent property owner 48 hours prior to starting any construction activities that may impact driveway and parking lot access or occur along the frontage of the property owner's parcel. Notification shall be in written form and include the contractor's contact information, the Engineer's contact information, and an estimated schedule of work and the associated impacts.

**2.0 Basis of Payment.** No direct payment will be made to the contractor for the labor, equipment, material, or time required to comply with this provision.

J. Possession of Right of Way – Parcels 2, 3, 6, 7, 8, 9, 11, 12, 14, 16, 17, 18, 20, and 21

**1.0 Description.** The contractor's attention is directed toward the following parcels which could be subject to delayed possession, Parcels 2, 3, 6, 7, 8, 9, 11, 12, 14, 16, 17, 18, 20, and 21.

(a) **Parcel 2** (3484 Jeffco Boulevard) – N/F PLANTATION PROPERTIES III, LLC – The new Right of Way (RW) and Temporary Construction Easement (TCE) are being acquired to facilitate installation and maintenance of a signal at the intersection of Route 61 and Lindenhof Drive/ St. John's Church Road, specifically at the northeast quadrant of the intersection. The contractor shall not enter or proceed with physical construction across said Parcel 2 until authorization is granted by the Engineer. The Contractor shall take no action that will result in unnecessary inconvenience, disproportionate injury or any other action coercive in nature to the business or operations thereon. Possession is anticipated to be obtained by 03/15/2024. This possession date is estimated and is not warranted, and a later possession date is equally possible.

(b) **Parcel 3** (3494 Jeffco Boulevard) – N/F SOUTHERN MISSOURI BANCORP INC., F/K/A FORTUNEBANK – The new Right of Way (RW) and Temporary Construction Easement (TCE) are being acquired to facilitate installation and maintenance of a signal at the intersection of Route 61 and Lindenhof Drive/ St. John's Church Road, specifically at the southeast quadrant of the intersection. The contractor shall not enter or proceed with physical construction across said Parcel 3 until authorization is granted by the Engineer. The Contractor shall take no action that will result in unnecessary inconvenience, disproportionate injury or any other action coercive in nature to the business or operations thereon. Possession is anticipated to be obtained by 08/15/2024. This possession date is estimated and is not warranted, and a later possession date is equally possible.

- (c) **Parcel 6** (4184 Jeffco Boulevard) – N/F TRACR ENTERPRISES LLC – The Temporary Construction Easement (TCE) is being acquired to reconstruct the driveway centered at Station 259+42.62 and install new drainage pipe, on the east side of Route 61. The contractor shall not enter or proceed with physical construction across said Parcel 6 until authorization is granted by the Engineer. The Contractor shall take no action that will result in unnecessary inconvenience, disproportionate injury or any other action coercive in nature to the business or operations thereon. Possession is anticipated to be obtained by 03/15/2024. This possession date is estimated and is not warranted, and a later possession date is equally possible.
- (d) **Parcel 7** (4190 Jeffco Boulevard) – N/F LAWRENCE J. RHEA, JR., TRUSTEE – The Permanent Drainage Easement (PDE) and Temporary Construction Easement (TCE) are being acquired to reconstruct the driveway centered at Station 260+05.00 and install new drainage pipe, as well as to construct and maintain other drainage facilities, on the east side of Route 61. The contractor shall not enter or proceed with physical construction across said Parcel 7 until authorization is granted by the Engineer. The Contractor shall take no action that will result in unnecessary inconvenience, disproportionate injury or any other action coercive in nature to the business or operations thereon. Possession is anticipated to be obtained by 03/15/2024. This possession date is estimated and is not warranted, and a later possession date is equally possible.
- (e) **Parcel 8** (4202 Jeffco Boulevard) – N/F NELSON-TORREGROSSA DEVELOPMENT, LLC – The new Right of Way (RW) and Temporary Construction Easement (TCE) are being acquired to reconstruct the driveway centered at Station 262+21.16 on the east side of Route 61. The contractor shall not enter or proceed with physical construction across said Parcel 8 until authorization is granted by the Engineer. The Contractor shall take no action that will result in unnecessary inconvenience, disproportionate injury or any other action coercive in nature to the business or operations thereon. Possession is anticipated to be obtained by 08/15/2024. This possession date is estimated and is not warranted, and a later possession date is equally possible.
- (f) **Parcel 9** (4183 Jeffco Boulevard) – N/F BRUCE R. LINK – The Temporary Construction Easement (TCE) is being acquired to reconstruct the driveways centered at Station 258+14.86 and Station 259+10.96 on the west side of Route 61. The contractor shall not enter or proceed with physical construction across said Parcel 9 until authorization is granted by the Engineer. The Contractor shall take no action that will result in unnecessary inconvenience, disproportionate injury or any other action coercive in nature to the business or operations thereon. Possession is anticipated to be obtained by 03/15/2024. This possession date is estimated and is not warranted, and a later possession date is equally possible.
- (g) **Parcel 11** (4212 Jeffco Boulevard) – N/F SAALE FARMS, INC. – The new Right of Way (RW), Permanent Sidewalk Easement (PSE), and Temporary Construction Easement (TCE) are being acquired to facilitate installation and maintenance of a signal at the intersection of Route 61 and Miller Road, and to install and maintain sidewalk and reconnect the driveway centered at Station 265+36.46, on the east side of Route 61. The contractor shall not enter or proceed with physical construction across said Parcel 11 until authorization is granted by the Engineer. The Contractor shall take no action that will

result in unnecessary inconvenience, disproportionate injury or any other action coercive in nature to the business or operations thereon. Possession is anticipated to be obtained by 08/15/2024. This possession date is estimated and is not warranted, and a later possession date is equally possible.

- (h) **Parcel 12** (4212 Jeffco Boulevard) – N/F SPENCO PROPERTIES, LLC – The new Right of Way (RW), Permanent Drainage Easement (PDE), and Temporary Construction Easement (TCE) are being acquired to facilitate installation and maintenance of a signal at the intersection of Route 61 and Miller Road, and to construct and maintain drainage facilities on the east side of Route 61. The contractor shall not enter or proceed with physical construction across said Parcel 12 until authorization is granted by the Engineer. The Contractor shall take no action that will result in unnecessary inconvenience, disproportionate injury or any other action coercive in nature to the business or operations thereon. Possession is anticipated to be obtained by 08/15/2024. This possession date is estimated and is not warranted, and a later possession date is equally possible.
- (i) **Parcel 14** (Property is directly northwest of the intersection of Jeffco Boulevard and Miller Road) – N/F N.S. CONSTRUCTION, INC. – The new Right of Way (RW) is being acquired to facilitate installation and maintenance of a signal at the intersection of Route 61 and Miller Road, and to realign Miller Road on the west side of Route 61. The contractor shall not enter or proceed with physical construction across said Parcel 14 until authorization is granted by the Engineer. The Contractor shall take no action that will result in unnecessary inconvenience, disproportionate injury or any other action coercive in nature to the business or operations thereon. Possession is anticipated to be obtained by 04/15/2024. This possession date is estimated and is not warranted, and a later possession date is equally possible.
- (j) **Parcel 16** (4313 Jeffco Boulevard) – N/F JUSCO LLC – The new Right of Way(RW) and Temporary Construction Easement (TCE) are being acquired to facilitate installation and maintenance of a signal at the intersection of Route 61 and Miller Road, to realign Miller Road on the west side of Route 61, and to reconnect the driveways centered at Station 267+43.68 and Station 269+78.83. The contractor shall not enter or proceed with physical construction across said Parcel 16 until authorization is granted by the Engineer. The Contractor shall take no action that will result in unnecessary inconvenience, disproportionate injury or any other action coercive in nature to the business or operations thereon. Possession is anticipated to be obtained by 08/15/2024. This possession date is estimated and is not warranted, and a later possession date is equally possible.
- (k) **Parcel 17** (4328 Jeffco Boulevard) – N/F 4328 JEFFCO CORPORATION, INC. – The Permanent Drainage Easement (PDE) and Temporary Construction Easement (TCE) are being acquired to construct and maintain drainage facilities on the east side of Route 61, and to reconnect the driveways centered at Station 268+43.42 and Station 269+21.62. The contractor shall not enter or proceed with physical construction across said Parcel 17 until authorization is granted by the Engineer. The Contractor shall take no action that will result in unnecessary inconvenience, disproportionate injury or any other action coercive in nature to the business or operations thereon. Possession is anticipated to be obtained by 08/15/2024. This possession date is estimated and is not warranted, and a later possession date is equally possible.

- (l) **Parcel 18** (4342 Jeffco Boulevard) – N/F JANET E. KEITEL, TRUSTEE – The Permanent Easement (PDE) and Temporary Construction Easement (TCE) are being acquired to construct and maintain drainage facilities on the east side of Route 61, and to reconnect the driveway centered at Station 269+56.12. The contractor shall not enter or proceed with physical construction across said Parcel 18 until authorization is granted by the Engineer. The Contractor shall take no action that will result in unnecessary inconvenience, disproportionate injury or any other action coercive in nature to the business or operations thereon. Possession is anticipated to be obtained by 03/15/2024. This possession date is estimated and is not warranted, and a later possession date is equally possible.
- (m) **Parcel 20** (Property is directly southeast of the intersection of Jeffco Boulevard and Jungermann Road) – N/F JUNIOR COLLEGE DISTRICT OF JEFFERSON COUNTY, MISSOURI – The Permanent Drainage Easement (PDE) and Temporary Construction Easement (TCE) are being acquired to construct and maintain drainage facilities on the east side of Route 61, and to reconnect the Jungermann Road entrance centered at Station 270+68.64. The contractor shall not enter or proceed with physical construction across said Parcel 20 until authorization is granted by the Engineer. The Contractor shall take no action that will result in unnecessary inconvenience, disproportionate injury or any other action coercive in nature to the business or operations thereon. Possession is anticipated to be obtained by 03/15/2024. This possession date is estimated and is not warranted, and a later possession date is equally possible.
- (n) **Parcel 21** (Property is at the intersection of Westward Trails Drive and Miller Road) – N/F WESTWARD TOWNHOMES, LLC – The new Right of Way (RW) and Temporary Construction Easement (TCE) are being acquired to reconstruct the entrance centered at (Miller Road East) Station 3+06.99 to the realigned Miller Road. The contractor shall not enter or proceed with physical construction across said Parcel 21 until authorization is granted by the Engineer. The Contractor shall take no action that will result in unnecessary inconvenience, disproportionate injury or any other action coercive in nature to the business or operations thereon. Possession is anticipated to be obtained by 03/15/2024. This possession date is estimated and is not warranted, and a later possession date is equally possible.

**1.2** The contractor is required to plan its order of work, manpower and equipment loading, and bid, taking into consideration all effects of the possible delayed possession of the parcel. Any effects, impacts, cumulative impacts or consequences of delay in possession of the parcel shall be noncompensable. This shall include any claim for extra work, as well as delay effects on work not delayed, suspension or acceleration of the work, differing site condition, interference or otherwise.

**1.3** The contractor and the Commission understand and agree that by executing this contract, the contractor releases the Commission from any possible liability under this contract or for a possible breach of this contract for failing to make the job site available until the possession of the parcel is authorized by the engineer, and for all direct and indirect, incidental, or consequential damages or losses the contractor may suffer from this delay in making the job site available or issuing a timely authorization. The contractor further waives any right the contractor may have by contract, at law or in equity to challenge the validity or enforceability of the contract, in return for the award of this contract to the contractor at its stated contract prices as bid for the required

work. It is provided, however, as contractors SOLE REMEDY for any delay in possession of the above parcel that the completion date of this contract may be extended, day for day, for each day that delayed possession actually interferes with the major items of work as determined by the engineer.

**2.0 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.

K. Utilities JSP-93-26F

1.0 For informational purposes only the following is a list of names, addresses, and telephone numbers of the known utility companies in the area of the construction work for this improvement:

<u>Utility Name</u>	<u>Known Required Adjustment</u>	<u>Type</u>
<b>Ameren Missouri</b> Brian Flier Telephone: (636) 671-6162 Email: <a href="mailto:bflier@ameren.com">bflier@ameren.com</a>	Yes	Power
<b>AT&amp;T (Distribution)</b> Herb Connors Telephone: (314) 453-3316 Email: <a href="mailto:hc1549@att.com">hc1549@att.com</a>	Yes	Communication
<b>Charter (Spectrum)</b> Don Hatfield Telephone: (314)341-4450 Email: <a href="mailto:Donald.Hatfield@charter.com">Donald.Hatfield@charter.com</a>	Yes	Communication
<b>MCI / Verizon</b> Domenic Nicaastro Telephone: (636) 459-1600 Email: <a href="mailto:domenic.nicaastro@verizon.com">domenic.nicaastro@verizon.com</a>	Yes	Communication
<b>Jefferson County PWSD #1</b> Erin Devore Telephone: (636) 296-0659 Email: <a href="mailto:edvore@pwsd1jeffco.org">edvore@pwsd1jeffco.org</a>	No	Water
<b>Jefferson County PWSD #10</b> Keith Flamm Telephone: (314) 623-7640 Email: <a href="mailto:pwsdtenjc@gmail.com">pwsdtenjc@gmail.com</a>	Yes	Water
<b>Spire Missouri East</b> Brian Langenbacher Telephone: (314) 713-6572 Email: <a href="mailto:Brian.Langenbacher@spireenergy.com">Brian.Langenbacher@spireenergy.com</a>	Yes	Gas

**1.1** 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 State at this time. This information is provided by the State "as-is" and the State 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 State 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 above listing information indicating existence, location, and status of any facility. Such verification includes direct contact with the listed utilities.

**1.2 Ameren Missouri:**

Ameren-Missouri has existing facilities within the project limits that are in conflict with the proposed work. Ameren-Missouri will relocate utility poles at the St. Johns Church Road and Miller Road intersections. This relocation work is expected to take place prior to the Notice to Proceed.

The location of the utility poles in conflict are as follow:

- 1 pole at Station 188+54 LT (north of Linderhof Dr)
- 1 pole at Station 190+02 LT (south of Linderhof Dr)
- 1 pole at Station 189+47 RT (intersection of St Johns Church Rd and 61/67)
- 1 pole at Station 262+70 RT (north of Miller Rd)
- 3 poles at Station 264+80 RT to Station 266+10 RT (intersection of Miller and 61/67)
- 2 poles at Station 264+80 LT to Station 266+59 LT (intersection of Miller and 61/67)
- 1 pole at Station 266+78 RT (south of Miller)
- 1 pole at Station 268+18 LT (south of Miller Rd)
- 1 pole at Station 1+86 LT (Miller Rd)
- 4 poles from Station 1+24 RT to Station 4+73 RT (Miller Rd)

Following communication facility transfers from the poles, Ameren will be responsible for removing all poles. **Pole removal may take place AFTER Notice to Proceed.**

The contractor shall contact Ameren-Missouri directly to verify the locations of their facilities. The contractor shall coordinate with Ameren-Missouri as necessary and take measures to protect in place their existing facilities during construction. The contractor shall protect the integrity of any existing facility in close proximity to contract work while performing construction activities.

There will be no direct pay for compliance with any of the above provisions.

The Commission cannot warrant the information above which was provided by Ameren Missouri.

**1.3 AT&T Distribution:**

AT&T Distribution (AT&T/D) has existing underground and aerial facilities within the project limits that are in conflict with the proposed project. AT&T/D has aerial lines on the following the utility poles listed in **Section 1.2 Ameren Missouri** that are located near St. John's Church Road on the east side of Route 61/67, near Miller Road on the west side of Route 61/67, and along Miller Road.

- 1 pole at Station 188+54 LT (north of Linderhof Dr)
- 1 pole at Station 190+02 LT (south of Linderhof Dr)
- 1 pole at Station 262+70 RT (north of Miller Rd)
- 3 poles at Station 264+80 RT to Station 266+10 RT (intersection of Miller and 61/67)
- 1 pole at Station 266+78 RT (south of Miller)
- 4 poles from Station 1+24 RT to Station 4+73 RT (Miller Rd)

AT&T/D facilities will be relocated to the new Ameren poles following Charter's relocation.

In addition to the conflicts listed above, AT&T/D has two existing buried copper lines along the north side of Miller Rd and continues on the west side of Route 61/67 to the pole at STA 262+67 RT. This line will be relocated following both Ameren's transfer by AT&T/D. AT&T/D also have a fiber line along the west of Route 61/67 throughout the project limits near Miller Road and also along the northside of existing Miller Road. These fiber lines are in conflict with the proposed drainage pipe crossing on Miller Road and the proposed drainage pipes and structures in front of Mac Auto Sales. These fiber lines will be relocated.

AT&T/D has an existing pull box in conflict the roadway widening at the NW corner of Miller Rd. The pull box is in conflict with the proposed widening and is being relocated west of its current location.

AT&T/D has an existing pullbox in conflict with the roadway widening at the NW corner of St. John's Church. The fiber line will be relocated and this existing pullbox will be abandoned.

The relocation work described at St John's Church Road has been completed. **The relocation work described at Miller Road may take place AFTER the Notice Proceed.**

The contractor shall directly contact AT&T/D to verify the locations of their facilities. The contractor shall coordinate with AT&T/D as necessary and take measures to protect in place their existing facilities during construction.

There will be no direct pay for compliance with any of the above provisions.

The Commission cannot warrant the information above which was provided by AT&T/D.

#### **1.4 Charter (Spectrum):**

Charter has existing aerial facilities within the project limits that are in conflict with the proposed project. Charter has aerial lines on the following utility poles listed in **Section 1.2 Ameren Missouri:**

- 1 pole at Station 190+02 LT (south of Linderhof Dr)
- 1 pole at Station 262+70 RT (north of Miller Rd)
- 3 poles at Station 264+80 RT to Station 266+10 RT (intersection of Miller and 61/67)
- 1 pole at Station 266+78 RT (south of Miller)
- 1 pole at Station 1+86 LT (Miller Rd)
- 4 poles from Station 1+24 RT to Station 4+73 RT (Miller Rd)

Charter facilities will be relocated to the new Ameren poles following Ameren's or Verizon's relocation.

The relocation work, described above, is anticipated to be completed by the Notice to Proceed. The contractor shall directly contact Charter to verify location of facilities. The contractor shall coordinate with Charter as necessary and take measures to protect in place their existing facilities during construction.

There will be no direct pay for compliance with any of the above provisions.

The Commission cannot warrant the information above which was provided by Charter.

## **1.5 MCI / Verizon:**

Verizon has existing underground and aerial facilities within the project limits that are in conflict with the proposed project. Verizon has aerial lines on the following utility poles listed in **Section**

### **1.2 Ameren Missouri:**

- 1 pole at Station 188+54 LT (north of Linderhof Dr)
- 1 pole at Station 190+02 LT (south of Linderhof Dr)
- 2 poles at Station 264+80 LT to Station 266+59 LT (intersection of Miller and 61/67)

Verizon facilities will be relocated to the new Ameren poles following Ameren's relocation.

Verizon also has underground line on the east side of Route 61/67 that is in conflict with the proposed drainage, inlets and manholes between STA 268+00 LT to STA 271+00 LT.

The relocation work, described above, is anticipated to be completed by the Notice to Proceed.

The contractor shall directly contact Verizon to verify the location of facilities. The contractor shall coordinate with Verizon as necessary and take measures to protect in place their existing facilities during construction.

There will be no direct pay for compliance with any of the above provisions.

The Commission cannot warrant the information above which was provided by Verizon.

## **1.6 Jefferson County PWSD #1:**

Jefferson County PWSD #1 (PWSD #1) has existing an existing 10-in water main that crosses Route 61/67 through a casing pipe near Station 189+69 and runs along the south side of St. John's Church and Linderhoff that may be in close proximity to the proposed signal equipment on the SE and SW corners. There is also a 6-inch water main connects into the 10-inch water main on the west side of Route 61/67 and runs south along the church's fence line.

**Before ordering materials and starting installation of the signal equipment at St. John's Church Road**, the Contractor shall pothole **(See Paragraph 4.0 of this provision below)** the 10-inch water main on the SW and SE corners of the intersection.

**Any conflict determined between the 10-in water main and the installation the new signal cabinet, power supply cabinet, and signal posts #1 and #6 shall be brought immediately to the attention of MoDOT's area utility coordinator and the Engineer for the project. A 'conflict' will include if the signal equipment is vertical above or directly adjacent to the water main, but not deep enough to disturb during initial construction. The engineer will determine whether relocation of the 10-inch water main is necessary to accommodate construction of the signal equipment or if the proposed work can be adjusted to avoid any utility relocation.**

There may be PWSD #1 water valves that need to be adjusted to grade during construction. The contractor shall contact PWSD #1 directly to verify location of facilities and to have valves adjusted to grade. The contractor shall coordinate with PWSD #1 as necessary and take measures to protect in place their existing facilities during construction.

The contractor shall coordinate and direct construction questions to Field Supervisor, Matt Dornseif at 636-245-9726 or Chief Operator, Justin Cruts at 636-245-9728.

