

JOB SPECIAL PROVISIONS TABLE OF CONTENTS

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

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Job No.: JNW0122

Route: 36

County: DeKalb

 THIS SHEET HAS BEEN SIGNED, SEALED AND DATED ELECTRONICALLY.	MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION 105 W. CAPITOL AVE. JEFFERSON CITY, MO 65102 Phone 1-888-275-6636
	BARTLETT & WEST, INC. 10733 Sunset Office Dr., Suite 220 St. Louis, MO 63127 Certificate of Authority: 000167 Consultant Phone: 314-384-5531
	If a seal is present on this sheet, JSP's have been electronically sealed and dated.
	JOB NUMBER: JNW0122 DEKALB COUNTY, MO DATE PREPARED: July 14, 2025
	ADDENDUM DATE:

Only the following items of the Job Special Provisions (Roadway) are
authenticated by this seal: A through P

 THIS SHEET HAS BEEN SIGNED, SEALED AND DATED ELECTRONICALLY.	MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION 105 W. CAPITOL AVE. JEFFERSON CITY, MO 65102 Phone 1-888-275-6636
	BARTLETT & WEST, INC. 601 Monroe St., Suite 201 Jefferson City, MO 65101 Certificate of Authority: 000167 Consultant Phone: 573-659-6745
	If a seal is present on this sheet, JSP's have been electronically sealed and dated.
	JOB NUMBER: JNW0122 DEKALB COUNTY, MO DATE PREPARED: July 14, 2025
	ADDENDUM DATE:

Only the following items of the Job Special Provisions (Roadway) are
authenticated by this seal: Q through X

JOB
SPECIAL PROVISION

A. General - Federal JSP-09-02L

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

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

1.2 The following documents are available on the Missouri Department of Transportation web page at 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 2025 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- 13-01D

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

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

Job No.: JNW0122
Route: 36
County: DeKalb

Notice to Proceed: December 8, 2025
Contract Completion Date: December 1, 2026

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

Job Number	Calendar Days	Daily Road User Cost
JNW0122	145	\$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 **\$1,500** per calendar day for each calendar day, or partial day thereof, that the work is not fully completed. For projects in combination, these damages will be charged in full for failure to complete one or more projects within the specified contract completion date or calendar days.

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

C. 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 10 minutes to prevent congestion from escalating to 15 minute or above threshold. If disruption of the traffic flow occurs and traffic is backed up in queues of 15 minute delays or longer, 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.

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.

3.0 Work Hour Restrictions.

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

Memorial Day
Labor Day
Thanksgiving
Christmas
New Year's Day

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

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

3.2 The contractor shall not perform any construction operation on the active lanes during restricted periods, holiday periods or other special events specified in the contract documents.

3.3 The contractor shall not alter the start time, ending time, or a reduction in the number of through lanes of traffic or ramp closures without advance notification and approval by the engineer. The only work zone operation approved to begin 30 minutes prior to a reduction in through traffic lanes or ramp closures is the installation of traffic control signs. Should lane closures be placed or remain in place, prior to the approved starting time or after the approved ending time, the Commission, the traveling public, and state and local police and governmental authorities will be damaged in various ways, including but not limited to, increased construction administration cost, potential liability, traffic and traffic flow regulation cost, traffic congestion and motorist delays, with a resulting cost to the traveling public. These damages are not easily computed or quantified. Therefore, the contractor will be charged with liquidated damages specified in the amount of **\$1,000 per 15 minute increment** for each 15 minutes that the temporary lane closures are in place and not open to traffic in excess of the limitation as specified elsewhere in this special provision. It shall be the responsibility of the engineer to determine the quantity of unapproved closure time.

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

4.0 Detours and Lane Closures.

4.1 When a changeable message sign (CMS) is provided, the contractor shall use the CMS to notify motorists of future traffic disruption and possible traffic delays one week before traffic is shifted to a detour or prior to lane closures. The CMS shall be installed at a location as approved or directed by the engineer. If a CMS with Communication Interface is required, then the CMS shall be capable of communication prior to installation on right of way. All messages planned for use in the work zone shall be approved and authorized by the engineer or its designee prior to

deployment. When permanent dynamic message signs (DMS) owned and operated by MoDOT are located near the project, they may also be used to provide warning and information for the work zone. Permanent DMS shall be operated by the TMC, and any messages planned for use on DMS shall be approved and authorized by the TMC at least 72 hours in advance of the work.

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

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

D. 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.

Missouri Highway Patrol (816) 387-2345	
City of Cameron	
Fire: (816) 632-2345	Police: (816) 632-6521

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

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

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

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

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

Job No.: JNW0122
Route: 36
County: DeKalb

Richard Orr, Project Contact
Northwest District Office Email:
3602 N. Belt Highway
Saint Joseph, MO 64506

Telephone: (816) 387-2483
Email: Richard.Orr@modot.mo.gov

1.1 All questions concerning the bid document preparation can be directed to the Central Office – Design as listed below.

Telephone Number: (573) 751-2876
Email: BCS@modot.mo.gov

2.0 Upon award and execution of the contract, the successful bidder/contractor shall forward all questions and coordinate the work with the engineer listed below:

Jessica Salyer, Resident Engineer
Northwest District
4718 South US-169
St. Joseph, MO 64506

Telephone: (816) 387-2590
Email: Jessica.Salyer@modot.mo.gov

F. Liquidated Damages for Winter Months JSP-04-17A

Delete Sec 108.8.1.3 (a)

Liquidated damages for failure to complete the work on time shall not be waived from December 15 to March 15, both dates inclusive.

G. 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:

Utility Name	<u>Known Required Adjustment</u>	<u>Type</u>
Brightspeed Walt Miller 319 Madison St. Jefferson City, MO 65101 Phone: (573) 230-7218 Email: walter.s.miller@brightspeed.com	None	Communications
Farmers Electric Cooperative Troy Hermanson 201 US-36 Bus Chillicothe, MO 64601 Phone (660) 646-4281	See Sec 2.1	Electric

Lumen Richard Redel 1 Solutions Parkway Town & Country, MO 63017 Phone: (816) 518-2804 Email: richard.redel@lumen.com	See Sec 2.2	Communications
Bluebird Mike Sanders 9201 Ward Pkwy Ste 300 Kansas City, MO 64114 Phone: (816) 517-1876 Email: mike.sanders@bluebirdnetwork.com	None	Communications
Spire Chris Collins 7500 E. 35 th Terrace Kansas City, MO 64129 Phone: (816) 509-4400 Email: Chris.collins@spireenergy.com	See Sec 2.3	Gas
United Fiber Aron Sharp 401 N. US Hwy 71 Savannah, MO 64485 Phone: (816) 244-2551 Email: asharp@ueci.coop	None	Communications
City of Cameron Tad Wilson 101 W. Second Cameron, MO 64429 Phone: (816) 632-2177 Email: publicworks@cameronmo.com	See Sec 2.4	Water & Electric

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 Commission at this time. This information is provided by the Commission "as-is" and the Commission expressly disclaims any representation or warranty as to the completeness, accuracy, or suitability of the information for any use. Reliance upon this information is done at the risk and peril of the user, and the Commission shall not be liable for any damages that may arise from any error in the information. It is, therefore, the responsibility of the contractor to verify the above listing information indicating existence, location and status of any facility. Such verification includes direct contact with the listed utilities.

2.0 Project Specific Provisions.

2.1 Farmers Electric Cooperative has underground primary facilities parallel to, and on the east side of, Bob Griffin Road and crossing under Route 36. The facilities were installed by directional bore and are at least 4 feet deep at all locations along north and south portions of Bob Griffin

Road where grading will be performed for contract ditch work. These facilities are not expected to be impacted by the construction and will not impede the progress of the contractor.

2.2 Lumen has an existing Lightcore handhole approximately 20 feet outside of the construction area along the west side of Bob Griffin Road that will be moved to avoid impacting the intersection improvements. Lumen has submitted relocation drawings and is diligently working to have their handhole moved by the contractor's notice to proceed. Consequently, the contractor is not expected to be delayed by Lumen's relocation. The contractor may contact **Richard Redel** at **(816) 518-2804** to discuss the relocation work or schedule for completion.

2.3 Spire has existing buried gas lines in the project limits. While the depth of the gas lines are not expected to impact construction, the surface access cover for an existing gas valve at Station 1161+78.63 and approximately 70' left of the centerline of US 36 will require adjustment to match the surface elevation of the new pavement. The contractor will be required to coordinate the adjustment of the gas valve/access cover with the pavement construction so that access to the valve is continuously maintained through construction. The contractor shall contact **Chris Collins** (Chris.Collins@spireenergy.com) with Spire at **(816) 509-4400** a minimum of 2 weeks before commencing either grading or paving operations to ensure the accessibility of the gas valve.