The contractor shall directly contact PWSD #1 to verify the locations of their facilities. The contractor shall coordinate with PWSD #1 as necessary and take measures to protect in place their existing facilities during construction.

There will be no direct pay for compliance with any of the above provisions.

The Commission cannot warrant the information above which was provided by PWSD #1.

### **1.7 Jefferson County PWSD #10:**

Jefferson County PWSD #10 (PWSD #10) has existing underground and at grade facilities within the project limits that are in conflict with the proposed project.

PWSD #10 has a 6-in cast iron pipe along the south side of existing Miller Rd that is **in close proximity** with a proposed culvert crossing the realigned Miller Rd. Per potholing information the proposed intersection point is approximately at STA 2+38 OFF 20.4' LT and the top of 6-inch cast iron pipe was found at elevation 556.62'. The proposed drainage pipe is designed to avoid conflicting by going under the existing 6-inch cast iron pipe. The contractor shall support the water line during construction and used clean rock as backfill to avoid settling around the water line after construction is complete and as approved by the engineer.

PWSD #10 has a 12-inch water main that will be **in close proximity** to signal post #1. Per potholing information, this water main is approximately 3.5' away from center of signal base. The contractor protect this water main during construction as directed by the engineer.

PWSD #10 has 12-inch water main that shows on the plan to be under the proposed drainage pipes and inlets along west side of Route 61/67 in front of Mac Auto Sales. Per potholing information, the 12-inch water main was found approximately 9-ft west of the proposed drainage structures within the parking lot of this property.

PWSD #10 also has a ¾-in copper service pipe crossing Route 61/67 that is **in conflict** with a proposed Inlet 3-2 (near STA 268+70 LT). This service line will be relocated.

PWSD #10 also has a ¾-in copper service pipe on the east side of 61/67 south of Miller Rd that is **in conflict** with a proposed Manhole 2 (near STA 269+50 LT).

PWSD #10 has a fire hydrant and two water valves at the northeast corner of the intersection of the Dollar General driveway and Route 61/67 (STA 265+00 LT) that is **in conflict** with a proposed curb ramp. These will be relocated.

The relocation work, described above, is anticipated to be completed by Notice to Proceed.

The contractor shall directly contact PWSD #10 to verify location of facilities. The contractor shall coordinate with PWSD #10 as necessary and take measures to protect in place their existing facilities during construction.

There will be no direct pay for compliance with any of the above provisions.

The Commission cannot warrant the information above which was provided by PWSD #10.

### **1.8 Spire Missouri East:**

Spire has existing underground facilities within the project limits that are in conflict with the proposed project.

Spire has a 4-in steel pipe in conflict with the proposed grading at Miller Rd near the motel. Spire has a pipe that crosses 61/67 at Jungerman Rd that is in conflict with a proposed culvert under Jungerman Rd.

The relocation work, described above, is anticipated to be completed by Notice to Proceed.

There will be no direct pay for compliance with any of the above provisions.

The Commission cannot warrant the information above which was provided by Spire.

**1.9** The contractor agrees that any effects of the presence of the utilities, their relocation, contractor's coordination of work with the utilities and any delay in utility relocation shall not be compensable as a suspension of work, extra work, a change in the work, as a differing site condition or otherwise including but, without limitation, delay, impact, incidental or consequential damages. The contractor's sole remedy for the effects of the presence of utilities, delay in their relocation or any other effects shall be an excusable delay as provided in Section 105.7.3. The contractor waives, for itself, its subcontractors and suppliers the compensability of the presence of utilities, delay in their relocation and any cost to the contractor, its subcontractors and suppliers in any claim or action arising out of or in relation to the work under the contract.

**1.10** The contractor shall be solely responsible and liable for incidental and consequential damage to any utility facilities or interruption of the service caused by it or its subcontractors operation. The contractor shall hold and save harmless the Commission from damages to any utility facilities interruption of service by its or its subcontractor's operation.

**2.0** It shall be noted by the contractor that MoDOT is a member of Missouri One Call (800 Dig Rite). Some work on this project may be in the vicinity of MoDOT utility facilities, which includes but is not limited to traffic signal cables, highway lighting circuits, ITS cables, cathodic protection cables, etc. Prior to beginning work, the contractor shall request locates from Missouri One Call. The contractor shall also complete the Notice of Intent to Perform Work form located at the Missouri Department of Transportation website:

<http://www.modot.mo.gov/asp/intentToWork.shtml>

**3.0** The contractor shall submit the form over the web (preferred method) or by fax to the numbers on the printed form. The notice must be submitted a minimum of 2 and a maximum of 10 working days prior to excavation just as Missouri One Call requires.

**4.0 Pot Holing Utility Facilities.** The Contractor shall notify the utility prior to pot holing the utilities marked facility. The utility may want to have a representative on site to observe the

contractor's pot hole work. The Contractor shall be responsible to pot hole any existing utility facility under the pavement or outside the pavement, to verify the utilities depth and location for all the Contractor's needs to construct the project. Core drilling pavement prior to pot holing for utilities may be necessary. Any pot holed utility facility determined to be in conflict with construction of the work for the project, shall be brought immediately to the attention of MoDOT's area utility coordinator and the Engineer for the project. The Engineer will determine whether relocation of the utility is necessary to accommodate construction of the project or if the proposed work can be adjusted to avoid any utility relocation. The Contractor is responsible for the costs to repair any utility or MoDOT facility damaged by their work to pot hole the utility.

A utility pothole unit shall be defined for this project as a single continuous excavation effort, by the Contractors chosen method, to expose a buried utility at the location marked by the utilities locator and approved by the Engineer. The excavation limits of a single pothole unit shall be any excavation taking place within a 2 feet radius around the center of the locate mark provided by the utilities locator, to a depth where either the utility has been satisfactorily exposed for the Engineer to see or to a depth where the search for the marked utility is terminated by the Engineer and the pothole location abandoned without exposing the utility.

**4.1 Basis of Payment.** All labor, equipment, materials and restoration necessary to pot hole and core drill to verify buried utilities shall be paid for under:

	Pay Item Number	Unit
902-99.02	Pot Holing Utility Facilities	Each

L. Lump Sum Temporary Traffic Control JSP-22-01A

**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 pre-existing 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

M. Site Restoration

**1.0 Description.** Restore to its original condition any disturbed area at sites including, but not limited to items such as, guardrail, 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** If the contractor elects and receives approval from the engineer for alternate trench and/or pull box locations, any areas of concrete slope protection, sidewalk, pavement, shoulders, islands, and medians – as well as any similar improvements consisting of asphaltic concrete materials – removed in conjunction with their construction shall be replaced with improvements of similar composition and thickness. Removals shall be achieved by means of full depth saw cuts, the resulting subgrade compacted to minimum density requirements and topped with 4 inches of compacted aggregate base course prior to replacement of surface materials. Concrete materials used in replacement, shall be approved by the engineer. A commercial asphalt mix may be used for replacement of asphaltic surfacing upon approval of the engineer.

**2.1** Any sidewalks and curb ramps that are disturbed as described in this provision shall be replaced to meet current ADA standards.

**2.2** Areas that are used by the contractor for jobsite trailers, equipment and materials storage, or used for project staging areas that are disturbed shall be cleaned up and restored to a condition that is both acceptable to the engineer and, at a minimum, equivalent to the existing site condition.

**1.0 Basis of Payment.** The cost of restoration of disturbed areas will be incidental to the unit price of the items associated with the disturbance. No direct payment will be made for any materials, equipment, time, or labor, which is performed under this provision.

N. Tree Clearing Restriction

**1.0 Description.** The project is within the known range of the federally endangered bats. These bats are known to roost in trees when not in winter hibernation. To avoid potential negative impacts to protected bats, removal of trees will only be allowed between November 1 and March 31.

**2.0 Basis of Payment.** No direct pay shall be provided for any labor, equipment, time, or materials necessary to complete this work.

O. ADA Compliance and Final Acceptance of Constructed Facilities JSP-10-01C

**1.0 Description.** The contractor shall comply with all laws pertaining to the Americans with Disabilities Act (ADA) during construction of pedestrian facilities on public rights of way for this project. An ADA Checklist is provided herein to be utilized by the contractor for verifying compliance with the ADA law. The contractor is expected to familiarize himself with the plans involving pedestrian facilities and the ADA Post Construction Checklist prior to performing the work.

**2.0 ADA Checklist.** The contractor can locate the ADA Checklist form on the Missouri Department of Transportation website:

[www.modot.org/business/contractor\\_resources/forms.htm](http://www.modot.org/business/contractor_resources/forms.htm)

**2.1** The ADA Checklist is not to be considered all-inclusive, nor does it supersede any other contract requirements. The ADA checklist is a required guide for the contractor to use during the construction of the pedestrian facilities and a basis for the commission's acceptance of work. Prior to work being performed, the contractor shall bring to the engineer's attention any planned work that is in conflict with the design or with the requirement shown in the checklist. This notification shall be made in writing. Situations may arise where the checklist may not fully address all requirements needed to construct a facility to the full requirements of current ADA law. In those situations, the contractor shall propose a solution to the engineer that is compliant with current ADA law using the following hierarchy of resources: 2010 ADA Standards for Accessible Design, Draft Public Rights of Way Accessibility Guidelines (PROWAG) dated November 23, 2005, MoDOT's Engineering Policy Guidelines (EPG), or a solution approved by the U.S. Access Board.

**2.2** It is encouraged that the contractor monitor the completed sections of the newly constructed pedestrian facilities in attempts to minimize negative impacts that his equipment, subcontractors or general public may have on the work. Completed facilities must comply with the requirements of ADA and the ADA Checklist or have documented reasons for the non-compliant items to remain.

### **3.0 Coordination of Construction.**

**3.1** Prior to construction and/or closure on an existing pedestrian path of travel, the contractor shall submit a schedule of work to be constructed, which includes location of work performed, the duration of time the contractor expects to impact the facility and an accessible signed pedestrian detour compliant with MUTCD Section 6D that will be used during each stage of construction. This plan shall be submitted to the engineer for review and approval at or prior to the pre-construction conference. Accessible signed detours shall be in place prior to any work being performed that has the effect of closing an existing pedestrian travel way.

**3.2** When consultant survey is included in the contract, the contractor shall use their survey crews to verify that the intended design can be constructed to the full requirements as established in the 2010 ADA Standards. When 2010 ADA Standards do not give sufficient information to construct the contract work, the contractor shall refer to the PROWAG.

**3.3** When consultant survey is not included in the contract, the contractor shall coordinate with the engineer, prior to construction, to determine if additional survey will be required to confirm the designs constructability.

**4.0 Final Acceptance of Work.** The contractor shall provide the completed ADA Checklist to the engineer at the semi-final inspection. ADA improvements require final inspection and compliance with the ADA requirements and the ADA Checklist. Each item listed in the checklist must receive either a "YES" or an "N/A" score. Any item receiving a "NO" will be deemed non-compliant and shall be corrected at the contractor's expense unless deemed otherwise by the engineer. Documentation must be provided about the location of any non-compliant items that are allowed to remain at the end of the construction project. Specific details of the non-compliant items, the ADA requirement that the work was not able to comply with, and the specific reasons that justify the exception are to be included with the completed ADA Checklist provided to the engineer.

**4.1** Slope and grade measurements shall be made using a properly calibrated, 2 foot long, electronic digital level approved by the engineer.

**5.0 Basis of Payment.** The contractor will receive full pay of the contract unit cost for all sidewalk, ramp, curb ramp, median, island, approach work, cross walk striping, APS buttons, pedestrian heads, detectible warning systems and temporary traffic control measures that are completed during the current estimate period as approved by the engineer. Based upon completion of the ADA Checklist, the contractor shall complete any necessary adjustments to items deemed non-compliant as directed by the engineer.

**5.1** 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 documents.

P. ADA Curb Ramp – St. Louis District Version 01-17-24

**1.0 Description.** This work shall consist of constructing new concrete curb ramps that are compliant with current Americans with Disabilities Act (ADA) and MoDOT guidelines at locations shown on the plans and as directed by the engineer.

**1.1** The contractor shall ensure that the persons establishing the grades of the ADA facilities have a copy of ADA related provisions at hand for reference. If it is found that written provisions for ADA facilities are not at hand, the engineer may cause ADA work to be ceased until a copy arrives.

**2.0 Construction Requirements.** Except as noted herein, all applicable provisions in Sec 608 of the Standard Specifications shall apply to the construction of the curb ramps.

**2.1** The following shall be included in the cost of a new ADA ramp:

- Excavation and preparing of the subgrade prior to placement of the aggregate base
- 4" Type 5 Aggregate Base underneath the new ramp
- Everything shown in the various figures of ADA ramp curb types on Standard Plan 608.50 shall be poured as 7" concrete. This includes all area of ramp, level landing pads and any flares included in the per each ADA Ramp.
- Variable height curb along the roadway within the limits of the new ADA ramp
- Variable height curb along the backside of the new ADA ramp

- Concrete median used to separate direction of travel within a dual perpendicular ramp
- Furnishing and installing any reinforcement needed as shown in the plans for curbs taller than 8"
- Tinting of concrete surface as required in the plans
- Saw Cuts needed for the removal of the existing concrete area where the new ADA ramp is being constructed
- Removal of the existing concrete area where the new ADA ramp is being constructed

**2.1.1** Regardless of the number of ramp areas or surfaces having a maximum ramp slope of 1V:12H (8.33%) that are constructed for a particular type of ADA Curb Ramp, the contractor **will not** be paid for additional number of ramps at that location. See special sheet for curb ramp pay limits. Exception: **Dual Perpendicular Ramps and Blended Transitions** will be paid as 2 each.

**2.2** The following shall be paid for separately in the cost of a new ADA ramp:

- Truncated Domes

**2.2.1** Detectable warning surfaces shall be provided, where a curb ramp, landing, or blended transition connects to a street. Where commercial or private driveways are provided with traffic control devices or otherwise are permitted to operate like public streets, detectable warnings should be provided at the junction between the pedestrian route and the street. See plans for additional details.

**2.2.2** The truncated domes shall come from Materials' Pre-Qualified List FS-1067 Table 1 from the following link:

<https://www.modot.org/materials>

**2.3 Gutter Correction.** The contractor shall establish the grade of the flow line of the gutter before establishing the grades of ADA facilities. The gutter line shall be free flowing with no ponding next to the curb. Under-performing gutters shall be replaced with a concrete curb and gutter or a minimum 1.75-inch thick asphalt mill and fill. Running or standing storm water shall not be pushed out into the roadway where it may be splashed on pedestrians by passing vehicles or cause a hydroplaning hazard. An asphalt mill and fill shall be a minimum of 1.75 inches thick and the edges shall be at a smooth milled butt joint. The contractor shall use an approved BP-1 mix for all corner asphalt mill and fill work unless another surface asphalt mix is specified elsewhere in the contract. Asphalt mill and fill is included in the work of ADA Curb Ramps. If asphalt mill and fill is needed at a corner without any other ADA work, it will be found as a separate line item in this contract.

## **2.4 Design Plans**

**2.4.1** Recommendations for the design type of each curb ramp to be built on this project are shown on the plans. Curb ramps constructed by the contractor may vary from the original design, with approval from the engineer, in size, shape, and location as necessary to comply with ADA laws. It is the contractor's responsibility to inspect locations in the field before bidding to verify quantities needed to satisfy this provision. No additional pay will be made to the contractor if the

original design is adjusted, and a different ramp type is constructed instead of the recommended/suggested in the plans.

**2.4.2** ADA provides some exceptions to ramp slope where space limitations exist. The apparent construction limits shown on the plans are not considered a space limitation. The contractor shall not place any ADA exceptions without consulting the Engineer on a case-by-case basis.

**2.4.3 Special Sheet.** A special sheet shows the pay limits for each standard ADA ramp type used by MoDOT. This special sheet is not intended to replace the Standard Plans, Standard specifications or MoDOT's ADA checklist but is intended only to provide consistency regarding pay lengths/limits within the St. Louis District.

As shown on this special sheet, 15 feet beyond the landing is considered part of the ADA ramp. Payment for the ramp will be 15 feet beyond the landing and no adjustment in sidewalk length/quantity will be made if this 15-foot ramp length is adjusted by the contractor in the field.

**2.4.4** When a project **is only** replacing ADA Curb Ramps at intersections, a warping panel shall be included and considered incidental to the cost of the new ADA Curb Ramp. When a project is also constructing new sidewalk tied into the new ADA Curb Ramp, this warping panel shall be paid for within the sidewalk pay item. A warping panel consists of tying in an ADA compliant cross slope to an existing cross slope.

**2.5 Median or Median Island Cut-throughs.** If there is an actual ramp with a slope not exceeding 8.33% (1V:12H) that provides access to the **raised portion** of the island or median instead of cutting through a portion of the island or median, then that area of concrete will be paid for separately as an ADA Curb Ramp, per each, as noted below. If the pedestrian path cuts through an island or median, then this area is not considered a ramp and will be paid for with individual items necessary to construct this pedestrian path.

**2.6 Prosecution of Work.** The contractor shall have all necessary personnel, equipment, and materials at hand for all work at each location before the work begins so that work may proceed without delay.

**3.0 Method of Measurement.** Final measurement will not be made for each ramp except for authorized changes during construction or where appreciable errors are found in the contract quantity. The revision or correction will be computed and added to or deducted from the contract quantity.

**4.0 Basis of Payment.** The accepted quantity of ADA compliant curb ramps will be paid at the contract unit price for the following items:

Pay Item Number	Type / Description	Unit
608-10.12	Truncated Domes	SF
608-99.02	ADA Curb Ramp	Each

Q. Median Island Cut-Throughs – St. Louis District Version 10-18-23

**1.0 Description.** This work shall consist of providing a median or median island cut-through that is compliant with current Americans with Disabilities Act (ADA) and MoDOT guidelines at locations shown on the plans and as directed by the Engineer.

**2.0 Construction Requirements.** The contractor shall be responsible for removing the existing median and if necessary, the existing pavement and base prior to installing the new cut-through as shown in the plans and as per Section 608 in both the Standard Plans and Standard Specifications. If new pavement/sidewalk is to be installed, it shall be minimum 7" Concrete Sidewalk on a 4" Type 5 Aggregate Base with new median island doweled into this new sidewalk. Truncated domes installed within the island or median cut-throughs shall be placed flush with the face of the curb/island.

**2.1 ADA Ramps.** If there is an actual ramp that provides access to the raised portion of the island or median instead of cutting through a portion of the island or median, then that area of concrete will be paid for separately as an ADA Curb Ramp, per each, and not per quantities noted below.

**2.2 Cross Slope through Cut-Throughs.** The contractor shall meet ADA requirements regarding cross slope through the cut-through.

**3.0 Method of Measurement.** Final measurement will not be made except for authorized changes during construction or where appreciable errors are found in the contract quantity. The revision or correction will be computed and added to or deducted from the contract quantity for each item listed in the Basis of Payment.

**4.0 Basis of Payment.** Payment for furnishing and installing a new median or median island cut-through shall include all excavation, base compaction, saw cuts, removal of existing pavement and median island, new sidewalk and base, new median island, new truncated domes, and all materials, equipment, tools, labor, and work incidental thereto, and shall be considered to be completely covered by the contract unit price for items listed below as indicated in the plans.

Pay Item Number	Type / Description	Unit
304-05.04	Type 5 Aggregate for Base (4 In. Thick)	S.Y.
608-10.00	Concrete Median	S.Y.
608-10.12	Truncated Domes	S.F.

R. Mailboxes

**1.0 Description.** Removal, temporary mounting, and resetting of mailboxes shall be handled in accordance with Sec 104.10. Mailboxes are to be reset as noted on the plans.

**2.0 Basis of Payment.** No direct payment will be made to the contractor to recover the cost of equipment, labor, materials, or time required for the temporary mounting, removal, relocation, or replacement of mailboxes or supports.

S. Access to Commercial and Private Entrances

**1.0 Description.** While working on entrances or adjacent properties, the contractor shall make every reasonable effort to minimize any interference to the properties and to complete the work diligently. Under no circumstances shall the contractor block ingress/egress to and from businesses during the normal business hours of each business unless as approved by the property owner and engineer.

**2.0 Construction Requirements.** On all entrances, the contractor shall keep one-half of the entrance open at all times. On narrow entrances it may be necessary for the contractor to provide temporary aggregate to provide access to the property. The contractor shall remove and dispose of the temporary aggregate following completion of the entrance. For properties with more than one entrance the contractor may construct one entire entrance at a time with the approval of the property owner and the engineer.

**2.1 Commercial Entrances at Parcel 6 and 7.** The contractor shall construct each of the entrances on Parcel 6 and Parcel 7 a half at a time. The contractor shall not work on both entrances at the same time.

**3.0 Basis of Payment.** No direct payment will be made to the contractor for any expenses incurred for compliance with this provision.

T. Removal and Delivery of Existing Signs JSP-12-01C

**1.0 Description.** All Commission-owned signs removed from the project shall be disassembled, stored, transported, and disposed of as specified herein. Sign supports, structures and hardware removed from the project shall become the property of the contractor.