2.4 The City of Cameron has existing water facilities within the project limits that are not expected to be affected by the contract intersection improvements. The City also has electric lines that service MoDOT lighting and signals at the existing intersection. Coordination of the removal of improvements with the installation of the new lighting and signal facilities is detailed in the contract documents and staged so that power requirements for this location are maintained throughout construction. The contractor shall contact **Tad Wilson** with the City of Cameron (publicworks@cameronmo.com) at **(816) 632-2177** at least 2 weeks prior to modifying or requesting service adjustment for the contract work.

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).

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. DBE Prompt Payment Reporting JSP-24-05B

1.0 Description.

1.1 This provision will only apply to contracts that have a Disadvantaged Business Enterprise (DBE) goal greater than 0% and have at least one DBE subcontractor.

1.2 MoDOT monitors the payments made by prime contractors and subcontractors to DBEs for compliance with DBE payment monitoring rules as outlined in 49 CFR 26.37. To facilitate this monitoring, MoDOT requires prime contractors to report their remitted payments to DBEs and subcontractors to report their remitted payments to lower-tier DBEs.

1.3 Tracking of DBE payments are made through the Signet™ application (Signet). Signet is a third-party service, supported by the vendor, for usage by the prime contractor and all subcontractors. Signet is only a reporting tool; it does not process financial transactions. MoDOT does not provide direct technical support for Signet. Information about Signet may be found at <https://signet-help.zendesk.com/hc/en-us>.

1.4 Upon completion of the first pay estimate on the contract, Signet will automatically send an email to the prime contractor prompting registration. The prime will be required to pay a one-time, fixed fee of \$1,000 for this contract directly to the Signet vendor. Use of Signet to track DBE payments will be available for the life of the contract, regardless of the contract value, contract duration, number of subcontractors, or payments reported. No additional fee will be charged to subcontractors that are required to report payments or DBEs that are required to verify payments through Signet. The contractor may also, at no additional cost, report payments through Signet to subcontractors that are not DBEs.

1.5 After each estimate, when contractor reporting of payments is complete, the subcontractor will receive an email notifying them of the payment and requesting verification of the reported

payment. A subcontractor that has not completed registration with Signet will be prompted to do so at this time.

1.6 Users will be set up automatically based on information in MoDOT's vendor list. Additional users under each contractor may be added once registration has been completed within Signet. The current vendor list can be found at <https://www.modot.org/bid-opening-info>.

1.7 For purposes of this requirement, payer is defined as the prime contractor or subcontractor that reports a payment in Signet to a vendor that is either a subcontractor, trucker, manufacturer, regular dealer, or broker. Payee is defined as the vendor that receives notification of payment through Signet from the prime contractor or a higher-tier subcontractor. Payment is defined as issuing an Electronic Funds Transfer (EFT) or mailing a check to a payee.

2.0 Requirements. Payers must report remitted payment to DBEs within Signet, for work performed by the DBE subcontractor, DBE trucking, materials supplied from a DBE manufacturer, dealer, or broker, as well as a return of retainage (and/or other amounts withheld), within 15 calendar days.

2.1 Prime contractors must report remitted payments to DBEs within 15 calendar days of each payment it receives from MoDOT. Prime contractors must also report payments to non-DBE subcontractors if that subcontractor is making payment to a lower tier DBE subcontractor, trucker, manufacturer, regular dealer, or broker.

2.2 The payer must report the following information within Signet:

- a. The name of the payee.
- b. The dollar amount of the payment to the payee.
- c. The date the payment was made.
- d. Any retainage or other amount withheld (if any) and the reason for the withholding (if other than retainage).
- e. The DBE function performed for this payment (e.g., contracting, trucking, or supplying as a manufacturer, dealer, or broker).
- f. Other information required by Signet.

The payer must report its return of retainage (and/or other amounts withheld) in separate, standalone payment entries (i.e., without being comingled with a payment for work performed or materials supplied).

2.3 In the event that no work has been completed by a DBE during the estimate period, such that no payment is due to a DBE subcontractor, trucker, manufacturer, regular dealer, or broker, then the prime contractor will mark payment complete within Signet, and no other payments are required to be reported.

2.4 Each subcontractor making a payment to a lower-tier DBE must report remitted payments within Signet, as detailed in Section 2.2, within 15 days of receipt of each payment from the prime contractor.

2.5 DBE payees must verify in Signet each payment reported by a payer within 15 calendar days of the payment being reported by the payer. This verification includes whether the payment was received, and if so, whether it was as expected.

3.0 Basis of Payment. A fixed cost of \$1,000 will be paid on this contract for the required software to report payments to DBEs through Signet. Regardless of the number of projects in a contract, a single payment will be made under item 108-10.00, SIGNET DBE REPORTING, per lump sum. The engineer reserves the right to underrun this item for any reason. Any additional costs for registration, software, usage, time, labor, or other costs will be considered incidental and no direct payment will be made.

J. 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. 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 No.	Unit	Description
401-99.05	Square Yard	Optional Pavement

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.

K. Tree Clearing Restriction JSP-07-05C

1.0 Description. The project is within the known range of the federally endangered Indiana bat, northern long-eared bat, and proposed endangered tricolored bat. These bats are known to roost in trees with suitable habitat characteristics during summer months.

1.1 MoDOT has determined that suitable trees for one or more of these bat species exist within the project area.

1.2 To avoid negative impacts to these bat species, removal of any trees/limbs greater than three (3) inches in diameter shall only occur between October 16 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.

L. No Open Burning NJSP 21-05

Delete Sec 201.2.5.1 and substitute with the following:

201.2.5.1 No Open Burning. The contractor is encouraged to harvest marketable timber, utilize mulched timber for erosion control and utilize excess mulch for composting. Open burning of trees and other brushy material shall not be allowed on the project site or on a tract immediately adjacent to the project site. No additional payment will be made for compliance with this provision.

M. 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.

N. Modified Curb and Gutter

1.0 Description. On Bob Griffin Road, gutter widths vary and may be as narrow as 18 inches, narrower than MoDOT's standard detail, and in those locations, Modified Curb and Gutter shall be used.

2.0 Construction Requirements. All materials and work performed for this item shall be in accordance with Sec 609 but will utilize the modified cross section shown in the Typical Section sheets of this plan set.

3.0 Method of Measurement. Measurement will be made in accordance with Sec 609.

4.0 Basis of Payment. Payment for the accepted quantity for the Modified Curb and Gutter will be made in accordance with the contract unit bid price for the item listed below and includes all labor, equipment, materials, and time required to comply with this provision.

Item No.	Unit	Description
609-99.03	Linear Foot	Misc: Modified Type B Curb and Gutter

O. Supplemental Revisions JSP-18-01JJ

- 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.

- **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.

- Third-Party Test Waiver for Concrete Aggregate

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

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

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

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

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

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

3.1 The testing facility shall be AASHTO accredited.

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

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

3.2 The testing facility shall provide their testing process, list of equipment, equipment calibration documentation, and testing certifications or qualifications of technicians performing the AASHTO T 161 Procedure B tests. The testing facility shall provide details on their freezing and thawing apparatus including the time and temperature profile of their freeze-thaw chamber. The profile shall include the temperature set points throughout the entirety of the freeze-thaw cycle. The profile shall show the cycle time at which the apparatus drains/fills with water and the cycle time at which the apparatus begins cooling the specimens.

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

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

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

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

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

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

15.0 Bidder's List Quote Summary. MoDOT is a recipient of federal funds and is required by 49 CFR 26.11 to provide data about its DBE program. All bidders who seek to work on federally

assisted contracts must submit data about all DBE and non-DBEs in accordance with Sec 102.7.9. MoDOT will not compare the submitted Bidder's List Quote Summary to any other documents or submittals, pre or post award. All information will be used by MoDOT in accordance with 49 CFR 26.11 for reporting to USDOT and to aid in overall DBE goal setting.

- **Add Sec 102.7.9 to include the following:**

102.7.9 Bidder's List Quote Summary. Each bidder shall submit with each bid a summary of all subcontractors, material suppliers, and service providers (e.g. hauling) considered on federally funded projects pursuant to 49 CFR 26.11. The bidder will provide the firm's name, the corresponding North American Industry Classification System (NAICS) code(s) the firm(s) were considered for, and whether or not they were used in the bid. The information submitted should be the most complete information available at the time of bid. The information shall be disclosed on the Bidder's List Quote Summary form provided in the bidding documents and submitted in accordance with Sec 102.10. Failure to disclose this information may result in a bid being declared irregular.