**2.0 Disassembly and Delivery.**

**2.1** All Commission-owned signs, (excluding abandoned billboard signs), designated for removal in the plans, or any other signs designated by the Engineer, shall be removed from the sign supports and structures, disassembled, stored, transported, and delivered by the contractor to the recycling center for destruction.

**2.2** The contractor shall coordinate and make arrangements with the recycling center for delivery of the signs. Sign panels shall be disassembled and/or cut into sizes as required by the recycling center.

**2.3** The contractor shall provide the Engineer with a "Sign Delivery Certification" attesting to completion of delivery of all existing sign material from the project to the recycler. In addition, the contractor shall provide to the Engineer a final "Sign Certification of Destruction" from the recycler that documents the total pounds of scrap sign material received from the project and attests that all such material will not be re-purposed and will be destroyed in a recycling process. The contractor can locate the required certification statements from the Missouri Department of Transportation website:

<https://www.modot.org/forms-contractor-use>

**2.4** Funds received from the disposal of the signs from the recycling center shall be retained by the Contractor.

**3.0 Basis of Payment.** All costs associated with removing, disassembling and/or cutting, storing, transporting, and disposing of signs shall be considered as completely covered by the contract unit price for Item No. 202-20.10, "Removal of Improvements", per lump sum.

**U. Sign Removal and Relocation**

**1.0 Description.** Existing signs and posts shall be either relocated or reinstalled at various locations as shown in the plans due to grading work.

**1.1** The contractor shall exercise reasonable care in the handling of the signs and posts during relocation. Should any sign or post be damaged due to the contractor's negligence, it shall be replaced in kind at the contractor's expense. The engineer shall have the final determination on whether the said sign equipment should be replaced or repaired.

**2.0 Basis for Payment.** All costs associated with compliance with this special provision for all material, equipment, labor, or any other incidental items shall be completely covered by the contract unit price for:

Item No.	Type	Description
903-99.02	Each	Sign Removal and Relocation

**V. Modified Bonded Asphaltic Concrete Pavement NJSP-15-11C**

**1.0 Description.** This work shall consist of the placement of a Polymer Modified Emulsion Membrane (PEM) or Cationic Modified Emulsion Membrane (CPEM) prior to a bituminous overlay of hot asphaltic concrete pavement. At the contractor's option, the contractor may replace the PEM/CPEM with a Performance Graded (PG) Asphalt Binder prior to a bituminous overlay of hot asphaltic concrete pavement. The PEM/CPEM or PG Asphalt Binder shall be spray applied prior to the application of the hot asphaltic concrete pavement so as to produce a homogeneous surface in accordance with Secs 401, 402, or 403.

**2.0 Materials.** All materials shall be in accordance with Division 1000, Material Details, and specifically as follows:

Item	Section
Polymer Modified Emulsion Membrane (PEM or CPEM)	1015.20.6.2
Performance Graded (PG) Asphalt Binder	1015.10

The PG Asphalt Binder shall be modified to meet the following performance parameters. The test results shall be submitted to the engineer for approval at least 30 days prior to use. The PG binder component shall account for at least 95% of the total product composition by volume.

Parameters*	Test Method	Min	Max
No-Pick-Up Time for Tack Coats; minutes	MoDOT TM 87	-	5
Average Bond Strength; psi	MoDOT TM 88 or alternate method	75	-
Elastic Recovery, percent	AASHTO T 301	60	-

\*The PG Asphalt Binder product shall exhibit a laboratory "no-pick-up" time of 5 minutes or less per MoDOT TM-87. The PG Asphalt Binder product shall exhibit laboratory bond pull-off strengths (average of three test specimens) of a minimum of 75 psi in accordance with MoDOT TM-88 method or other approved research test methods at the target application rate prescribed within this specification. The elastic recovery may be waived if the product has proven performance in cold weather climates with freeze/thaw conditions.

**3.0 Construction Requirements.** The PEM/CPEM or PG Asphalt Binder shall be applied in accordance with Sec 407 except as modified herein.

**3.1 Coldmilled Surfaces.** All coldmilled surfaces shall be thoroughly cleaned with air blowing, air vacuuming, or other approved methods resulting in a cleaned surface free of all dust, loose material, grease, or other foreign material at the time the tack is applied to the satisfaction of the engineer. Historically, conventional sweeping equipment has not produced satisfactory results and will not be acceptable as the sole operation. .

**3.2 Requirements of Polymer Modified Emulsion Membrane (PEM or CPEM).**

**3.2.1 Equipment.** No wheel, track or other part of the paving machine or any hauling equipment shall come in contact with the PEM/CPEM before the asphaltic concrete pavement mixture is applied.

**3.2.2 Application.** The target application rate of the PEM/CPEM shall be 0.20 gallons per square yard. The application rate shall be within +/- 0.02 gallons per square yard of the target application rate during construction. The average application rate used within the entire areas of the job limits shall be within +/- 1% of the target application rate. The PEM/CPEM shall be sprayed at a temperature of 120 - 180°F. The sprayer shall accurately and continuously monitor the application rate and provide a uniform coverage across the entire width to be overlaid.

**3.2.2.1** The application rate of the PEM/CPEM shall be verified by dividing the volume (of PEM/CPEM used) by the area of paving for that day.

**3.2.2.2** No water shall be added to the PEM/CPEM.

**3.3 Requirements of Performance Graded (PG) Asphalt Binder**

**3.3.1 Equipment.** The PG Asphalt Binder product shall be applied with an asphalt distributor that has been properly cleaned and set-up specifically for use of hot applied PG Asphalt Binder products. The distributor shall have the full circulating and heating capabilities in the tank and a heated spray bar.

**3.3.2 Application.** The target application rate of the PG Asphalt Binder shall be 0.15 gallons per square yard. The application rate shall be within +/- 0.02 gallons per square yard of the target application rate during construction. The average application rate used within the entire area of the job limits shall be within +/- 1% of the target application rate.

**3.3.3 Non-Tracking.** The PG Asphalt Binder shall be modified to be non-tracking that does not stick to the tires, tracks or other parts of paving equipment or vehicles such that the surface to be overlaid becomes visible or void of tack prior to the placement of the asphaltic concrete pavement mixture. A test strip using the PG Asphalt Binder product of 200 feet long (maximum) shall be applied to the roadway. After application, the PG Asphalt Binder shall be non-tracking within 10 minutes or less. If the test strip exhibits unacceptable tracking, then work shall cease until the PG Asphalt Binder product is either reformulated, switched to a different PG Asphalt product, or a spray paver application method is utilized. The test strip shall be conducted until satisfactory results are achieved.

**3.3.4 Safety.** Proper storage, handling, and application guidelines shall be followed carefully in accordance with the product manufacturer. A copy of this information shall be provided to the

engineer. The information shall include the application temperature range, maximum allowable temperature for the product, and the particle charge.

**3.3.4.1** Safety procedures of all products shall be addressed in the contractor's safety plan and a pre-construction meeting shall be held with the employees involved with the construction of the asphalt overlay to address all safety procedures, protocols, and personal protective equipment (PPE) of hot applied PG Asphalt Binder prior to application.

**4.0 Method of Measurement.** Measurement of the Polymer Modified Emulsion Membrane or PG Asphalt Binder shall be based on the volume in gallons in accordance with Sec 1015. No measurement will be made for cleaning the underlying pavement.

**5.0 Basis of Payment.** The accepted quantity of Polymer Modified Emulsion Membrane (PEM/CPEM) or PG Asphalt Binder shall be paid for at the contract unit price for 407-99.12, Misc. Modified Bonded Asphaltic Concrete Pavement, per gallon. No direct payment will be made for cleaning the coldmilled surface. All costs for cleaning shall be considered incidental to the cost of coldmilling pavement, as provided elsewhere in this contract.

W. Optional Pavements JSP 06-06H

**1.0 Description.** This work shall consist of a pavement composed of either Portland cement concrete or asphaltic concrete constructed on a prepared subgrade. This work shall be performed in accordance with the standard specifications and as shown on the plans or established by the engineer.

**2.0** The quantities shown reflect the total square yards of pavement surface designated for each pavement type as computed and shown on the plans.

**2.1** No additional payment will be made for asphaltic concrete mix quantities to construct the required 1:1 slope along the edge of the pavement, or for tack applied between lifts of asphalt.

**2.2** No additional payment will be made for aggregate base quantities outside the limits of the final surface area as computed and shown on the plans. When A2 shoulders are specified, payment for aggregate base will be as shown on the plans.

**2.3** The grading shown on the plans was designed for the thinner pavement option as indicated on plans. For projects with grading in the contract, there will be no adjustment of the earthwork quantities due to adjusting the roadway subgrade for optional pavements.

**2.4** The contractor shall comply with Sections 401 through 403 for the asphalt option and Sections 501 and 502 for the concrete option.

**2.5** Pavement options composed of Portland cement concrete shall have contrast pavement marking for intermittent markings (skips), dotted lines, and solid intersection lane lines. The pavement markings shall be in accordance with Section 620. No additional payment will be made for the contrast pavement markings.

**3.0 Method of Measurement.** The quantities of concrete pavement will be measured in accordance with Section 502.14. The quantities of asphaltic concrete pavement will be measured in accordance with Section 403.22.

**4.0 Basis of Payment.** The accepted quantity of the chosen option will be paid for at the contract unit bid price for Item 401-99.05, Optional Pavement, per square yard.

**4.1** For projects with previously graded roadbeds, any additional quantities required to bring the roadway subgrade to the proper elevation will be considered completely covered by the pay item for Subgrading and Shouldering.

**4.2 Price Adjustment for Fuel.** If the contractor accepts the option for fuel adjustment in the bid proposal, a fuel adjustment will be applied in accordance with Sec 109.14 for the type of pavement constructed.

X. Geosynthetic Interlayer Specification for Highway Applications JSP-04-01

**1.0 Description.** This work shall consist of furnishing and placing a geosynthetic interlayer within the pavement structure as shown on the plans or directed by the engineer. The geosynthetic interlayer shall provide a moisture barrier/stress relieving membrane and shall be placed beneath a hot-mix asphalt (HMA) overlay.

**2.0 Material.**

**2.1 Geosynthetic Interlayer.** The geosynthetic interlayer shall consist of geosynthetic material, saturated with asphalt binder.

**2.1.1 Geosynthetic Material.** The geosynthetic material shall be of the system specified on the plans and in accordance with Appendix A: Geosynthetic Material.

**2.1.2 Tack Coat.** The tack coat material for the geosynthetic material shall be a PG 64-22 asphalt binder, unless the manufacturer of the geosynthetic material recommends a higher performance grade asphalt binder. The asphalt binder shall be in accordance with Sec 1015. No emulsions will be allowed.

**2.2 Clean Sand.** Clean sand shall be sand meeting Sec 1005.2 or a washed sand meeting the approval of the engineer.

**3.0 Equipment.** Equipment used to place the asphalt tack on the geosynthetic material, to install the geosynthetic material or to roll the geosynthetic material into the tack coat shall be in accordance with the manufacturer's recommendations.

**4.0 Construction Requirements.**

**4.1** The geosynthetic material shall be stored as per the manufacturer's recommendations in a dry covered condition free from dust, dirt and moisture.

**4.2** The geosynthetic material shall be installed in accordance with the manufacturer's specifications and this specification. Where a conflict exists between the specifications, the more stringent specification will apply. A copy of the manufacturer's specifications shall be provided to the engineer at the pre-construction meeting or no later than five working days prior to installation.

**4.3** A manufacturer representative shall be present, at minimum, for the first two days of installation of the geosynthetic interlayer and available thereafter upon request by the engineer.

**4.3.1** This requirement may be waived by the engineer under the following conditions:

(a) The contractor has been certified by the manufacturer for installation of the geosynthetic material.

(b) A copy of the written certification is provided to the engineer and the contractor certification is approved by the engineer prior to installation of any material.

**4.3.2** If a manufacturer representative has been waived in accordance with Section 4.3.1, the engineer will still maintain the right to require a representative to be present if the engineer deems it necessary due to poor installation practices by the contractor.

**4.4** The surface on which the geosynthetic material is to be placed shall be reasonably free of dirt, water, vegetation or other debris. The geosynthetic interlayer shall be placed on a drainable surface, and any rutting or low spots in the pavement shall be removed by milling or by the use of a leveling course as shown on the plans. Cracks exceeding 1/8 inch (3 mm) in width shall be filled with suitable crack filler. Potholes shall be properly repaired as directed by the engineer. Fillers shall be allowed to cure prior to placement of the geosynthetic material.

**4.5** Neither the asphalt binder nor the geosynthetic material shall be placed when weather conditions, in the judgement of the engineer, are not suitable. Air and pavement temperatures shall be sufficient to allow the tack coat to hold the geosynthetic material in place. The air temperature shall be 50 F (10 C) and rising for placement of the asphalt tack coat.

**4.6** The specified application rate of tack coat shall be sufficient to satisfy the asphalt retention properties of the geosynthetic material and to bond the geosynthetic material and HMA overlay to the existing pavement.

**4.7** Application of the tack coat shall be by a calibrated distributor truck spray bar. Hand spraying, squeegee and brush application will only be allowed where the distributor truck does not have room to operate and shall be kept to a minimum. Temperature of the tack coat shall be sufficiently high enough to permit uniform spray pattern and shall be at minimum 290 F (145 C). To avoid damage to the geosynthetic material, distributor tank temperatures shall not exceed 325 F (163 C).

**4.8** The target width of the tack coat application shall be the geosynthetic material width plus 6 inches (150 mm). Tack coat application shall be wide enough to cover the entire width of geosynthetic material overlaps. The tack coat shall be applied only as far in advance of the geosynthetic material installation as is appropriate to ensure a tacky surface at the time of the geosynthetic material placement. Traffic shall not be allowed on the tack coat.

**4.9** The geosynthetic material shall be placed onto the tack coat with minimum folds or wrinkles and before the tack coat has cooled and lost tackiness. As directed by the engineer, wrinkles or folds in excess of 1 inch (25 mm) shall be slit and laid flat or pulled out and replaced. In these repaired areas, additional tack coat shall be applied as needed to achieve a sound bond to the substrate. Damaged geosynthetic material shall be removed and replaced, per the manufacturer's recommendations, at the contractor's expense with the same type of material.

**4.10** Overlap of geosynthetic material joints shall be sufficient to ensure full closure of the joint, but shall not exceed 6 inches (150 mm). Transverse joints shall be lapped in the direction of

paving to prevent edge pickup by the paver. A second application of tack coat shall be placed beneath the overlapping geosynthetic material to ensure proper bonding of the double material layer.

**4.11** Brooming, squeegee or pneumatic rolling shall be used to remove any air bubbles and to maximize geosynthetic material contact with the pavement surface and shall be done in accordance with the manufacturer's specifications and to the satisfaction of the engineer.

**4.12** Excess tack coat that bleeds through the geosynthetic material shall be removed by broadcasting clean sand or other material approved by the engineer on the geosynthetic interlayer. Broadcasting of clean sand may also be used to facilitate movement of equipment during construction, to prevent tearing or delamination of the geosynthetic material or to prevent pickup by the paving machine. If sand or other approved material is applied, any excess material shall be removed from the interlayer prior to placing the HMA overlay. Scattering loose HMA mix out in front of the paver tires will also be permissible. No other material, such as asphalt release agents or diesel, shall be used for this purpose.

**4.13** No traffic, except necessary construction traffic or emergency vehicles, shall be driven on the geosynthetic interlayer, unless approved by the engineer. If traffic on the interlayer is approved by the engineer, clean sand shall be lightly broadcasted over the geosynthetic interlayer, and any loose sand shall be removed prior to paving.

**4.14** Placement of the first lift of the HMA overlay shall closely follow placement of the geosynthetic interlayer. All areas in which the geosynthetic interlayer has been placed shall be paved during the same day, unless approved otherwise by the engineer. In the event of rainfall on the geosynthetic interlayer prior to the placement of the first HMA overlay lift, the geosynthetic interlayer shall be allowed to dry before the HMA is placed. The compacted thickness of the first lift of the HMA overlay on the geosynthetic interlayer shall not be less than 1.5 inches (38 mm), and the temperature of the mix at placement shall not exceed the geosynthetic material melting point temperature, unless approved otherwise by the engineer. Approval by the engineer may be based upon a test strip or evaluation of the material when taking QC/QA cores. Where the total HMA overlay thickness is less than 1.5 inches (38 mm), geosynthetic material shall not be placed.

**5.0 Method of Measurement.** Measurement for furnishing and installing the geosynthetic interlayer will be made to the nearest square yard (m<sup>2</sup>) of pavement specified to be covered.

**6.0 Basis of Payment.** The accepted quantities of geosynthetic interlayer will be paid for at the unit price for each of the pay items included in the contract.

403-99-05	1.0	SQUARE YARDS	SYSTEM B (COMPOSITE GRID)	GEOSYNTHETIC PAVING	INTERLAYER FABRIC/REINFORCING
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### **Appendix A: Geosynthetic Material**

**1.0 Scope.** This specification covers geosynthetic material, which is to be saturated with asphalt binder to form a geosynthetic interlayer, for use as a moisture barrier and a stress relieving membrane within the pavement structure.

**2.0 Acceptance.** Acceptance of the material will be based on the manufacturer's certification and upon the results of such tests as may be performed by the engineer.

### 3.0 Material.

**3.1 System A Geosynthetic Material.** System A shall be a non-woven paving fabric composed of 85 percent or more polyolefin, polyester or polypropylene fibers. The paving fabric shall meet the following requirements:

Property	Test Method	Requirements <sup>a</sup>
Grab Strength	ASTM D 4632	100 lbs. (450 N)
Ultimate Elongation	ASTM D 4632	≥50 %
Weight (Mass) per Unit Area	ASTM D 5261	4.0 oz./s.y. (135 g/m <sup>2</sup> )
Asphalt Retention <sup>b, c</sup> , Min.	ASTM D 6140	0.20 gal./s.y. (0.9 l/m <sup>2</sup> )
Melting Point, Min.	ASTM D 276	300 F (150 C)

<sup>a</sup> All numeric values shall represent Minimum Average Roll Values (MARV) in the weaker principle direction.

<sup>b</sup> The asphalt binder retention value shall be the amount required to saturate the paving fabric only. Asphalt retention shall be provided in the manufacturer's certification. Numerical value does not indicate the asphalt application rate required for construction.

<sup>c</sup> Product asphalt retention property shall meet the specified MARV value.

**3.2 System B Geosynthetic Material.** System B shall be a composite paving fabric consisting of paving fabric bonded to a reinforcement grid. The paving fabric shall be in accordance with Section 2.1. The reinforcement grid shall be either an epoxy or elastomeric polymer coated glass fiber structural grid. The composite shall be in accordance with the following physical properties:

Properties	Test Method	Requirement
Grid Tensile Strength <sup>a</sup>	ASTM D 6637	560 lbs/in.(100 kN/m)
Grid Elongation at Break	ASTM D 6637	< 5 %
Grid Junction Strength <sup>b</sup>	GSI/GG-2	15 lbs. (67 N)
Grid Melting Point, Min.	ASTM D 276	425 F (218 C)
Aperture Size, Max., MD/XD <sup>c</sup>	- -	1.02/1.2 in. (26/30 mm)
Peel Strength, Fabric to Grid	ASTM D 413	10 lbs/ft (146 N/m)

<sup>a</sup> All numeric values shall represent MARV in the weaker principle direction.

<sup>b</sup> Tested with grid attached to the paving fabric.

<sup>c</sup> Shall be centerline to centerline, where MD = machine direction and XD = cross-machine direction.

**3.3 System C Geosynthetic Material.** System C shall be a geotextile paving mat composed of 50 percent or more fiberglass fibers. The paving mat shall meet the following requirements:

Properties	Test Method	Requirement <sup>a</sup>
Breaking Strength, Min.	ASTM D 5035	45 lbs/2 in. (200 N/50 mm)
Ultimate Elongation.	ASTM D 5035	< 5 %
Weight (Mass) Per Unit Area, Min.	ASTM D 5261	4.0 oz./s.y. (136 g/m <sup>2</sup> )
Asphalt Retention <sup>b, c</sup> , Min.	ASTM D 6140	0.20 gal./s.y. (0.9 l/m <sup>2</sup> )
Melting Point, Min.	ASTM D 276	400 F (205 C)

<sup>a</sup> All numeric values shall represent MARV in the weaker principle direction.

<sup>b</sup> The asphalt binder value shall be the amount required to saturate the paving fabric only. Asphalt retention shall be provided in the manufacturer's

certification. Numerical value does not indicate the asphalt application rate required for construction.

° Product asphalt retention property shall meet the specified MARV value.

**4.0 Prequalification.** Prior to approval and use of this material, the manufacturer shall submit to Construction and Materials a certified test report showing specific test results from an independent laboratory in accordance with all requirements of these specifications. The certified test report shall contain the manufacturer's name, brand name of material, lot tested and date of manufacture. In addition, the manufacturer shall submit a one square yard (m<sup>2</sup>) sample for laboratory testing accompanied by a technical data sheet and an MSDS. New certified test results and samples shall be submitted any time the manufacturing process or the material formulation is changed and may be required when random sampling and testing of material offered for use indicates nonconformity with any of the requirements specified. Those products that have been prequalified can be found in [Field Section 1011 Table 2](#) and may be used on projects upon acceptance of the material in accordance with Section 5.0.

**5.0 Certification.** The contractor shall furnish a manufacturer's certification to the engineer for each lot of material furnished stating the name of the manufacturer, the chemical composition of the filaments or yarns and certifying that the material supplied is in accordance with this specification. The certification shall include or have attached typical results of tests from specific lots for all specified requirements.

**5.1** The manufacturer shall be responsible for establishing and maintaining a QC program to assure compliance with the requirements of this specification. Documentation describing the QC program shall be made available to the engineer upon request.

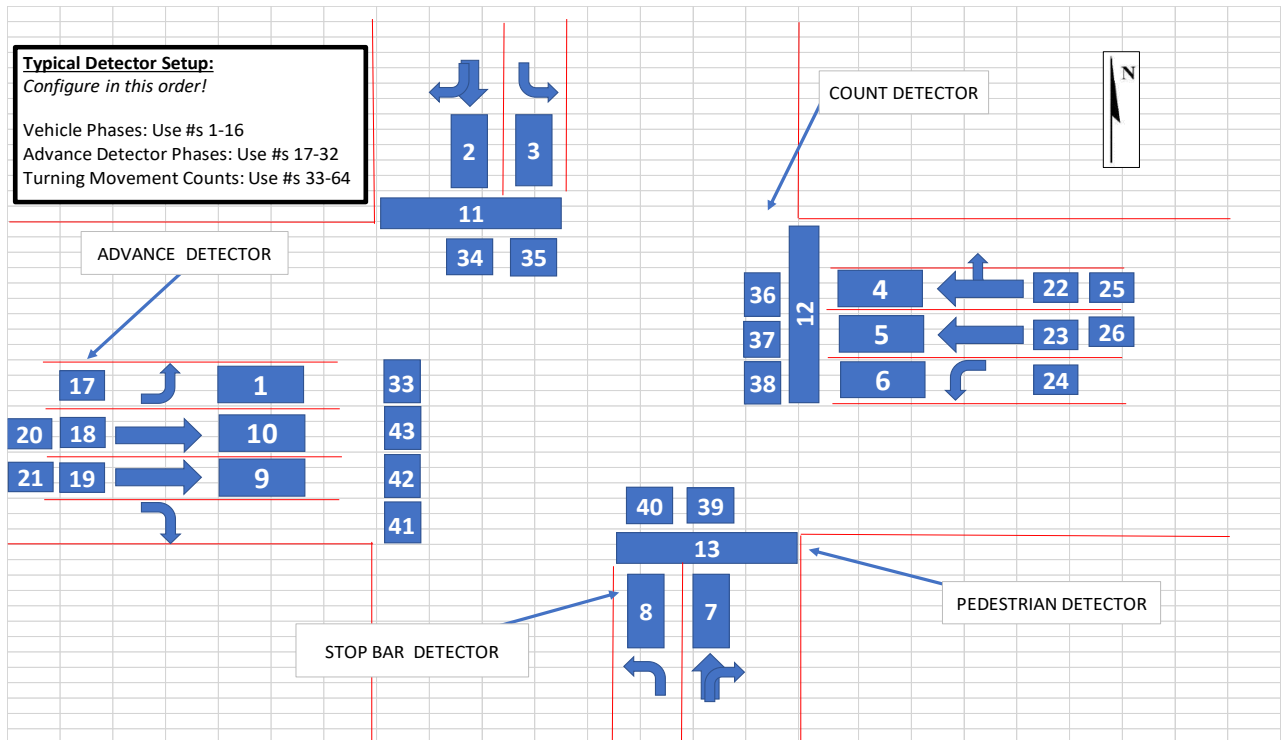
**5.2** The manufacturer's certificate shall state that the furnished material meets MARV requirements as evaluated under the manufacturer's QC program. A person having legal authority to bind the manufacturer shall attest to the certificate.

Y. SL District Traffic Signal Detection System

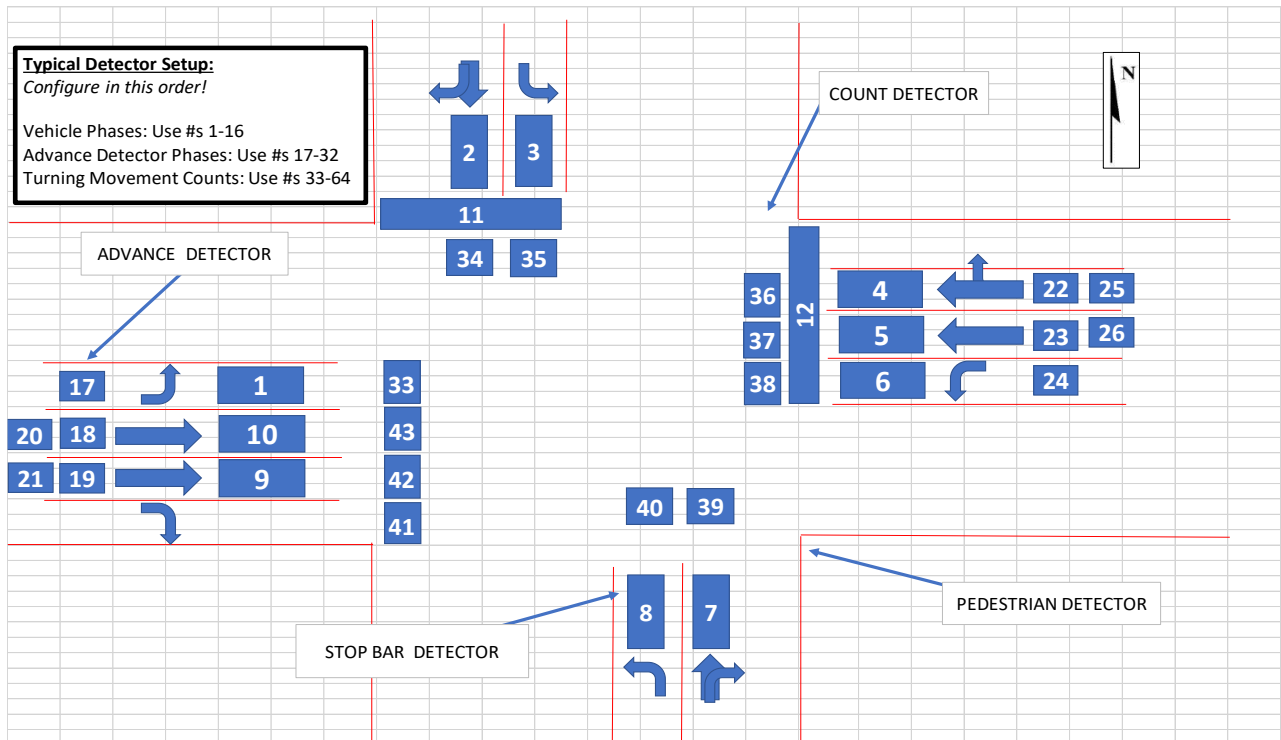
**1.0 Description.** This work shall consist of providing detectors for signalized installations that will support advance traffic signal performance measures (ATSPM) on the Commission's St. Louis District roadways. Detectors shall be in accordance with the Missouri Standard Specifications for Highway Construction (latest version) and installed to provide detection at locations as shown on the plans or as directed by the Engineer in accordance with Section 902. If any information conflicts between Section 902 and this JSP, the JSP shall supersede.

**2.0 Detector Zones.** The following detector zones shall be placed as shown in the plans:

- Stop Bar Detection
- Advance Upstream (Performance Measures)
- Dilemma Zone
- Turn Counts
- Advance Video Zones (if applicable)
- Radar Zones (if applicable)
- Advance Data Collector (if applicable)
- Bicycle/Pedestrian (see Section 2.2)



**US 61/67 and St. Johns Church Road**



**US 61/67 and Miller Road East**

**2.1 Dilemma Zones.** Dilemma zone detection shall be required for the following approaches for high speed dilemma zone detection:

**NB and SB US 61/67 @ St. Johns Church Road**  
**NB and SB US 61/67 @ Miller Road**

Dilemma zone detectors shall be placed at 5 secs and 8 seconds travel time before stop bar per below Table unless directed otherwise in the plans or by the Engineer.

Approach Speed (MPH)	Advance Detector Placement 5 secs Travel time	Advance Detector Placement 8 seconds travel time
35 mph	260	415
40 mph	295	470
45 mph	330	530
50 mph	370	590
55 mph	405	645
60 mph	440	705

**2.2 Bicycle/Pedestrian Zones.** Bicycle and/or pedestrian zones (if applicable) shall be provided as directed by the Engineer. Specific zone placement and description as required by vendor shall be reviewed and approved by the Engineer.

**3.0 Performance Measures.** In addition to presence detection, the detection system shall be capable of providing data to an advanced traffic signal controller that can perform at a minimum the following calculations in real time for each detection zone without the addition of another device:

- Speed
- Volume
- Lane Occupancy
- Vehicle Classification
- Other available performance measures

For speed calculations thru movements are required for all detection installations. Turning movement measurements are required for all detection installations. For volume measurements/calculations both mainline thru and all turning movements are required. All values are to be assigned to detector channels within the controller. Other performance measures must be clearly defined. In all cases all performances measures must be ultimately available in an easily usable, exportable format. Turning movement counts shall be installed per the detector setup diagram(s) above to include all lanes. The Contractor shall provide documentation to the Engineer to confirm the volumes are configured and operational through the detection system. The Contractor shall also provide a final schedule of detector assignments in the .pdf format to the Engineer and the Commission's signal maintenance supervisor. Performance measurement data must be configured and fed into the Commission's ATSPM platform with data storage confirmed, see Section 5.0. If utilized on the project, the Contractor's Traffic Engineer shall assist in this task.

**4.0 Material.** The Contractor can choose from the following list of detector types according to the exceptions noted below:

- Induction Loop
- Video Image

- Radar

Reference each detection type's subsection for specific allowable models. Unless otherwise specified on the plans, the Contractor may supply more than one type of detector and customize the installation based on field conditions, as approved by the Engineer.

**4.1 Induction Loops.** Induction loops, if selected, shall be in accordance with the Missouri Standard Specifications for Highway Construction (latest version) and shall be installed to provide detection at locations as shown on the plans or as directed by the Engineer in accordance with Section 902. Detector channels shall be assigned as per the layout in this JSP or as directed by the Engineer.

**4.2 Video Detection.** If video detection is selected, the following provisions shall also apply.

**4.2.1 Description.** The Contractor shall furnish and install all equipment, materials, software and other miscellaneous items that are required to provide a fully functional Video Detection System for the control of vehicular and pedestrian traffic signals.

**4.2.2 Material.** The video detection system shall consist of power supply, hard-wired video cameras, all necessary video and power cabling with end connectors, mounting brackets, surge protection as recommended by the manufacturer, video detection processors/extension modules capable of processing the number of camera and phase combination video sources shown on the project plans. The video detection system will be defined as the complete assembly of all required equipment and components for detection of vehicles. Each video detection system shall consist of the video camera(s), lightning arrester for video cabling, processor unit(s), control device (track ball or keypad; no mouse allowed), software and license for system control via a computer (if applicable), communication components, and a color monitor. The video detection system shall have the most current available firmware installed. All camera views shall be obtainable without requiring the disconnection and reconnection of cables within the system. The video detection systems in the list below are the only systems that are tested, fully functional, and approved for use in the St. Louis District.

- Autoscope Vision
- Iteris Vantage Next
- Aldis Gridsmart Smart mount Camera (Performance Module to be included)

**4.2.3 Installation Requirements.** The video detection system shall be installed per the manufacturer's recommendations. The installer shall be certified by the video detection system's manufacturer to install the system. All CAT5 cable runs (if used) shall be continuous without splice from the cabinet to the camera. If requested by the engineer, a factory certified representative from the supplier shall be available for on-site assistance for a minimum of one day during installation. The bottom of the video camera shall be mounted per the manufacturer's recommendations, unless otherwise indicated on the plans or approved by the Engineer. The video detection system shall not be installed on pedestal signal unless otherwise directed by the Engineer. The video detection system shall not be installed on a 15' luminaire arm unless otherwise directed by the Engineer.

A separate grounded 120 VAC service outlet shall be provided in the controller cabinet for supplying power to the parts of the video detection system requiring AC power. Use of the grounded service outlet located on the cabinet door will not be permitted. The video detection system must integrate/be compatible with an Advanced Transportation Signal Controller (ATC).

The Contractor shall also be advised that if the Iteris Vantage Next video detection system is selected for locations utilizing existing signal cabinets, the Contractor shall also procure an upgraded power supply for the video detection system per the Manufacturer's recommendations.

**4.2.4 Detection Zones.** The detection zones shall be created by drawing the detection zones on the video image. A graphical user interface shall be built into the video detection system and displayed on a video monitor or computer. It shall be possible to edit previously defined detector configurations to fine-tune detection zone placement. When a vehicle is detected by crossing a detection zone, there shall be a visual change on the video display, such as a flashing symbol or a change in color or intensity to verify proper operation of the video detection system.

**4.2.5 Performance.** Overall performance of the video detection system shall be comparable to inductive loops. Using camera optics and in the absence of occlusion, the video detection system shall be able to detect vehicle presence with 98% accuracy under normal day and night conditions with only slight deterioration in performance under adverse weather conditions, including fog, snow and rain. When visibility exceeds the capabilities of the camera, the video detection system shall default to placing a call on all detectors. Supportive documentation is required to meet this specification and shall be provided to the Engineer before installation.

**4.2.6 Monitor.** The monitor shall be an LCD active matrix with a minimum 7" diagonal screen color monitor, an NTSC-M system and BNC video in-out connections built into the housing. The unit shall be compact and lightweight, securely mounted to the cabinet shelving, have low power consumption, constructed to operate under extreme temperature conditions, and run on AC power. AC adaptor shall be included. The monitor shall be installed to automatically power on when the cabinet door is opened and automatically power off when the cabinet door is closed. A manual on/off switch shall be provided.

**4.2.7 Video Camera and Housing.** The camera shall produce a color video image of vehicles during daylight hours, with an optional production of black and white images during nighttime hours. The video shall produce a clear image for scenes with a luminance from a minimum range of 0.18 to 929 foot-candles (2.0 to 10,000 lux). The camera shall provide a minimum resolution of 430 lines horizontal (TVL) and 350 lines vertical under NTSC operation. The camera shall include an electronic shutter or auto iris control based on average scene luminance and shall be equipped with an auto iris lens. sun shield that prevents sunlight from directly entering the lens. The sun shield shall include a provision for water diversion to prevent water from flowing in the camera field of view and shall be able to slide forward and back.

**4.2.8 Video Detection System Connections.** All bus connections in the video detection system shall be corrosion resistant. Serial communications to a computer shall be through an RS-232/RS-422 serial port through a subminiature "D" connector with a computer running supplied system software. The port shall have the capability to access detection system data as well as the real-time imagery needed to show detector actuations. The processor shall have a RJ-45 plug using Ethernet 10/100 protocols. The equipment shall be provided with either a NEMA TS1 or NEMA TS2 interface as shown on the plans.

For TS2 systems, the video detection system shall be equipped with a TS2 Type 1 detector interface, where detector information is transmitted serially via an RS-485 data path. A 15-pin subminiature "D" connector, meeting the requirements of the TS2 standard, shall be used for the serial detector output. A minimum of 32 detector outputs is required, with the capability of expansion to 64 outputs if required based on the design plans.

The contractor shall be responsible for any changes or additions to either an existing or new cabinet in order to provide a properly functional video detection system and monitor display. This may include, but is not limited to, additional SDLC connectors, an MMU (malfunction management unit), shelf relocation and component reorganization. No direct pay for any changes or additions. All required connections will be considered part of the video detection system installation.

**4.2.9 Documentation.** The contractor shall provide one bound copy and one electronic version (.pdf format) of the user's manual.

**4.3 Radar Detection.** If radar detection is selected, the following provisions shall also apply.

**4.3.1 Description.** Provide, install and test continuous tracking advance detector (CTAD) units and cabinet interface to detect range, speed, and vehicle estimated time of arrival (ETA) to the stop bar for vehicles or clusters of vehicles moving in the user selected direction of travel. The CTAD shall also detect instantaneous roadway efficiency. This specification sets forth the provisions for a radar detection system that detects vehicles, pedestrians, bicycles, and motorcycles on roadways and provides vehicle presence and full-motion tracking.

#### **4.3.2 Material**

**4.3.2.1 Stop Bar Detector.** The radar detection systems in the list below are the only systems approved for use in the St. Louis District. Installation of radar detection systems shall follow both the below specifications and the manufacturer's instructions.

- WAVETRONIX SmartSensor
  - Matrix

Provide a radar detection system with the following features.

- Shall be able to track/detect a minimum of 64 objects
- Shall be able to operate in a temperature range between -30 degrees and 165 degrees F
- The detection zones shall be configurable based off several factors' such as classification, ETA, speed, presence, and delay.
- The radar sensor shall be forward fire
- The sensor shall operate in the 25 GHz band
- The sensor shall be housed in a sealed IP-67 enclosure

**4.3.2.2 Advance Detector.** The radar detection systems in the list below are the only systems approved for use in the St. Louis District. Installation of radar detection systems shall follow both the below specifications and the manufacturer's instructions.

- WAVETRONIX SmartSensor
  - Advance
  - Advance Extended
- Iteris Vector
- In addition to the specifications listed in Section 4.3.2.1, the detection range shall also cover the dilemma zone distances prescribed in section 2.1.

#### **4.3.2.3 Power and Communications.**

- Power and communications cabling shall be installed per manufacturer specifications
- The radar sensor shall operate at 24 VDC
- Power consumption shall be no more than 38 watts
- If required, the advance detection System shall include all equipment to communicate wirelessly.

**4.3.2.4 Contact Closure Card.** Any contact closure card shall be compatible with a NEMA detector rack and shall be installed per manufacturer specifications.

**4.3.2.5 Lightning Surge Protection.** The CTAD shall include surge protection hardware installed per manufacturer specifications. The hardware shall be accepted by the engineer before installation in the cabinet.

#### **4.3.3 Construction Requirements.**

**4.3.3.1 Mounting Location.** All mounting hardware shall be installed per manufacturers specifications. The CTAD shall be mounted as follows:

- at a height that is within the manufacturer's recommended mounting heights.
- The radar shall be positioned so that all detection zones needed for an approach can be captured.
- in a forward-fire position, looking towards either approaching or departing traffic.

**4.3.3.2 Induction Card Rack Interface.** {Install the contact closure card in the existing induction card rack} **or** {Install a 4-position induction card rack with power supply} and configure based on manufacturer's instructions to provide all needed detection outputs. Any power supply cards for the induction card rack needed for proper operation of the CTAD shall be provided and installed by the contractor.

**4.3.3.3 Support.** A factory certified representative from the supplier shall be available for on-site assistance for a minimum of one day during installation and shall provide two (2) days of local training after the CTAD has been installed and are operational.

**4.3.3.4 Acceptance Testing.** The contractor shall develop a proposed test procedure for the CTAD and submit it to the Engineer for approval. It must include visual verification of vehicle detections being received. Each detector shall be tested separately. Revise the proposed test procedure until it is acceptable to the Engineer. Provide all equipment and personnel needed to safely conduct the tests. Arrange for the Engineer's representative to witness the tests. Give the Engineer a report documenting the result of the tests.

#### **4.3.4 Documentation and Software.**

**4.3.4.1** Prior to purchasing the CTAD system, the contractor shall submit five copies of catalog cut sheets and the environmental testing results to the Engineer for approval.

**4.3.4.2** The contractor shall provide five copies of the operation and maintenance manuals for the CTAD system.

**4.3.4.3** Contractor shall provide one copy of the software and any cables needed to interface with the system.

**4.3.4.4** Contractor shall provide the CTAD installation kit, if applicable, to the Commission upon completion and acceptance of the project.

**5.0 Communication with Advanced Transportation Management System (ATMS).** The detection systems and all performance measure data should be fed directly into the Commission's current ATSPM platform (currently through TransSuite). All data must be online and verified by contractor to be fully operational and available for data output reporting via the Commission's ATSPM platform. In addition, the data storage for long-term storage use should be configured properly on the Commission's ATSPM platform. The Contractor shall be responsible for ensuring the firmware of all detection works with the Commission's ATSPM platform. If utilized on the project, the Contractor's Traffic Engineer shall assist in this task.

**6.0 Technical Support for Detection System.** The detection system(s) chosen for installation shall be free of defects in material and workmanship. For five (5) years, technical support from factory certified personnel or factory certified installers shall be available from the supplier. Ongoing software support by the supplier shall include updates for the processor unit and computer software and shall be provided at no cost during this two-year period. The update of the processor unit software to be NTCIP compliant shall be included. Detection system(s) must not be within 5 years of end of support or sale by manufacturer.