P. Optional Temporary Pavement Marking Paint NJSP-18-07G

1.0 Description. This provision provides the contractor with the option to either complete all Permanent Pavement Marking Paint (PPMP) prior to the time limits specified herein or to apply Temporary Pavement Marking Paint (TPMP) in accordance with Sec 620.10.2 (4 in. width) in all locations shown on the plans as PPMP and delay application of the PPMP until the spring of 2027, as allowed herein. PPMP is defined as Class 1 Pavement Marking Paint and Class 2 Pavement Marking Paint and does not include Sec 620.20.3 Durable Pavement Markings.

1.1 No application of PPMP shall occur between October 1, 2026 and March 1, 2027, both dates inclusive, except as stated herein. When the contractor has begun application of PPMP prior to October 1, 2026, and weather limitations stated in Sec 620.20.2.4 can be met, the contractor may complete the PPMP within the first seven (7) calendar days of October. If all (100%) of the PPMP is not completed on or before October 7, 2026, all previously applied PPMP, including any painted markings applied prior to October 1, shall be considered TPMP, and the contractor shall complete the remaining marking with TPMP, and then re-apply PPMP in all planned locations after March 1, 2027. All PPMP shall be completed prior to June 1, 2027. No additional payment will be made for PPMP that is later determined to be TPMP due to the contractor's failure to complete the PPMP within the time specified.

1.2 Use of TPMP Prior to October 1. The contractor has the option to apply TPMP in lieu of PPMP prior to October 1, 2026, even when there is sufficient time to complete the PPMP prior to October 1, 2026. For example, the contractor may choose to use TPMP as a base coat for the PPMP on open-graded surfaces in order to achieve higher retroreflectivity readings on the surface coat as compared to a single application.

1.2.1 The contractor has the option of using TPMP in lieu of Temporary Raised Pavement Markers if applied each day that existing markings are obliterated.

2.0 Construction Requirements. TPMP shall be accurately placed in the final planned location and shall be completely covered by the final application of PPMP. Any failure to comply with this

requirement shall be corrected by removal of the misplaced pavement markings at the contractor's expense and without marring of the pavement surface.

2.1 Prior to application of the PPMP on TPMP, TPMP shall be fully cured in accordance with the manufacturer's recommendation, or for a period of 12 hours, whichever is greater.

3.0 Weather Limitations. All weather limitations specified in Sec 620 for PPMP and TPMP shall apply. Cold Weather Pavement Marking Paint, in accordance with Sec 620.10.6, shall be used for TPMP when specified weather limitations do not allow the use of waterborne paint. No additional payment will be made for the use of Cold Weather Pavement Marking Paint as TPMP. Cold Weather Pavement Marking Paint is not an allowable substitute for PPMP and shall subsequently be covered with PPMP.

4.0 Time Exception. If application of PPMP is to be delayed to the spring of 2027, the contractor shall submit a request to the engineer for a time exception and shall provide a revised work schedule that shows the planned completion of the PPMP.

4.1 Upon receipt of the time exception request in Section 4.0, the engineer will list "Application of Permanent Pavement Marking Paint" as an exception on the Semi-Final Inspection form, thus granting an exception to the count of contract time thru June 1, 2027, solely for the purpose of delaying application of PPMP. This time exception shall not apply to any time needed to complete any other work items. Liquidated Damages, as specified elsewhere in this contract, shall remain in effect for all other work items not completed by the contract time limits, as specified elsewhere in this contract, and for PPMP not completed by June 1, 2027.

5.0 Method of Measurement. No final measurement will be made for TPMP.

6.0 Basis of Payment. Full payment for TPMP will be made at the contract lump sum price even when PPMP is completed prior to the time limitation and TPMP is not used or only partially used.