**7.0 Construction Requirements.** Construction requirements shall conform to Sec 902.

**8.0 Method of Measurement.** Method of measurement shall conform to Sec 902.

**9.0 Basis of Payment.** Measurement and payment for work covered by this specification shall include all equipment, materials, tools, labor, programming, testing, and documentation necessary to provide a detection system **per intersection** and shall be paid at the contract unit price as follows:

Item No.	Type	Description
902-99.02	Each	SL District Traffic Signal Detection System

Z. Traffic Signal Maintenance and Programming

**1.0 Description.** Traffic signal maintenance and timing for this project shall be in accordance with Section 902 of the Standard Specifications, and specifically as follows.

**2.0 Qualified Traffic Engineer**

**2.1** The contractor shall have an experienced traffic Engineer with a Professional Engineer's (PE) license in Missouri as well as a Professional Traffic Operations Engineer (PTOE) certification (hereafter referred to as "contractor's traffic Engineer") with the noted experience defined below. MoDOT shall approve the traffic Engineer prior to them being hired.

**2.2 Experience.** Any proposed contractor traffic Engineer shall be able to demonstrate personal successful previous experience in the following tasks:

**2.2.1 Response.** The contractor's traffic Engineer shall have the ability to be on site within 1 hour of being requested.

**2.2.2 Corridor Management:** Time/space diagram manipulation in order to successfully adjust offsets and splits for rapidly changing traffic demands.

**2.2.3 Controller Programming:** Ability to program by hand and by software Phase, TBC, and Coordination levels of Siemens controllers along with NTCIP-compatible controllers.

**2.2.4 Intersection Programming:** Implementation of adjusted and/or new timing plans as a result of changing traffic demand.

**2.2.5 Signal Software:** Use and understanding of both Siemens signal software and TransCore traffic control software.

**2.3** The contractor shall submit the names(s) of proposed traffic engineer(s) and the name(s) all of other personnel on their proposed staff along with detailed experience in all tasks outlined in Paragraph 2.2 above. The Engineer reserves the right to reject any contractor traffic engineer, before the start of work, who does not have sufficient experience or, at any point during the project, which does not satisfy the requirements set forth within this Job Special Provision. A list of potential traffic engineers shall be submitted for review to the Project Manager and the Commission's Traffic Engineers prior to bid.

**2.4 VPN Access.** The Commission operates the noted signals through a central signal system which is capable of remote adjustments to controller programming.

**2.4.1** The approved contractor's traffic Engineer and any staff assigned to manage the traffic signals during the project is encouraged to apply for VPN (Virtual Private Network) access with the Engineer once the project is awarded. If approved, the Engineer will assign a unique IP address to the contractor's traffic engineering staff, which will allow for remote access to the Commission's central signal control systems as appropriate and the ability to interface with the noted signals on this project.

### **3.0 Existing Traffic Signals and Communication System**

**3.1** The contractor shall notify the Engineer 3 weeks prior to the date of ramp bridge closure and detour implementation. The contractor shall meet with the Engineer's representatives to discuss their traffic mitigation plan at least 1 week before the date of the first closure and as needed between construction stages. Traffic mitigation plan should at a minimum include:

- Proposed Timing Plan changes and any models
- Anticipated locations of concern
- A map in electronic format displaying the locations and names of the signals and owning agency as detailed in Paragraphs 3.2 and 3.3 below.
- Other traffic mitigation efforts

**3.2** Once a ramp closure has been implemented by the contractor, the contractor shall then be solely responsible for the following signals' controller programming until completion of all closures necessary to complete the contractor's work. Maintenance at these locations for items other than controller programming issues or incidents caused by controller programming or other construction done by the contractor shall remain with the Commission. If any part of an existing

traffic signal or its controller within the limits of this project has otherwise been modified or adjusted by the contractor, or the contractor makes any roadway changes to reduce the traffic capacity through a signalized intersection within the limits of the project, or the contractor begins work at an intersection with signals already in operation, the contractor shall then be solely responsible for that signal's controller programming and all signal maintenance as specified in 902.2 and 902.3, except for power costs, until Final Acceptance of the project. Traffic signal maintenance and timing responsibilities shall be broken down in accordance with the below schedules:

**Signals Affected:**

US 61/67 @ St Johns Church Road  
US 61/67 @ Miller Road  
US 61/67 @ MO 231  
US 61/67 @ Richardson Road  
US 61/67 @ Rockport Heights Elementary School

**3.3** The Engineer shall provide to the contractor 2 weeks' notice an electronic report on the existing phasing and timing of each traffic signal, which may be the contractor's responsibility to program. The Engineer's representative shall be available to the contractor before any changes are made to a signal or controller to answer any questions about the report. In lieu of the report, the contractor's traffic Engineer may obtain this information from the appropriate agency's central signal control system. Once the contractor has modified a signal or controller for any reason, the contractor shall be solely responsible for the existing timing plans and all subsequent timing changes.

**3.4** The contractor shall notify the Engineer or representative of the changes no later than 1 working day after changes are programmed if unable to provide advance notice as specified in 902.2. In addition, the Contractor shall notify the Engineer and the Commission's Traffic Engineers within one (1) hour of successful implementation of the detour plan.

**3.5** The contractor shall be solely responsible for maintaining the coordination at any affected signal to the satisfaction of the Engineer or representative until completion of work as set forth in section 3.2 of this provision. Maintenance of coordination may include the synchronization of the affected controller's internal time clocks to the second using an atomic clock, or other means approved by the engineer. If time clock synchronization is used, the contractor shall verify all affected controllers are synchronized at least 1 time per week with a report to the Engineer or representative. This report will be in the form of a documentation record as spelled out in the Work Zone Traffic Management Plan.

#### **4.0 Existing Traffic Signal Maintenance and Response**

**4.1** The contractor shall respond to any signal timing complaints or malfunction complaints for those locations detailed in Section 3.0 of this provision and as specified in Section 902.21.1. Response time shall be 1 hour for complaints received by the contractor between 6 AM and 6 PM on non-holiday weekdays, and 2 hours for all other times. For some cases (due to travel times or other extenuating circumstances) additional time may be acceptable within reason, but must be approved by the engineer. These timeframes will replace the '24 hour' response time in Section 105.14 for any signal-related incidents, where the entire cost of the work, if performed by MoDOT personnel or a third party, will be computed as described in Section 108.9 and deducted from the payments due the contractor.

**4.2** The contractor must supply a contact name and phone number who will be responsible for receiving signal timing complaints for the Engineer. These complaints may be forwarded directly to the contractor by someone other than the Engineer's representative and will not relieve the contractor from properly responding based on the response times of this Provision. The contractor shall respond to the Engineer and notify the Commission's Traffic Engineers and the representative within 12 hours of the complaint as to the remedy. The contractor shall submit to the Engineer's representative a weekly report of complaints received and remedies performed throughout the duration of the project.

## **5.0 Original Signal Controller Programming and Acceptance**

**5.1** The contractor will be responsible for restoring the original signal controller programming at existing intersections and coordination plans for each intersection immediately upon ramp re-opening. The Engineer shall preserve and house the original controller files and provide the contractor with access to those files to perform the restoration of the original plans. Normal plan restoration can be done by a manual command in the signal control system or a preprogrammed time-of-day command change. For any locations rendered offline at the time of re-opening, these locations shall be returned to normal operation by hand. The Contractor shall notify the Engineer and the Commission's Traffic Engineers within one (1) hour of removal of the detour plans. The contractor will be relieved of signal programming maintenance at an existing restored intersection once 48 consecutive hours have passed without a programming malfunction, including restoring normal signal programming to the satisfaction of the Commission. If an agency desires any changes from an original plan, the agency will assume immediate maintenance of the signal to implement desired changes.

## **6.0 Post Project Report**

**6.1** The contractor shall submit to the Engineer a post project report, four to six weeks after the final signal adjustments have been completed. The report shall include at a minimum an observation report, summary of timing changes and locations, summary of complaints, and any other pertinent information regarding the contractor's efforts for managing these signal corridors in one electronic document.

## **7.0 Deliverables**

**7.1** All deliverables mentioned in this provision shall be submitted to the Engineer in a timely manner to the satisfaction of the Engineer prior to receiving full compensation for this work.

- Experience submittal
- Preliminary Traffic Mitigation Plan
- Notification of Detour Implementation
- Time Base Reports, As Needed
- Complaint Resolutions
- Notification of Restoration to Normal Operations
- Post Project Report

**8.0 Construction Requirements.** Construction requirements shall conform to Sections 902, 1061 and 1092.

**9.0 Method of Measurement.** Method of measurement shall conform to Section 902.

**10.0 Basis of Payment.** Payment will be considered full compensation for all contractor services, installation, and labor to complete the described work:

Item No.	Type	Description
902-99.01	Lump Sum	Traffic Signal Maintenance & Programming

AA. ATC Traffic Signal Controller

**1.0 Description.** The Commission's St. Louis District is utilizing TransCore's TransSuite software as their Advanced Traffic Management System (ATMS), therefore all signal controllers must be able to interface with their TCS program.

**2.0 Material.** All traffic signal controllers purchased and installed on this project shall be selected from the list below and match the cabinet type and connections indicated on the D-37C sheet for each intersection(s). The controllers on the list below are the only controllers that are tested, fully functional, and approved with the version of TransSuite that the St. Louis District is currently operating (TransSuite version 19.4):

Controller/Firmware Type	Firmware Supported	Cabinet Type (Match in field)
Econolite Cobalt	32.65.10 or newer	NEMA TS2 Type 1 or 2
Econolite ASC/3	2.66	NEMA TS2 Type 1 or 2
McCain Omni EX	1.11	NEMA TS2 Type 1 or 2
Intelight X3	MaxTime 2.1.1	NEMA TS2 Type 1 or 2

**3.0 Construction Requirements.** Contractor shall ensure that the signal controller as noted above is programmed to be compatible with the previously mentioned version of TransSuite TCS system.

**4.0 Acceptance Testing.** All controllers shall be tested per the Commission's specifications. Programming and testing should be done prior to any installation and approved by the Commission's engineer or representative. The contractor shall provide a copy of the signal programming to the engineer via an USB Flash drive.

**5.0 Documentation.** Contractor shall provide the engineer with an electronic copy of the manufacturer's signal controller manual or link to the website where the manual can be downloaded in .pdf format.

**6.0 Basis of Payment.** Measurement and payment for work covered by this specification shall include all equipment, tools and materials necessary and shall be paid at the contract unit price as follows:

Item No.	Type	Description
902-99.02	Each	ATC Traffic Signal Controller

BB. Network Connected Signal Monitor

**1.0 Description.** The Commission's signal cabinet shall have a flashing yellow arrow compatible monitor installed with an internal RJ-45 plug for 10/100 Ethernet communication that is connected to the Commission's computer network through Commission furnished Ethernet switch and allow a remote user running the monitor's software to interface with any specific monitor.

**2.0 Performance.**

**2.1 Inputs.** If video detection is used, inputs into controller shall be via SDLC port. Signal cabinet to be TS2 Type 2 setup with 3 ea. SDLC connectors and the monitor to be a Malfunction Management Unit (MMU).

**2.2 Status and Event Logging.** Monitor shall be able to remotely communicate, at a minimum, active status, current faults, and event logs for at least the previous 7 days.

**2.3 Flashing Yellow Arrow.** Monitor shall be capable of operating a flashing yellow arrow for left turns by utilizing unused yellow channels on the pedestrian load switches.

**2.4 Software and Configuration.** Software needed to communicate to any network-enabled monitor shall be provided to the Commission for an unlimited number of users.

**3.0 Construction Requirements.**

**3.1 Requirements.** Construction requirements shall conform to Sections 902 and 1092.

**3.2 Setup and Training.** A minimum of one day of training shall be provided in the operation, setup communication and maintenance of the monitors.

**3.3 Acceptance Testing.** Contractor shall demonstrate that all network-connected monitors are remotely communicating and individually addressable via supplied software and Commission furnished devices from the Commission's St. Louis Traffic Management Center in order to satisfy the requirements of this provision. No direct payment will be made for this testing.

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

**5.0 Basis of Payment.** No direct payment will be made for the software. Payment will be considered full compensation for all labor, equipment, and material to complete the described work other than Commission furnished devices needed to complete the network connections. Payment will be made as follows:

Item No.	Type	Description
902-99.02	Each	Network Connected Signal Monitor

CC. Advance Warning Flasher

**1.0 Description.** An AWF installation is the addition of a sign with flashing yellow beacons to alert drivers approaching a signalized intersection that the light is about to turn from the green

phase to red phase. While typically used on high-speed roadways it may also be used at locations that have limited site distance of the signal indications. The purpose of a combination highway traffic signal and AWF system is to: 1) inform the driver in advance of a required drive decision (prepare to stop), and 2) minimize the number of drivers that will be required to make that decision in the dilemma zone.

**1.1** The Advance Warning Flasher shall operate through logic gates within the signal controller. The contractor shall provide a document to the traffic engineer with the proposed logic gate information for review and approval prior to installation. Separate logic gates shall be programmed to provide alternating ("wig-wag") flashing operation.

**1.2** The advance warning flasher shall be used in conjunction with signs to warn and control traffic at locations as shown on plans or as designated by Engineer (paid for separately). The flasher shall be installed at location(s) as shown on plans.

**1.3** The contractor shall notify the traffic engineer at least 24 hours before advance warning flasher signal activation. Contact information is below:

Eddie Watkins  
(314) 275-1543, Cell: (314) 650-5461



**2.0 Basis of Payment.** Measurement and payment for complete Advance Warning Flasher meeting requirements above and including all miscellaneous hardware required for a fully operational system as shown on the plans shall be considered completely covered by the contract unit price for the following pay items:

Item Number	Type	Description
902-83.09	LF	CABLE, 16 AWG 3 CONDUCTOR
902-52.00	LF	CONDUIT, 2 IN., TRENCH WITH TRACER WIRE
902-72.00	LF	CONDUIT, 2 IN., PUSHED WITH TRACER WIRE
902-91.00	CUYD	BASE, CONCRETE
902-27.15	EA	POST, SIGNAL 15 FT.
902-01.21	EA	SIGNAL HEAD, TYPE 11T



#### DD. Audible Pedestrian Pushbuttons and Signing

**1.0 Description.** Audible pedestrian pushbuttons and signing will be required for all pedestrian indications at all the intersections.

**2.0 Installation.** Audible signals should be installed as part of a pushbutton assembly.

#### **3.0 Equipment.**

**3.1 Walk Indications.** Accessible pedestrian signals shall have both audible and vibrotactile walk indications.

**3.2 Vibrotactile.** Vibrotactile walk indications shall be provided by a tactile arrow on the pushbutton that vibrates during the walk interval. Tactile arrow shall be located on the pushbutton that vibrates during the walk interval. Tactile arrow shall be located on the

pushbutton, have high visual contrast (light on dark or dark on light), and shall be aligned parallel to the direction of travel on the associated crosswalk.

**3.3 Audible.** Accessible pedestrian signals shall have an audible walk indication during the walk interval only. The audible walk indication shall be audible from the beginning of the associated crosswalk.

**3.4 Pushbutton signage.** In addition to standard pedestrian sign requirements, all pushbuttons for the locations mentioned in 1.0 shall have additional signage to indicate crosswalk direction by use of a tactile arrow and the name of the street containing the crosswalk served by the audible pedestrian signal. The sign shall be located immediately above the push button mechanism and parallel to the crosswalk controlled by the button. The street name shall be the name of the street or reasonable abbreviation whose crosswalk is controlled by the push button. Signage shall comply with ADA Accessibility Guidelines (ADAAG) 703.2 specifications for Braille and raised print.

**3.4.1 Arrow.** Signs shall include a tactile arrow aligned parallel to the crosswalk direction. The arrow shall be raised 0.8 mm (.03 inch) minimum and shall be 4 mm (1.5 in) minimum in length. The arrowhead shall be open at 45 degrees to the shaft and shall be 33 percent of the length of the shaft. Stroke width shall be 10 percent minimum and 15 percent maximum of arrow length. The arrow shall contrast with the background.

**3.4.2 Street Name.** Accessible pedestrian signals (APS) shall include street name information aligned parallel to the crosswalk direction and shall comply with Revised Draft Guidelines for Accessible Public Rights-of-Way R409.3 or shall provide street name information in audible format.

#### **4.0 Performance.**

**4.1 Audible Locator Tone.** Locator tone that tells the pedestrian that the intersection is equipped with APS and where it is. Pushbutton locator tones shall have duration of 0.15 seconds or less, and shall repeat at 1-second intervals. Pushbutton locator tones shall be intensity responsive to ambient sound, and be audible 6 to 12 feet from the pushbutton, or to the building line. The locator tone shall operate during the DON'T WALK and flashing DON'T WALK intervals only and shall be deactivated when the pedestrian signal is not operative.

**4.2 Verbal Wait Message.** Acknowledge tone that tells the pedestrian that they have placed a call and informational message that tells the pedestrian to "Wait to cross" street name at intersecting street name.

**4.3 Verbal Walk Message.** The verbal messages shall provide a clear message that the walk interval is in effect, as well as to which crossing it applies. If available, the audio tone feature will not be used. The verbal message that is provided at regular intervals throughout the timing of the walk interval shall be the term "walk sign," which will be followed by the name of the street to be crossed.

**4.4 Volume.** Automatic volume adjustment in response to ambient traffic sound level will be provided up to a maximum volume of 100 dB. The units shall be responsive to ambient noise level changes up to no more than 5 dB louder than ambient sound. Tone or

voice volume measured at 36 inches from the unit shall be 2dB minimum and 5dB maximum above ambient noise level. At installation, signal system is to be adjusted to be audible at no more than 5 to 12 feet from the system.

## **5.0 Documentation and Support.**

**5.1 Operation and Maintenance Manuals.** Two copies of the operation and maintenance manuals for each station shall be included.

**5.2 USB with Audible Messages.** The Contractor shall provide two copies of USB data card to the Engineer that contains files for the manufacturer's audible messages for complete operation of all APS signals at all stations.

**6.0 Construction Requirements.** Construction requirements shall conform to Sec 902, 1061, and 1092.

**7.0 Method of Measurement.** Method of measurement shall conform to Sec 902.

**8.0 Basis of Payment.** Payment for the audible signals will be for each unit per bid item, 902-99.02, "Audible Pedestrian Pushbutton and Signing with Verbal Walk Message", per each. This will include all wiring, power adaptors, pushbuttons and installation hardware needed. Payment for signing and mounting hardware will be paid for separately. All costs incurred for complying with this provision including labor shall be considered completely covered by the contract unit price for:

Item Number	Type	Description
902-99.02	EA	Audible Pedestrian Pushbutton and Signing with Verbal Walk Message

## **EE. Pedestrian Push Button Stanchion**

**1.0 Description.** This work shall consist of installing pedestrian push button stanchions at the locations shown on the plans.

**2.0 Requirements.** Posts used for pedestrian push button stanchions shall be 48-inch long 4-inch diameter (4.5-inch O.D) schedule 40 aluminum pipe.

**3.0 Construction Requirements.** The post for the pedestrian push button stanchion shall be installed on top of a breakaway pedestal base mounted to a foundation in the sidewalk. The sidewalk foundation shall be constructed as part of the sidewalk and have an 18-inch diameter and 12-inch depth. The breakaway pedestal base shall be mounted to the sidewalk foundation using proper sized anchor bolts according to manufacturer's instructions.

A slip form connection shall be provided on the wiring in the breakaway pedestal base to sever the connection in the event the pedestrian push button stanchion is struck by a vehicle. Access to wiring shall be provided through an access panel in the breakaway pedestal base as well as the pipe post cap. The cap shall be secured and weather proofed when it is not opened for access.

The final product shall meet or exceed Americans with Disabilities Act (ADA) requirements for pedestrian facilities.

**4.0 Method of Measurement.** Final measurement of pedestrian push button stanchions will be made per each.

**5.0 Basis of Payment.** Payment for furnishing all labor, equipment, materials, labor, and tools necessary to place pedestrian push button stanchions shall be completely covered by the contract unit price for:

Pay Item Number	Type / Description	Unit
902-99.02	Pedestrian Push Button Stanchion	Each

FF. Contractor Verification of Signal Base Locations

**1.0 Description.** The Contractor shall field verify that the proposed traffic signal base locations will not need to be shifted to avoid utilities prior to ordering the traffic signal equipment. The Contractor shall be proactive in the discovery of potential utility conflicts. The Contractor shall directly contact the utility companies to verify the location of facilities, and coordinate with the utility company and the Engineer to determine if a conflict will be encountered due to the work proposed in the contract. If a conflict is anticipated, the Contractor shall perform test holes to field verify no conflicts exist with proposed traffic signal base locations.

If a conflict is determined, the Contractor shall shift the signal base location, as approved by the Engineer. The Contractor shall coordinate construction activities with the utilities and take measures to ensure the integrity of the existing facilities are not disturbed during construction.

The contractor will be compensated for the additional mast arm length if required. The Contractor shall not order materials until measurements are field verified.

**2.0 Basis of payment.** No direct payment will be made to the contractor to recover the cost of equipment, labor, materials, incidentals, or time required to fulfill the above provisions, unless specified elsewhere in the contract document.

GG. Coordination with MoDOT Signal Shop for Cabinet Entry

**1.0 Description.** Commission-furnished color-coded pad locks have been placed on all of MoDOT's signal cabinets in addition to the key used to unlock the door handle. To gain access to the appropriate cabinets during the project all contractors shall coordinate with MoDOT's signal shop to obtain the proper keys and locks..

**1.0.1 Keys & Locks.** Red locks & keys are provided when a contractor has modified the signal cabinet and MoDOT staff shall not have access to the cabinet until it is accepted for maintenance. The blue keys are provided for entry into the cabinet where MoDOT's Signal Shop group deems the access to be minor in nature (entry to the cabinet to make a simple network switch connection, for example).

**1.0.2 Completion of Project.** At the completion of the project all keys and pad locks distributed to contractor during the project shall be returned to the Signal Shop supervisor or their representative and keys shall not be reproduced.

**2.0 Contact.** Initial contact must be made at least seven calendar days before work begins, preferably when the project has the notice to proceed or during the pre-construction meeting, if applicable. MoDOT's Signal Shop supervisors shall be notified prior to work beginning. Contact the signal shop via email at [sltrs@modot.mo.gov](mailto:sltrs@modot.mo.gov) to coordinate which padlocks are to be used.

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

HH. Countdown Pedestrian Signal Heads

**1.0 Description.** This work shall consist of furnishing, installing and placing into operation any countdown, pedestrian signal heads.

**2.0 System Requirements.** Delete Sec. 1092.1.9 in its entirety and substitute the following:

**1092.1.9 Pedestrian Signal Heads.** Pedestrian signal heads shall be in accordance with ITE specifications and standards for pedestrian traffic control signal indications and the following:

(a) Pedestrian signal head housings shall be constructed of a one-piece, 0.250-inch (6 mm) thick, polycarbonate material as shown on the plans. The housing shall include an integral mounting bracket designed for side-of-pole mounting on all makes of signal poles with a terminal compartment and minimum 5-position, double-row terminal block.

(b) The door, lens and any openings in the housing shall have gaskets or seals to exclude dust and moisture from the inside of the compartment.

(c) Lenses shall be constructed of polycarbonate material.

(d) Pedestrian signal head units shall be provided with a manufactured preformed rectangular visor or screen-type louver.

(e) All plastic material shall be ultraviolet stabilized.

(f) Indications shall be ITE Class 3 symbol messages. The "Upraised Hand" symbol shall be illuminated with a filled, Portland orange LED module. The "Walking Person" symbol shall be illuminated with a filled, white LED module. The "Countdown" display numbers shall be illuminated with a Portland orange LED module. The LED modules shall be in accordance with applicable portions of Sec 1092.1.

(g) Pedestrian traffic control signal faces shall be constructed such that all messages are displayed from the same message-bearing surface having a black opaque background. The "Countdown" display shall be located to the right of the "Upraised Hand" and "Walking Person" symbols, which will be overlaid.

(h) Pedestrian signal heads require "Countdown" displays and shall have the following features:

- (1) Display numbers must be two digits at least 9 inches in height.

(2) Shall only display the "Countdown" time during the pedestrian change interval. Time displayed shall be in seconds, and begin only at the beginning of the pedestrian change interval. The flashing "Upraised Hand" symbol shall be concurrently displayed during the pedestrian change interval. The total time displayed at the start of the pedestrian change interval shall be automatically adjusted by the pedestrian signal head and not require any manual settings or additional wiring to the signal cabinet.

(3) Once the "Countdown" display reaches "0", the "Countdown" display shall blank-out until the next pedestrian change interval begins.

(4) If the pedestrian change interval is interrupted or shortened as part of a transition into a preemption sequence, the "Countdown" display shall go dark immediately upon activation of the preemption transition.

(5) A test switch shall be provided in order to test the "Countdown" display.

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

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

**5.0 Basis of Payment.** Payment for pedestrian signal heads, including all materials, equipment, labor and tools shall be made and considered completely covered by the contract unit price bid for:

Item Number	Type	Description
902-99.02	Each	Countdown Pedestrian Signal Head, Type 1S

II. MoDOT TS2 Type 1 Cabinet Assembly Job Special Provision

**1.0 Description.** The cabinet assembly shall meet, as a minimum, all applicable sections of the latest revisions as found in the NEMA TS2 Standard Publication and sections 902 and 1092 of the Missouri Standard Specifications for Highway Construction manual. Where differences occur, this specification shall govern.

**2.0 Materials.**

**2.1 Cabinet.** The cabinet shall be constructed from aluminum with a minimum thickness of 0.125 inches. The cabinet shall be designed and manufactured with materials that will allow rigid mounting, whether intended for pole, base or pedestal mounting. All mounting points where the cabinet is bolted to the foundation shall be reinforced at the factory by welding in an additional layer of material equal to the thickness of the material that the cabinet is constructed from. Triangular gussets are also required when the base plate and cabinet walls are welded together vs. continuous rolled material. A rain channel shall be incorporated into the design of the main door opening to prevent liquids from entering the enclosure. All external hardware shall be stainless steel. Unless otherwise specified, the cabinet exterior shall be supplied with a natural aluminum finish. Sufficient care shall be taken in handling to ensure that scratches are minimized. All surfaces shall be free from weld flash. Welds shall be smooth, neatly formed, free

from cracks, blowholes and other irregularities. All sharp edges shall be ground smooth. The cabinet shall be equipped with (2) lifting brackets for installation and removal purposes.

**2.2 Cabinet Doors.** The cabinet shall include front and rear doors of NEMA type 3R construction with rain tight gaskets. A stiffener plate shall be welded across the inside of the main door to prevent flexing. Doors shall include a mechanism capable of holding the door open at approximately 90 and 165 degrees under windy conditions. Manual placement of the mechanism shall not be required by field personnel. Only the main door shall have ventilation louvers. A plaque designation "Traffic Control" shall be affix to each main cabinet door.

**2.3 Door Alarm.** The front and rear doors shall be equipped with switches wired to the traffic signal controller alarm **with** 1 input for logging and reporting of a door open condition. This should indicate a Special Status 1 alarm in the signal controller alarm screen.

**2.4 Shelves.** No less than (2) shelves shall be provided and each shall have the ability to be independently removed, relocated, and adjusted. The front edge of each shelf shall have holes predrilled at a spacing of no greater than 8 inches to accommodate tie-wrapping to secure cables/harnesses.

**2.5 Mounting Rails.** A minimum of one set of vertical "C" channels shall be mounted on each interior wall of the cabinet for the purpose of mounting the cabinet components. The channels shall accommodate spring mounted nuts or studs. All mounting rails shall extend to within 7 inches of the top and bottom of the cabinet.

**2.6 Pull-out Drawer.** The cabinet shall be equipped with a pull-out drawer/shelf assembly. A 1½ inch deep drawer shall be provided in the cabinet, mounted directly beneath the controller support shelf. The drawer shall have a hinged top cover and shall be capable of accommodating one complete set of cabinet prints and manuals. This drawer shall support 50 pounds in weight when fully extended. The drawer shall open and close smoothly. The drawer dimensions shall make maximum use of available depth offered by the controller shelf and be a minimum of 18 inches wide.

**2.7 Police Door.** The police door shall contain only (1) switch used for flash/auto operations. The ability to turn field indications off from the police panel will not be permitted.

**2.8 Lighting.** The cabinet shall include no less than (3) field replaceable LED light assemblies along the top and sides of the cabinet. The LED panels shall be controlled by a manually activated toggle switch on the tech panel.

**2.9 Fans/Ventilation.** The components of the system as well as the CFM requirements shall be in compliance with the MoDOT 902 & 1092 specifications.

**2.10 Heater.** The cabinet shall be supplied with a 200 Watt fan heater with thermostat control that is designed to protect electronics from the effects of low temperatures such as corrosion, freezing or condensation, which can damage critical components within a control enclosure. Housing shall be constructed of aluminum. Overall dimensions including mounting areas shall be approximately: 4inch depth, 4inch width, 5.50inch height.

**2.11 Switch Guards.** All switches shall include switch guards. All switches shall be clearly labeled.

**2.12 Receptacles and power strip(s).** One 8-outlet IP-addressable power strip shall be provided and Commission-furnished. The installation of the power strip shall be included in the cost of the cabinet assembly. The main door tech panel shall contain a 15 amp duplex GFI receptacle. A separate grounded service outlet shall be provided in the controller cabinet for supplying power to the video detection monitor. The monitor shall be installed to automatically power on when the cabinet door is opened and automatically power off when the cabinet door is closed. The use of the grounded service outlet located on the cabinet door will not be permitted for this function. A manual on/off switch shall also be provided and mounted to the main door tech panel.

**2.13 16-Position Back Panel Wiring.** All new signal cabinets shall have a 16-position load switch back panel and conform to the following specifications. Regardless of the number of phases specified on the plans, all load switch positions shall be completely wired for use. The load switch back panel shall be configured for NEMA Configuration "A" or "G" as designated on the signal plans. Vehicle phases, overlaps (including FYA configurations), and pedestrian phases shall be wired such that it must work with a Type 16 MMU. The cabinet shall include both a DT panel and a CTB (SDLC) panel with 6 harnesses.

#### **2.14 Detection Configuration.**

**2.14.1 For all Detector Types.** Detection configuration shall be in accordance with the configuration prescribed in the SL District Detection JSP.

**2.14.2 Intersections with Video Detection.** For intersections with video detection, the cabinet shall be wired to automatically power on the video monitor when the cabinet door is open.

**2.15 Load Switch.** The front of the load switch shall be provided with (3) indicators to show the input signal from the controller to the load switch and (3) indicators to show the output to the field devices. The full complement of load switches shall be supplied with each cabinet to allow for maximum phase utilization for which the cabinet is designed.

**2.16 SDLC.** All connection points shall be protected by a BIU 15 pin surge suppressor used for the protection of any devices on Port 1 Synchronous Data Link Control (SDLC). Each cabinet shall be provided with a SDLC hub assembly and (6) SDLC cables unless otherwise noted on the order form. All mechanical connections shall be soldered.

**2.17 Surge Protection.** Surge protection shall be a modular plug in type product as listed in the MoDOT Traffic APL.

**2.18 AC line filter.** The AC line filter shall protect equipment from malfunctions due to conducted interference coming into the equipment from line, especially line to ground (common mode) noise and transients. Overall dimensions including mounting areas shall be approximately: 4.17inch width and 3.53inch height.

**2.19 Signal Buss Relay.** The relay shall be a direct "drop-in" replacement for existing mercury displacement relays. The relay shall be a single pole solid state or hybrid relay. Overall dimensions including mounting areas shall be approximately: 2.5inch depth, 2inch width, 5 inch height.

**2.20 Field Wiring termination.** All field wires shall be attached to the back panel terminal strips via a mechanical copper lug, which can accommodate wire sizes from 14AWG - 6AWG. Lugs shall be provided for all field outputs to maximize the cabinet design.

**2.21 Flash Transfer Relays.** The full complement of relays shall be supplied with each cabinet to allow for maximum phase utilization for which the cabinet is designed.

**2.22 Cabinet Wiring Prints.** Paper cabinet prints as well as electronic media shall be provided with each cabinet. (4) paper copies shall be provided (22" X 34") and (1) electronic copy in pdf and dgn format. All flash program wiring configurations shall be represented on the cabinet print (Red, Amber, No Flash, FYA, Ped, FYA & Ped).

**2.23 Generator Attachment.** A generator plug shall be installed on each cabinet unless otherwise noted. The access door shall be hinged, lockable and watertight. The plug shall conform to the (NEMA L5-30 configuration). An automatic transfer switch shall be provided which will switch power to/from "line", "UPS" or "generator" when power from one of the sources has been lost or gained. The unit shall be rated for 30 amps and shall contain either a LCD display or indicator lights that validate the following: Line in, Line out, UPS in, UPS out and "from" generator. The unit shall contain a main breaker (on/off switch), a UPS bypass breaker (switch) and a Generator breaker (switch). To minimize the impact of the presence of the auto transfer switch, the dimensions shall be no greater than 12" wide X 6" deep X 4" high. The unit shall be constructed of either aluminum or stainless steel.

### **3.0 Testing.**

**3.1** Each controller and cabinet assembly shall be tested as a complete entity under signal load in accordance with Missouri Standard Specifications Section 902 for a minimum of 30 days after installation.

**3.2** Each assembly shall be delivered with a signed document detailing the cabinet final tests performed.

The cabinet shall be assembled and tested by the controller manufacturer or authorized local distributor to ensure proper component integration and operation.

### **4.0 Warranty and Training.**

**4.1** If a Controller and/or Malfunction Management Unit are ordered with a cabinet assembly, the Controller and Malfunction Management Unit shall be warranted by the manufacturer against mechanical and electrical defects for a period of 2 years from date of shipment. The manufacturer's warranty shall be supplied in writing with each cabinet and controller. Second party extended warranties are not acceptable.

**4.2** The cabinet assembly and all other components shall be warranted for a period of one year from date of shipment. Any defects shall be corrected by the manufacturer or supplier at no cost to the owner.

**4.3** MoDOT may require training on the maintenance and operation of NEMA TS2 cabinet assemblies. Maintenance and operation personnel shall be trained on troubleshooting, maintenance and repair of cabinets and all serviceable equipment. Training shall include field level troubleshooting and bench repair. This training shall be for a minimum of sixteen hours

over two days. Training shall be conducted at a time and location mutually agreeable by the contractor and the signal shop traffic supervisor or as directed by MoDOT.

**5.0 Method of Measurement.** Method of measurement shall conform to Sections 902 and 1092 of the Standard Specifications.

**6.0 Basis of Payment.** Payment included with cost of pay item 902-42.83 (Controller Assembly Housing, NEMA TS2 Controller) paid per each. Payment will be considered full compensation for all labor, equipment and material to complete the described work as shown on the plans. No additional payment will be made to provide conformance.

JJ. Combination Pad Mounted 120V/240V Power Supply and Lighting Controller with Uninterruptible Power Supply (UPS) – TS2 Traffic Signal Cabinet

**1.0 Description.** This work shall consist of furnishing and installing combination 120/240-volt signal and lighting power supply and uninterruptible power supply (UPS) at signalized intersections utilizing a TS2 traffic signal control cabinet.

**2.0 UPS Requirements.** The traffic signals being constructed on the intersections listed below shall include an “Uninterruptible Power Supply” specifically constructed and NEMA approved for traffic signal operations.

- **US 61/67 @ St Johns Church Road**
- **US 61/67 @ Miller Road**

**2.1 UPS Location and Cabling.** The UPS shall be installed separately from the signal cabinet and shall be installed in the same cabinet as the power supply and lighting controller station. In addition to the power cables from the UPS to the signal cabinet, the contractor will route but not connect an outdoor rated CAT-6 cable between the UPS RJ-45 port and the Ethernet switch in the signal cabinet. The contractor shall also install a 7-conductor serial cable and make the appropriate connections from the UPS to the traffic signal cabinet. The **On battery** contact (C-1) on the inverter should be programmed to energize when the UPS provides battery backup. The normally open contact should be wired to provide logic ground to Alarm 2 when the UPS is in battery backup mode. This should indicate a Special Status 2 alarm in the signal controller alarm screen. The **Low Battery** contact (C-2) on the inverter should be programmed to energize when the UPS drops below a preset voltage level, typically set at 40%. The normally open contact should be wired to provide logic ground to Test Point A when the UPS is in Low Battery mode. This should indicate a Special Status 3 alarm in the signal controller alarm screen. The **Arrestor** contact should be wired to provide logic ground to Test Point B and generate a Special Status 4 alarm in the signal controller alarm screen. The **Timer #1** contact (C-4) on the inverter should be programmed to energize after the UPS is in inverter mode for **three (3)** hours. The normally closed contract should be wired in series with the remote flash output to allow for the circuit to open after **three (3)** hours and bring the signal to flash after the side streets service. The remote flash parameters shall be programmed to red/red flash, unless directed otherwise by the Engineer. The CAT-6 cable and serial 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 signal cabinet. The contractor shall verify all control wiring with the manufacture of the traffic signal cabinet assembly for accuracy and compatibility and perform test to ensure proper operation. The contractor shall be responsible for all controller programming to mask the TS2 features to this setup. Upon completion of all controller programming, contractor shall notify contractor's or

Commission's traffic engineer (depending on assignment) for uploading into Commission's central signal control system.

**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  $\pm 10\%$  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 84%.
- (i) The step-load response of the UPS shall be full recovery in  $\frac{1}{2}$ -cycle @ 50% change with a resistive load.
- (j) The transfer time of the UPS line to back up 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.
- (l) 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 250VAC @ 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.
- (l) 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) time-of-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:
- (d) ON BATTERY. The relay is energized whenever the UPS switches to battery power.
- (e) 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.
- (f) 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.
- (g) ALARM. The relay is activated after a specific or general alarm is detected.
- (h) conditions include: line frequency, low output voltage, no temperature probe, overload,
- (i) unconnected batteries, high temperature (>55°C) and low temperature (<-20°C).
- (j) FAULT. The relay is activated after a specific or general fault is detected. These faults
- (k) include: short circuit, low battery voltage (<41VDC), high battery voltage (> 59VDC), overload and over temperature (>75°C).
- (l) OFF. The relay is disabled and will not activate under any condition.
- (m) TIMER 2. Same as TIMER 1.
- (n) TIMER 3. Same as TIMER 1.
- (o) 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.
- (p) The UPS shall have a default dry contact relay configuration of:
 

C1	ON BATT
C2	LOW BATT
C3	LOW BATT
C4	TIMER
C5	ALARM
C6	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 a 3 pole, 35 amp, 300 volt Eurostyle socket terminal strip (22-8 AWG).
- (b) The UPS shall have six (6) user programmable dry contact relay terminal blocks on the front panel. The terminal blocks shall be 3 pole, 35 amp, 300 volt PLUGGABLE TERMINAL BLOCK (12-26 AWG)
- (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 3 pole, 35 amp, 300 volt PLUGGABLE TERMINAL BLOCK (12-26 AWG).

- (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 a 50 amp SB® series type battery connector (16-6 AWG).
- (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.
- (l) 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 94Ah.
- (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 all devices shown on the plans that are powered through the signal cabinet for three (3) hours and then send the signal into all red flash and power that state for an additional three (3) 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  $\pm 100\text{mV}$  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 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 furnishing and installing pad mounted combination 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 Number	Type	Description
902-99.02	Each	Combination Pad Mounted 120V/240V Power Supply And Lighting Controller with UPS

**KK. Top Mount Lighting Pole**

**1.0 Description.** This work shall consist of furnishing and installing top mount poles as indicated in the plans.

**2.0 Construction Requirements.** Top mount poles shall conform to the Type AT lighting poles and shall be fabricated with a circumferentially welded top mount and top plate to accept top mounted luminaires. The top mount shall extend 4" above the top of the pole and meet AASHTO loading requirements for the luminaires provided. The top mount shall be made of the same material as the pole shaft, be constructed as a one-piece pole and top mount unit by the manufacturer and have an outside diameter that accepts the appropriate luminaire slip-fitter. Pole and top mount shall conform to all MoDOT specifications and material requirements. Bridge mounted poles shall be constructed to match the existing bolt pattern.

**3.0 Basis of Payment.** Payment for furnishing and installing top mount poles shall include all excavation, materials, equipment, tools, labor, and work incidental thereto, and shall be considered completely covered by the contract unit price for:

Item Number	Item Name	Units
901-99.02	30 Ft. Top Mount Lighting Pole	Each

**LL. Top Mount Luminaire**

**1.0 Description.** This work shall consist of furnishing and installing LED Top Mounted Luminaires as indicated in the plans.

**2.0 Construction Requirements.** Luminaires shall be vertical top mount type (pole top mount) with a slip-fitter that accommodates a standard 2" top mount. Available types are listed on the MoDOT approved products list and must meet all MoDOT Specifications along with additional requirements noted in the additional sections below. The contractor shall coordinate the pole top mount size with the luminaire mount to ensure compatibility. All luminaires for this project shall allow for a tilt angle to be adjusted in the field dependent upon the placement of the pole. All necessary mounting brackets and hardware shall be included in the payment for the luminaire.

**2.1** LED luminaires shall not be equipped with a Photo Control Receptacle.

**2.2** LED Luminaires shall have a terminal block for easy installation of a two wire Line/neutral circuit (no wire nuts for termination of field/luminaire circuit).

**2.3** LED luminaires shall have an easy access point for future repairs to the driver.

**2.4** LED luminaires shall have pole adaptors which are capable of feeding wires through without disassembling the knuckle.

**3.0 Basis of Payment.** Payment for furnishing and installing top mounted luminaires shall include all materials, equipment, tools, labor, and work incidental thereto, and shall be considered completely covered by the contract unit price for:

Item Number	Item Name	Units
901-99.02	120V Top Mounted LED - A Luminaire	Each

MM. MoDOT St. Louis District Inventory Management

**1.0 Description.** MoDOT St. Louis District has an inventory management system for managing both in field and spare inventory. To manage the inventory efficiently, a list of parts with serial and contract numbers if applicable shall be submitted to the engineer before project acceptance.

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

NN. ITS Site Restoration

**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

OO. ITS Pull Box

**1.0 Description.** Furnish and install ITS Pull Boxes with concrete pads as shown on the plans.

**2.0 Materials.**

**2.1 Pull Box.** ITS pull boxes shall meet the requirements in Section 1062 of the Missouri Standard Specifications for Highway Construction.

**2.2 Ground Rod.** Ground rods shall be listed according to UL requirements as detailed in the standard UL 467, Grounding and Bonding Equipment, and meet the requirements of NEC 250. Use electrodes that are solid copper or copper-bonded steel.

**2.3 Concrete Pad.** The contractor shall install a non-reinforced concrete pad around the ITS pull box as shown in the plans. The concrete used shall be a Class 'B' concrete as described within Sec 501 of the Standard Specifications.

**3.0 Construction.** Install ITS pull boxes as shown in the plans. Provide a concrete pad around the pull boxes as shown in the plans. Install a ground rod in the Class 5 pull boxes nearest ITS or signal cabinets.

**4.0 Basis of Payment.** Measurement and payment for ITS Pull Boxes with a concrete pad includes excavation, materials, construction, backfill and all miscellaneous hardware required for a fully operational system. Payment will be made as follows:

Item No.	Type	Description
910-99.02	Each	ITS Pull Box with Concrete Pad, Preformed Class 2
910-99.02	Each	ITS Pull Box with Concrete Pad, Preformed Class 5

PP. MoDOT ITS Equipment Within Project Limits

**1.0 Description.** MoDOT owned fiber optic cable and conduit, critical MoDOT power supplies and power cables, and pull boxes for fiber and power cabling and other above and underground ITS (Intelligent Transportation System) facilities are present within the limits of this project. Damage or interruption of these items can cause extensive outages to the MoDOT network.

**2.0 Construction Requirements.** The contractor shall exercise reasonable care while completing work near these facilities, and shall take steps necessary to protect these facilities from damage for all items that are not specifically identified as being removed and/or relocated in the plans. Should any of the existing wiring or conduit be damaged by the contractor, it shall be replaced at the contractor's expense and the system in full operation within 4 hours of when the damage occurred. If it is mutually agreed upon between the Commission and the Contractor that the repairs will require more than 4 hours to complete, a mutually agreed upon time for repairs to be complete will be determined.

**2.1** The contractor shall not modify any existing network or electrical connections within equipment cabinets, unless coordinated with MoDOT ITS staff. Existing connections include, but are not limited to, fiber jumpers, CAT5(e) cables, power supplies, and power strips. The connection to specific fiber and copper ports on network equipment shall also not be modified, unless coordinated with MoDOT ITS staff, as the network equipment has been configured specifically for each equipment cabinet. Significant network outages and unnecessary troubleshooting to investigate outages can occur, even with minor changes to existing connections within the cabinet.

**3.0 Liquidated Damages.** In the event of damage, if the system is not repaired and in full operation within 4 hours of the damage occurring, or within the timeframe agreed upon, the contractor will be charged with a liquidated damage specified in the amount of \$100.00\_per hour for each full hour that the system is not fully operational. This damage will be assessed independently of the liquidated damages specified elsewhere in the contract.

**3.1** The MoDOT Engineer will also have the option of issuing a work order for MoDOT's on-call ITS Maintenance contractor to make repairs, if it is the Engineer's opinion that the contractor creating the damage will not be able to make repairs in a timely manner. Contractor's reimbursement for MoDOT expense for this option shall be in addition to the liquidated damages.

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

QQ. ITS Asset Management Tool

**1.0 Description.** For all locations where any MoDOT and other agency's ITS (Intelligent Transportation System) components are modified or added, the contractor shall be responsible for populating and updating Commission's ITS and Signal Network Asset Management Tool to reflect the final condition of the entire ITS system within the project limits as shown on the plans. Updating shall be performed by Commission approved staff (currently NexusWorx).

## **2.0 Construction Requirements.**

**2.1** Contractor shall provide any relevant notes to a specific location that can be entered into the tool to aid in the understanding of the device configuration and location. At a minimum, this will include providing the required latitude and longitude coordinates of each pull box, DMS, CCTV, node cabinet, conduit, cable, and fiber, along with any serial numbers and/or identification information. The Contractor shall locate the conduit every 100 feet using a GIS locating device that is accurate to the nearest foot. The Contractor shall provide a GIS based map of the conduit route and a complete listing of all of map coordinates in an electronic format. Population of the fiber management tool will be required for all devices that have been installed to date as well as any devices installed under this contract.

**2.2** Other agency's ITS assets such as conduit, fiber cable, Cat-E cable, cabinet, pull box, etc. within MoDOT Right-Of-Way shall be highlighted including in a polygon in the ITS Asset Management Tool so it can be clearly identified for future references.

**2.3** The contractor shall furnish to Commission approved staff a copy of the final plans relevant to all of the ITS components in Visio and/or Microstation formats, if relevant.

**2.4** The contractor shall be provided one licensed read-only access login by Commission before work begins.

**2.5** A PDF and Visio format of all relevant fiber splicing shall be posted into the Tool's perspective ITS and Signal cabinets.

## **3.0 Acceptance Testing.**

**3.1** All entries and updates shall be completely entered and available for use within 30 days from final acceptance of the project.

**3.2** Commission staff shall verify population of the fiber management tool, including accuracy and completeness of details for each component prior to acceptance and payment.

**4.0 Measurement and Payment.** Measurement and Payment for items covered by this specification include the population and acceptance testing, in addition to all materials and equipment necessary for a fully operational system.

<b>Item No.</b>	<b>Type</b>	<b>Description</b>
910-99.01	Lump Sum	ITS Asset Management Tool

### **RR. Install MoDOT Furnished IP-Addressable Power Strip**

**1.0 Description.** The contractor shall install the Commission furnished and programmed IP-Addressable Power Strip(s) in the ITS and/or Signal Cabinets as shown of the plans.

**2.0 Installation Requirements.** The contractor shall install the Commission Furnished (hardwire only) the power strip as noted below:

**Inside the Signal Cabinet:** Mounting shall be on the left side panel of the cabinet above the detector panel attached to the DIN rails, with the power cable facing away from the door. The hardwire interconnect panel, if present, should be removed to make room. A plastic wire tie shall secure any transformer packs plugged into this unit. The power source shall be hardwired to cabinet auxiliary breaker circuit with no plug in to any cabinet outlet allowed.

**Inside the ITS Cabinet:** Mounting shall be on the back side of the ITS Type 7 cabinet (or any open space of other ITS cabinets away from the door) and on any open space of the signal cabinet with the power cable facing away from the door or other devices.

The old power strip as well as any other inactive devices, if present, should be removed to make room. If the contractor has any question regarding the inactive devices inside the signal cabinet, they should contact MoDOT signal shop supervisor. In case of ITS cabinets, they shall contact the ITS group.

The power source shall be hardwired to cabinet auxiliary breaker with no plug in to any cabinet outlet allowed.

**3.0 Acceptance Testing.** The Contractor shall contact MoDOT St. Louis ITS staff via an email to [SLITS@modot.mo.gov](mailto:SLITS@modot.mo.gov) or 314-275-1526 to verify remote communication to the power strip upon installation and while still on-site. They also shall provide a list of devices and designated port assignments to the ITS group so they can update that port description in the Power Strip software.

All IP Addressable ITS and Signal network devices shall be plugged into the manageable (meaning it can be rebooted remotely) IP Power Strip ports Except the network switch.

**4.0 Basis of Payment.** Measurement and payment for Power Strip Installation includes the removal of the old and inactive power strip or other devices to make space for new power strip, installation of new power strip, grounding, testing and all miscellaneous hardware required for a safe, fully operational Power Strip. Payment will be made as follows:

Item Number	Unit	Description
910-99.02	Each	Install MoDOT Furnished IP-addressable Power Strip

#### SS. Fiber Optic Cable Installation, Relocation, Replacement

**1.0 Description.** This work shall consist of installing, splicing, and terminating fiber optic cables. The fiber optic cable may be new or existing cable relocated as shown on the plans. Fiber optic cable relocation requires existing cable to be removed from an existing conduit system and installed in a new or existing conduit system per plans. Relocated cable must be carefully removed from the existing conduit system without being damaged. No direct pay shall be paid for relocating the existing fiber optic cable into new ITS or signal cabinet. If the existing fiber cable is removed, that length shall be paid separately per plans.

**2.0 Materials.** Some of the below noted materials may not be applicable on this project. See the plans and below quantities for applicable materials.

**2.1 Cable.** Fiber optic cable shall be of loose tube construction. Provide certification by an independent testing laboratory that the cable meets all requirements of Rural Utilities Service Bulletin 1753F-601a *Minimum Performance Specification for Fiber Optic Cables* ([https://www.rd.usda.gov/files/UTP\\_Bulletins\\_1753F-601a.pdf](https://www.rd.usda.gov/files/UTP_Bulletins_1753F-601a.pdf)). The cable shall be gel free, all dielectric, and have 12 fibers per tube. The cable sheath shall have length markings in feet, and shall indicate that the unit of measure is feet. The cable shall have single mode fibers whose attenuation does not exceed 0.35 dB/km and 0.25 dB/km for 1310 nm and 1550 nm signals, respectively. The optical fibers used in the cable shall meet or exceed the International Telecommunication Union ITU-T G.652.D requirements.

**2.2 Splice Tray.** Splice trays shall be 11.7" long, 3.9" wide, and 0.2" tall. They shall be aluminum with clear plastic covers, designed for outdoor use. Each shall accommodate 24 fusion splices. The trays shall have a black powder coat finish. The trays shall have both perforations for cable ties and crimpable metal tabs for buffer tube strain relief.

**2.3 Connector.** Connectors shall be the LC type with ceramic ferrules, unless a different connector is required to mate with the equipment or an existing panel. They shall be suitable for use in traffic cabinets and shall be designed for single mode fibers.

**2.4 Pigtail.** Pigtails shall be factory-made, buffered, and strengthened with aramid yarn to reduce the possibility that accidental mishandling will damage the fiber or connection. Pigtails shall be yellow. Each must contain one fiber. Length shall suffice to provide two feet of slack after installation.

**2.5 Jumper.** Jumpers shall meet the requirements for pigtails, but shall have a connector on each end. Length shall suffice to provide approximately five feet of slack after installation.

**2.6 Interconnect Center.** An interconnect center is a splice enclosure that has a patch panel built into one of its walls. Within the interconnect center, fibers in cables are spliced to pigtails and the pigtails are plugged into the patch panel from the inside. This allows jumper cables (not part of the interconnect center) to plug into the patch panel from the outside, connecting the fibers to equipment in the cabinet or to other fibers on the patch panel. Within an interconnect center, some fibers may be spliced to the corresponding fiber in a mating cable, rather than to a pigtail. Still other fibers may be coiled, un-terminated.

The enclosure shall be made of powder-coated metal. It shall have provisions for cable strain relief and for connector labeling. The enclosure's patch panel shall have at least 24 positions. Provide enough splice trays for all splices made in the interconnect center. Provide patch panel modules that are compatible with the connectors specified in section 2.3 of this provision.

**2.6.1 Wall-Mounted Interconnect Center.** The enclosure shall be designed for wall or panel mounting and occupy no more than 350 square inches of wall space. It shall have a gasketed, hinged door. It shall hold at least six splice trays. These enclosures are typically used in signal cabinets.

**2.6.2 Rack-Mounted Interconnect Center.** The enclosure shall have brackets and all other hardware required for rack mounting in an EIA standard 19-in. equipment rack. It shall take up no more than three rack units (1¾ inch each) in the cabinet. It shall have front and rear doors. It shall hold at least four splice trays. These enclosures are typically used in ITS device cabinets.

**2.7 Rack-Mounted Splice Enclosure.** The enclosure shall have brackets and all other hardware required for rack mounting in an EIA standard 19-in. equipment rack. However, alternate forms of mounting will be permitted if more practical at a particular location. The enclosure shall take up no more than five rack units (1¾ inch each) in the cabinet. It shall be made of powder-coated aluminum. These enclosures are typically used in network node cabinets.

**2.7.1** The enclosure shall have provisions for cable strain-relief. It shall have hinged front and rear doors.

**2.7.2** The enclosure shall include splice trays as specified in section 2.2 of this provision. The contractor shall provide enough splice trays for all the splices made in the enclosure. The enclosure shall include a splice tray holder with capacity for 22 trays. It shall be mounted on a sliding shelf inside the enclosure so that individual trays can be removed from the enclosure without disturbing the other trays or removing the enclosure itself from the cabinet.

**2.8 Rack-Mounted Patch Panel Enclosure.** The enclosure shall have brackets and all other hardware required for rack mounting in an EIA standard 19-in. equipment rack. However, alternate forms of mounting will be permitted if more practical at a particular location. The enclosure shall take up no more than five rack units (1¾ inch each) in the cabinet. It shall be made of powder-coated aluminum. Provide patch panel modules that are compatible with the connectors specified in section 2.3 of this provision, as needed. These enclosures are typically used in network node cabinets.

**2.9 Underground Splice Closure.** Closures for underground fiber splices include all materials necessary to make, organize, and protect the splices.

**2.9.1** The closure shall supply environmental protection of cable and splices from water and dirt. It shall be designed for splicing fiber-optic cables underground in pull boxes and to be submersed in water.

**2.9.2** Provide certification by an independent testing laboratory that the closure meets all requirements of Telcordia GR-771 for environmentally sealed closures for buried installation.

**2.9.2** The closure shall be re-enterable without any special tools.

**2.9.3** The closure shall be able to accommodate at least four fiber optic cables.

**2.9.4** The closure shall accommodate 144 single mode fiber splices.

**2.9.5** It shall be possible to remove any splice tray without disturbing the others.

**2.9.6** Splice trays in the closure need not be of the type specified in 2.2, above.

**2.9.7** Designed for butt splicing.

**2.9.8** No encapsulated materials shall be allowed.

**2.10 Tracer Wire.** A jacketed #14 AWG XHHW-2 standard blue tracer wire (also known as the locator wire) shall be provided in the conduit within the project limits unless it exists.

### **3.0 Construction Requirements.**

**3.1 Pre-Installation Cable Inspection and Testing.** Prior to installation, confirm that the cable is in good condition and complies with the specifications. The contractor shall perform fiber testing (see below requirements) of new fiber on the reel and existing fiber before it is removed. Notify the SLITS Group about any fiber anomalies and submit fiber testing reports to the SLITS Group for review and approval. Any defects found after installation will be deemed the fault of the contractor.

### **3.2 Cable Installation.**

**3.2.1** The ITS and network devices located within the project limits are a crucial part of the traffic operation system for this area. It is imperative that the network downtime be kept to a minimum when adding, removing, or modifying any existing ITS and network devices. This may require the contractor to perform work that will affect existing network devices during nighttime and/or weekend hours, at the discretion of the Engineer. Allowable timeframes for this work will be subject to the need for ITS devices in the area to be used to manage other traffic impacting work zones.

**2.2.2** In case of fiber optic cable replacement, all new fiber cable must be installed, spliced, terminated and go online before removing the old cable.

**3.2.3** Remove existing cable to be relocated and install cable such that the optical and mechanical characteristics of the fiber are not degraded. Do not violate the minimum bend radius or the maximum tension, both during and after installation.

**3.2.4** Before any cable installation is performed, provide the engineer with four copies or an electronic copy, as required by the engineer, of the cable manufacturer's recommended maximum pulling tensions for each cable size. These pulling tensions shall be specified for pulling from the cable's outer jacket. Also, provide a list of the minimum allowable cable bending radius and the cable manufacturer's approved pulling lubricants. Only those lubricants approved by the cable manufacturer will be permitted.

**3.2.5** If the cable is pulled by mechanical means, use a clutch device to ensure the allowable pulling tension is not exceeded. Also, attach a strain gauge to the pulling line at the cable exit location, and at a sufficient distance from the take-up device, such that the strain gauge can be read throughout the entire cable pulling operation.

**3.2.6** Do not leave the let-off reel unattended during a pull, in order to minimize the chance of applying excess force, center pull, or back feeding.

**3.2.7** Use an approved lubricant, in the amount recommended by the cable manufacturer, to facilitate pulling the cable. After the cable has been installed, wipe the exposed cable in a pull box, junction box, or cabinet clean of cable lubricant with a cloth before leaving the pull box, junction box, or cabinet.

**3.2.8** When installing new fiber optic cable store 30 feet of slack fiber in every intermediate pull box, unless otherwise noted on plans. Additional slack storage, as indicated on the plans, is required in designated pull boxes. At cabinet locations, where cable runs from the pull box directly to an equipment cabinet, store 60 feet of slack fiber optic cable in the pull box, unless otherwise noted on plans. Additionally, treat the cable returning from the cabinet to the pull box as a separate cable, and store 60 feet of slack for these links, unless otherwise noted on plans. Store slack cable neatly on the walls of the pull box using racking hardware acceptable to the engineer.

If the length of fiber optic cable being relocated does not allow for fully meeting these slack requirements, maximize fiber slack at cabinets before providing slack in pull boxes.

**3.2.9** While pulling and until splicing seal the fiber optic cable ends to prevent the escape of filling compound and the entry of water.

**3.3 Splicing.** Splice all optical fibers, including spares, to provide continuous runs. Splices shall be allowed only in equipment cabinets except where shown on the plans.

**3.3.1** Make all splices using a fusion splicer that automatically positions the fibers using the Light Injection and Detection (LID) system or the High-resolution Direct Core Mounting (HDCM) system. Provide all equipment and consumable supplies.

**3.3.2** Secure each spliced fiber in a protective groove. Completely re-coat bare fibers with a protective room temperature vulcanizing (RTV) coating, gel or similar substance, prior to insertion in the groove, so as to protect the fiber from scoring, dirt, or microbending.

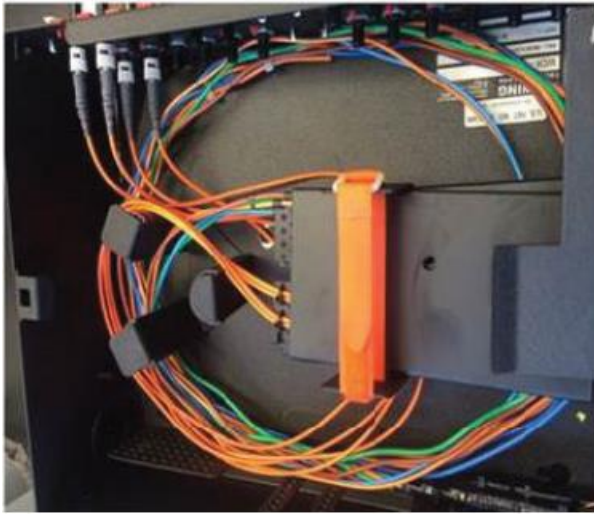
**3.3.3** Prior to splicing to a fiber installed by others, measure and record the optical loss over that fiber. See section 4.0 of this provision.

**3.3.4** Use a different splice tray for each buffer tube color. If an enclosure contains multiple buffer tubes of the same color, but none of the fibers in one of the tubes are spliced to fibers in other tubes of the same color, use a separate splice tray for that tube.

**3.4 Termination.** Terminate fibers by splicing them to factory-made pigtails. Cap all connectors that are not connected to a mating connector.

**3.5 Tracer Wire.** The contractor shall install a jacketed #14 AWG XHHW-2 standard blue tracer wire (also known as the locator wire) in conduit with new or replaced fiber optic cable(s). In the pull box nearest to the ITS or signal cabinet connect the tracer wire to a ground rod with a ground rod clamp and provide five feet of slack, as shown on the ITS pull box detail. In other fiber pull boxes provide five feet of slack, but a ground rod shall not be installed. Secure the tracer wire slack in individual coils to the inside wall of each pull box. If the tracer wire already exists, the contractor shall ensure it is connected to the ground rod properly in the pull box nearest to the ITS or signal cabinet and demonstrate a locate signal will transmit along the tracer wire. When fiber optic cable is relocated, existing tracer wire may be reused.

**3.6 Fiber Management.** Fiber in splice trays along with pigtails and buffer tubes in the interconnect center or splice closures shall be neatly looped and restrained following telecom industry standard fiber and cable management practice and enclosure manufacturer's recommendations. Shown below are examples of acceptable and unacceptable fiber and cable management. Work will not be accepted unless good fiber management practices are followed.



Acceptable



Unacceptable

**3.7 Required Fiber Splicing, Installation and Testing Experience.** Submit resumes, certificates and references detailing fiber installation, splicing and testing for on-site personnel to the engineer for approval. Subcontractors used on the project are considered part of the contractor's team and are also required to submit resumes, certificates and references. Submit to the engineer references including client project manager, phone number and project experience. Demonstrate successful completion of fiber optic cable installation and splice training courses by providing certificates of completion. Failure to comply may result in a declaration of noncompliance.

In addition, ensure a number of the contractor's team approved by the engineer that has at least two years of experience in the installation, splicing and testing of the fiber optic cable is on site at all times during the fiber optic cable installation and fiber optic splicing work until successful completion of the work. Receive approval from the engineer for any substitution of this individual. The engineer may stop the work activity on this project as a result of the absence of these on-site personnel from the project and may continue to charge time to the contractor and will not grant a time extension.

**3.8 Existing Fiber Replacement.** When plans show new fiber being installed to replace existing fiber, the existing fiber should remain in service until the new fiber is installed and is ready for splicing to minimize network downtime.

**3.9 Fiber Relocation.** The fiber optic cable is a crucial part of the traffic operation system. It is imperative that the downtime be kept to a minimum when relocating fiber optic cable. When existing fiber is disconnected for relocation, the relocation and fiber splicing of the relocated fiber shall progress continuously to minimized downtime.

#### **4.0 Acceptance Testing.**

**4.1 General.** Test the fiber after installation, including all splicing and termination, is complete. Note, however, that this test procedure involves measuring the loss of fiber installed by others before splicing to it. For each fiber optic link, including spare fibers, determine whether the optical loss is within the limits permitted by these specifications. A link is a continuous segment of fiber between one connector (or unterminated end) and another connector (or unterminated end).

When testing links that do not have connectors on both ends, use a mechanical splice to attach a pigtail to the unterminated fiber for the duration of the test.

**4.2 Test Procedure.** For each fiber link, follow this procedure:

- (a) If the link includes fiber installed by others, use an optical loss test set to measure and record the optical loss over that portion of the link before it is spliced to new fiber.
- (b) Calculate the maximum allowable loss for the completed link, both at 1310 nm and at 1550 nm. Use the following formula:

Maximum link loss = Measured loss over portion installed by others  
+ (Fiber length in km) x (0.35 for 1310 nm and 0.25 for 1550 nm)  
+ (Number of fusion splices) x (0.05)  
+ (Number of mechanical splices [for temp. connection]) x (0.3)  
+ (Number of connections) x (0.5)

Provide this calculation to the engineer along with the test results.

- (c) Calibrate an optical loss test set and provide evidence satisfactory to the engineer that the set produces accurate results at both wavelengths. This can be a demonstration that the set correctly measures the loss of a test fiber whose loss is known.
- (d) Use the test set to measure the loss of the link under test. Record the result at both 1310 nm and 1550 nm. Arrange for the engineer or his representative to witness these tests.
- (e) If the measured loss exceeds the calculated maximum, use an optical time domain reflectometer and other test equipment to troubleshoot the link. Take whatever corrective action is required, including cable replacement, to achieve a loss less than the calculated maximum.

**4.3 Test Result Documentation.** Prepare a report showing all of the links tested in this project. For the portions installed in this project, show the equipment cabinets, splices, and pigtails. On each line representing a link, show the maximum allowable loss and the actual loss. The actual loss shall be the one measured after all corrective actions have been taken. Submit an electronic copy of the report to the engineer, along with the calculations for the maximum allowable loss. Submit the report including calculations in an electronic format acceptable to the engineer.

**5.0 Documentation.** Provide the engineer mark-ups of the plans, neat and legible, illustrating as-built versions of the splice and connection diagrams that are contained in the plans.

**6.0 Certifications.** New fiber optic cable shall be factory certified to meet the requirements in this specification. In addition, the manufacturer shall certify that the fiber optic cable has a life expectancy of 20 years.

**7.0 Basis of Payment.** Measurement and payment for items covered by this specification include the new or relocated fiber optic cable, acceptance testing, in addition to all materials, labor and equipment necessary for a fully operational system. Payment will be made as follows:

Item No.	Type	Description
910-99.02	Each	Fiber Optic Fusion Splice
910-99.02	Each	Furnish and Install SM Fiber Optic Pigtail
910-99.02	Each	Furnish and Install SM Fiber Optic Jumper
910-99.02	Each	Wall-Mounted Interconnect Center
910-99.03	Linear Foot	Fiber Optic Cable, 24 Strand, Single Mode

TT. MoDOT Buried Cable Driveable Delineator Post

**1.0 Description.** The contractor shall install a MoDOT 'Buried Cable' delineator post (see plans for details) next to all new fiber optic pull boxes within the project limits. The post shall withstand multiple directional impacts and providing a long lasting and extremely durable product requiring little field maintenance. The contractor shall not be required to install posts at pull boxes nearest to new or existing field cabinets. The posts shall be placed at a minimum spacing of 500 feet, unless line of sight to the adjacent post would be obstructed, in which case the Engineer may direct the contractor to install posts at points to allow for ground-level line of sight from adjacent posts or field cabinets.

**2.0 Construction Requirements.** Construction requirements shall confirm to the delineator post manufacture recommendations and engineer's approval.

**2.1 Materials.** The post shall be supplied in orange color and incorporate a premium UV inhibitor package to resist harmful effects to the sun. The post shall have a minimum 0.20" wall thickness and shall stand up straight in all weather conditions and self-right to straight upon impact. Top of post shall be permanently sealed and partially flattened and transition to round to afford 360 degree visibility. The post materials shall include an anchor, a non-mechanical flexible joint, and a round delineator post.

The post assembly should allow for easy change-out of any one part if necessary.

**3.0 Basis for Payment.** Payment for the 'Buried Cable' delineator post shall be considered full compensation for all contractor-provided equipment items, labor, and material to complete the described work. Payment will be made as follows:

Item No.	Type	Description
910-99.02	Each	MODOT BURIED CABLE DRIVEABLE DELINEATOR POST

UU. Coordination with ITS Staff and Utility Locates

**1.0 Description.** Any work that will impact the existing communications network must be coordinated with the Commission's St. Louis 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.** The contractor shall notify the ITS group via an email to [SLITS@modot.mo.gov](mailto:SLITS@modot.mo.gov) at least 2 days before any work that may impact the existing network communications. The contractor shall include the Job#, location and brief scope of work in the email's subject line. The engineer shall be notified prior to making contact with ITS staff. For MoDOT Utility location updates, the contractor must contact MoDOT TMC at 314-275-1500 and ask for Utility Locate Section at least seven calendar days before performing any work.

**3.0** The ITS and network devices located within the project limits are a crucial part of the traffic operation system for this area. It is imperative that the downtime be kept to a minimum when adding, removing, or modifying any existing ITS and network devices. This may require the contractor to perform work that will affect existing network devices during nighttime and/or weekend hours, at the discretion of the Engineer. Allowable timeframes for this work will be subject to the need for ITS devices in the area to be used to manage other traffic impacting workzones.

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

## VV. Conduit

### **1.0 Description.**

**1.1** 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% 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 Intercept Existing Conduit with Proposed Pull Box.**

**3.3.1** Determine whether the conduit is occupied. If so, disconnect the cables at one end of the cables and pull them back so that they are not damaged when the conduit is cut. Alternatively, they can be removed entirely and replaced with new, identical cables. Notify the engineer if any of the cables appear to be in poor condition.

**3.3.2** Excavate a pit big enough for the pull box and drain material, with at least an additional foot on each side with conduit.

**3.3.3** Install the drain material. From the top of the drain material, measure the vertical distance to the bottom the conduit at the points corresponding to the walls of the box.

**3.3.4** If the conduit is PVC or metal, cut it in two places such that the distance between the cuts is longer than the box. Be sure the ends are cut squarely. If the conduit is HDPE, cut it in the center of the pit. Ensure that the pit is long enough that the conduit can be bent out of the way when the box is installed, and can be bent enough to insert the conduit through the wall of the box.

**3.3.5** Make a hole in the wall of the box at each point that the conduit will enter. Use the distances measured earlier to determine how far from the box's bottom to make the holes.

**3.3.6** Set the pull box in the pit with the holes aligned with the conduits.

**3.3.7** Pass the conduits through the wall of the box so that they end about one inch inside the wall. For PVC conduit, extend the existing conduit using a short length of new PVC conduit that includes a socket end. For metal conduit, thread the existing conduit, apply a threaded coupling, and add a short length of new conduit. For HDPE, bend the existing conduit to pass through the box wall, then cut it to length inside the box.

**3.3.8** Use non-shrink grout to completely fill the space between the conduit and box wall.

**3.3.9** Backfill the pit and restore the area as with any pull box installation.

**3.3.10** Reinstall, reconnect, and test the cables that were pulled back at the beginning of the procedure. Alternatively, replace them in kind and test them.

#### **3.4 Install Conduit into Existing Pull Box.**

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

**3.4.2** 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.

**3.4.3** Install the conduit.

**3.4.4** 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.

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

#### **4.0 Basis of Payment.**

**4.1** All surface-mounted junction boxes, fittings, liquid-tight flexible conduits, hangers, supports, resin anchor systems, and all hardware are incidental to the cost of conduit.

**4.2** 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.

**4.3** Payment for Intercept Conduit with Pull Box includes only that work that would not be incurred in a normal pull box installation. The cost of the box and its installation will be paid for separately.

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

Item No.	Type	Description
910-99.03	Linear Foot	Conduit, HDPE, Trench, 2"
910-99.03	Linear Foot	Conduit, HDPE, Drill, 2"
910-99.02	Each	Install Conduit Into Existing Box

WW. Contractor-Furnished and Install Closed Circuit Television (CCTV) Assembly

**1.0 General.**

**1.1 Description.** The contractor shall remove the existing CCTV Camera Assembly at the noted intersections (if applicable) and install a Contractor furnished IP (Internet Protocol) closed circuit television (CCTV) assembly on a new 4" x 20' extension metal pole (if there is no CL type pole at the noted location; this pole shall be paid separately) which will be mounted to the signal up-right pole (see detail drawing), and install a Contractor furnished power supply and surge protection in the new signal cabinet. Provide cable connecting the camera to the equipment in the cabinet and to ground, set up the camera assembly, and test for proper operation.

**1.2 Compatibility.** The St. Louis District is utilizing TransSuite as their Advanced Traffic Management System (ATMS) and all CCTV cameras must be able to integrate with the software and its related interfaces.

**2.0 Materials.**

**2.1** Camera assembly, mounting bracket, power supply, and surge suppressors will be provided by the Contractor. The cable connecting the camera to the cabinet will also be provided by the contractor.

**2.2 CCTV Camera.** All CCTV cameras purchased and installed on this project shall be selected from the list below. These are the only CCTV cameras that are tested and fully functional with the current MoDOT ATMS (Advanced Traffic Management System):

CCTV Manufacturer	Model	Connection Type
CostarHD (formerly known as Cohu)	4220HD RISE 3 Dome	Outdoor cat5e
Axis	Q6155-E Dome	Outdoor cat5e
Bosch	Autodome 7000i	Outdoor cat5e

**2.3 POE Injector.** The Power Over Ethernet (POE) injector shall be of a make and model produced by the manufacturer of the camera. The POE injector shall operate on standard 120 VAC at 60 Hz electrical service and shall not be affected by transient voltages, surges, and sags normally experienced on commercial power lines. The POE injector shall have an operating temperature range of -40 degrees F (-40 degrees C) to 158 degrees F (70 degrees C).

**2.4 Surge Protection.** The cable between the POE injector and the camera assembly shall be protected by a surge protection device in the cabinet that meets the following requirements:

- a) UL listed and labeled to current editions of UL 497B and UL 497C
- b) Operating Temperature: -20 degrees F (- 28 degrees C) to 122 degrees F (50 degrees C)
- c) Operating Humidity: 95% RH non-condensing
- d) Wall, DIN rail or 19" rack mountable
- e) Three stage protection
- f) Maximum Continuous Operating Voltage: 44-52 V
- g) Data Rate: >100 Mbps
- h) Frequency: 125 MHz
- i) Surge Capacity: 10kA per mode (8x20  $\mu$ s)
- j) Maximum Let-Through Voltage <90Vpk

**2.5 Cables.** Provide CAT 5e outdoor rated cable to carry power, video, and camera control between the camera and POE injector. Between the POE injector and the Ethernet switch an outdoor rated CAT 5e patch cable with factory terminated connectors shall be used. These cables shall meet requirements of applicable manufacturers listed in Section 2.2 above.

**2.6 Banding.** Provide stainless steel bands to affix the mounting bracket to the pole. The banding shall be 1-inch wide, 0.044-inch thick, stainless steel.

### **3.0 Construction Requirements.**

**3.1** The contractor shall coordinate this work as well as any ITS (Intelligent Transportation System) network changes with MoDOT St Louis District ITS Group in advance via an email to [SLITS@modot.mo.gov](mailto:SLITS@modot.mo.gov).

**3.2** The contractor shall use the latest manufacture camera firmware.

**3.3** Install the dome so that the pole does not block the camera's view of traffic. Unless directed differently by the engineer, install the camera in the same position as the existing camera.

**3.4** To confirm the existing camera pole is properly grounded, use a device that measures resistance to ground using the three-point fall-of-potential method to ensure that the resistance from the pole to ground does not exceed 8 ohms. If resistance exceeds the 8 ohms threshold report to the engineer.

**3.5** Terminate all the cables on surge protectors, install the Contractor furnished power supply in the cabinet, and connect the camera power circuit to the power supply. Connect POE injector port to the existing Ethernet switch in the cabinet.

**3.6** Restrict the camera's field of view, if necessary, so that a user cannot use the cameras to look in the windows of dwellings. To the extent that it does not interfere with the use of the camera for traffic management purposes, ensure that a camera cannot be used to view residential property. The camera should have clear view of all approaching traffic lanes. Prior to creating these restrictions, submit to the engineer a written description of the proposed restrictions to be installed at each camera, and the proposed method of achieving them. It shall not be possible for an operator to override these restrictions without intervention by his or her supervisor. Affixing a mask to the inside of the clear dome shall be an acceptable method to achieve this. Highlight

situations in which there is a conflict between the need to protect privacy and the need to know about traffic situations. Revise the field of view restrictions as directed by the engineer.

**3.7** Apply a rain repellent coating to the outside of the lower dome, following the coating manufacturer's instructions. The coating must be recommended by the CCTV manufacturer for use on their equipment.

#### **4.0 Acceptance Testing.**

**4.1** Upon delivery of a shipment of camera assemblies, the Contractor shall conduct a visual inspection and test of the camera assemblies to check for manufacturing defects and shipping damage. The camera assembly shall be powered during this testing, and tests shall follow procedures developed by the manufacturer and approved by the engineer. The engineer will witness this testing and the contractor may witness this testing if he or she chooses. The Contractor shall be responsible for replacing all defective units uncovered by this testing.

**4.2** After installing the camera assembly, test it using the same procedures used when the camera assemblies were delivered. In addition, demonstrate that the agreed upon viewing restrictions have been implemented. If the installed camera assembly fails to operate properly, and the problem cannot be fixed by changing the wiring or setup parameters, the camera assembly will be deemed defective and the contractor shall return it to the manufacturer for replacement at Contractor's expense. Except for costs borne by the manufacturer under their warranty agreement, the cost of replacement shall be borne entirely by the contractor.

**4.3** SLITS Group shall inspect this CCTV assembly installation as well as the related network devices for proper operations prior to acceptance.

**5.0 Basis of Payment.** Measurement and payment for furnishing and installing the camera assembly installation includes testing, grounding testing, and all miscellaneous hardware required for a safe, fully operational camera assembly. Payment will be made as follows:

Item No.	Type	Description
910-99.02	Each	CCTV Camera Assembly
910-99.02	Each	Install CCTV Camera Assembly
910-99.03	LF	CCTV Camera Cable

#### **XX. Install or Relocate Existing Communication Equipment**

**1.0 Description.** The contractor shall install MoDOT furnished ethernet network switch(s) or relocate all existing network equipment from existing ITS or signal cabinet into new cabinet, make necessary connections and test for proper network connection. This work shall be coordinated with MoDOT SLITS Group via an email to [SLITS@modot.mo.gov](mailto:SLITS@modot.mo.gov).

#### **2.0 Materials.**

**2.1** The Contractor shall install MoDOT furnished Ethernet network switch(es) or relocate the existing Ethernet network switch(es), video encoders, cellular modem and other existing or new network devices inside the new ITS or signal cabinet as shown on the detail communication plans. These will include power cables and network device surge arresters. Relocating the existing CCTV camera(s) and network radios(s) shall be paid under separate pay items.

**2.2** The Contractor shall furnish and install any other cables such as Category 5E patch cords, coax patch cords, and short serial cables, etc. as required for the new location connections.

### **3.0 Construction Requirements.**

**3.1** Provide to the engineer a detailed schedule of installation of Contractor furnished communications equipment, at least thirty (30) days before commencing this type of work. Additionally, coordinate such work with the engineer.

**3.2** The Contractor shall NOT move any cables from port to port on the network switches without prior MoDOT approval. For equipment installed in cabinets, mount the equipment in the rack as shown in the approved cabinet layout diagram or, for existing cabinets, as directed by the engineer, and connect the power cables and ground wires. If there are insufficient outlets in existing cabinets, provide Commission approved power strips as required. Connect the communication cables as shown on the connection diagrams in the plans. The equipment will be configured by the Commission, and therefore do not change any configuration settings.

**3.3** Assist Commission staff in making the installed equipment operational. This may entail having a person with a cellular telephone at the cabinet reporting on results and making changes as directed by Commission staff. It may also entail installing replacement equipment when a unit cannot be made to work properly.

**3.4 Cisco Ethernet Switch.** Prior to the beginning of the project, the Contractor shall verify the correct switch type and model including any additional necessary Cisco supported equipment with MoDOT St. Louis ITS department. Additional equipment may include but is not limited to the power supply, DIN rails, and any applicable Cisco supported SFPs (Small Form-factor Pluggable transceivers), or expansion modules. For signal cabinets, the switch shall be mounted on the left side panel above the 120V IP Power Strip. Attach unit to 2 rails of the side panel, with the power cable facing away from the cabinet door. The Cisco switch shall be powered from the 120V IP Power Strip. The Cisco Ethernet Switch including the additional Cisco supported equipment shall be delivered to Commission's ITS Engineer for programming at least 2 weeks prior to the field installation.

**3.5. Cellular Modem.** If present, the contractor shall provide before and after documents on cellular modem signal strength. The new cellular modem signal strength shall be equivalent or better than existing. Contractor shall be responsible for installation or relocation of cellular antenna to achieve acceptable signal strength.

**3.6 Other Agency's Devices on MoDOT Right-Of-Way and Facilities.** If other agency's devices such as emergency pre-emption system, CCTV Camera, etc. exist within MoDOT Right-Of-Way and must be relocated onto the new MoDOT facilities, the contractor must notify MoDOT SLITS Group via an email to [SLITS@modot.mo.gov](mailto:SLITS@modot.mo.gov) and MoDOT area traffic engineer in the early stage of the construction. MoDOT SLITS Group and MoDOT area traffic engineer will coordinate the removal and re-installation of those devices with responsible agency.

**4.0 Basis of Payment.** Measurement and payment for communication equipment installation will be on a per cabinet basis. The unit price shall include patch cords, cabling, assistance to Commission staff in getting the equipment operational, documentation, and all miscellaneous hardware required for a safe, fully operational system. Payment will be made as follows:

Item No.	Type	Description
910-99.02	Each	Install or Relocate Existing Communication Equipment

YY. Truck Mounted Attenuator (TMA) for Stationary Activities JSP-23-04

1.0 Description. Provide and maintain Truck Mounted Attenuators (TMA) in accordance with Sec 612 and as specified herein.

2.0 Construction Requirements. Truck Mounted Attenuators (TMA) shall be used for the work activities indicated in the plans or specified herein.

2.1 Sidewalk and curb ramp construction at the intersection of Route 61/67 and Linderhof Drive – See Plan Sheet 27 for work area location and Plan Sheet 39 (“Shoulder Work with Minor Encroachment” TA) for TMA location.

2.2 Striping Operations - STA. 183+09.86 to STA. 197+16.69 (Section 1 - Route 61/67 at St. Johns Church Road) and STA. 257+26.16 to STA. 273+35.53 (Section 2 – Route 61/67 at Miller Road East) – See Plan Sheet 41A (“Center Line/ Edge Line Striping on Four-Lane Highways” TA) for TMA locations.

3.0 Method of Measurement. No measurement will be made for Truck Mounted Attenuators (TMA).

4.0 Basis of Payment. Delete Sec 612.5.1 and substitute with the following:

612.5.1 No payment will be made for truck mounted attenuators (TMAs) used in mobile operations or for any TMAs designated as optional.

612.5.1.1 Payment for TMAs required for stationary work activities will be paid for at the contract unit bid price for Item 612-30.01, Truck Mounted Attenuator (TMA), per lump sum. The lump sum payment includes all work activities that require a TMA, regardless of the number of deployments, relocations, or length of time utilized. No payment will be made for repair or replacement of damaged TMAs.