6.2 If a \$0 bid is entered for TPMP, no payment will be made should TPMP become necessary.

Q. Disposition of Existing Signal/Lighting and Network Equipment JSP-15-05A

1.0 Description. All controllers, cabinets, cabinet equipment, network equipment, DMS equipment, antennas, radios, modems, and other equipment noted in the plans shall be removed by the contractor and delivered to the following location:

Commission's Maintenance Lot
513 E. Grand
Cameron, MO 64429
Phone number: 1-888-275-6636

2.0 Signal Equipment. All equipment {or specific equipment listed here} other than network communication devices noted in 3.0 are to be transported to the address listed above. The contractor shall notify the Commission's representative 24 hours prior to each delivery by calling the phone number listed above and ask for the field traffic supervisor.

3.0 Network Communication Devices. Devices such as CCTV cameras and domes, video encoders, device servers, Ethernet switches, media converters, and radio assemblies are to be

transported to the address listed below. The contractor shall notify the Commission's representative 24 hours prior to each delivery by calling phone number listed below and providing details for the delivery.

Commission's TMC
600 NE 84th Terrace
Kansas City, MO 64118
Phone number: 816-622-6500

4.0 The contractor shall exercise reasonable care in the handling of the equipment during the removal and transportation. Should any of the equipment be damaged by the contractor's negligence, it shall be replaced at the contractor's expense. The contractor shall dispose of any other equipment. Delivery shall be within 2 working days of removal. All items returned shall be tagged with the date removed, project number and location/intersection.

5.0 Basis of Payment. Payment for removal, handling and transportation of all equipment specified shall be considered completely covered by the contract unit price for 202-20.10, Removal of Improvements, per lump sum.

R. 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.

S. MoDOT TS2 Type 1 Cabinet Assembly

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.

Item No.	Type	Description
902-42.83	Each	Controller Assembly Housing, NEMA TS2 Controller

T. 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 36 and Bob F Griffin 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 Test Point A 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 B 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 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 contact 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. The alarm
- (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 Weco p/n 324-HDS/03 or equivalent.
- (b) The UPS shall have six (6) user programmable dry contact relay terminal blocks on the front panel. The terminal blocks shall be JITE p/n PTB750B-03-1-03-3 or equivalent.
- (c) The UPS shall have one (1) user input and one (1) Automatic Transfer Switch (ATS) terminal block on the front panel. The terminal blocks shall be JITE p/n PTB750B-03-1-03-3 or equivalent.
- (d) The UPS shall have a DE-9 RS-232 connector on the front panel.
- (e) The UPS shall have an RJ45 Ethernet connector on the front panel.
- (f) The UPS shall have a battery connector on the front panel. The battery connector shall be an Anderson p/n SB50 or equivalent.
- (g) The UPS shall have a RJ14 battery temperature probe connector on the front panel.

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

- (a) The operating temperature range of the UPS shall be -40° to 55°C with the capability of operating @ 800W for up to 2hr at 74°C ambient.
- (b) The storage temperature range of the UPS shall be -40° to 75°C.
- (c) The operating and storage humidity (non-condensing) range of the UPS is up to 95% RH.
- (d) The altitude operating range of the UPS is up to 12,000ft with a de-rating of 2°C per 1000ft above 4500ft.
- (e) The UPS shall be shipped in materials designed to meet requirements for ISTA program.
- (f) The UPS shall pass electrical safety standards UL1778, CSA 22.2 No. 107.3, EN50091-1-1-2 and EN60950.
- (g) The UPS shall pass emission standards FCC Subpart J Level A for conducted and radiated EMI CISPR22, EN55022 Level A for conducted and radiated EMI.
- (h) The UPS shall pass Immunity standards:
 - EN61000-4-2: ESD (Electrostatic discharge).
 - EN61000-4-3: Radiated immunity.
 - EN61000-4-4: EFT (Electrical fast transient).
 - EN61000-4-5: Surge.
 - EN61000-4-6: Conducted (Power and signal lines).
 - EN61000-4-8: Power frequency magnetic.
 - EN61000-3-2: Harmonic distortion.
- (i) The UPS shall display agency approval mark "cCSAus" on the manufacturer's nameplate label.

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

- (a) The MPS shall be a self-contained module separate from the UPS
- (b) The MPS shall be shelf or rack mountable.
- (c) The MPS shall have terminal blocks labeled "AC Input", AC Output", "To UPS" and "From UPS".

- (d) The MPS shall be a Break-Before-Make rotary switch.
- (e) The MPS shall be rated at 120VAC @ 20A.
- (f) The MPS shall have a 5-15R duplex receptacle connected to utility line.
- (g) The MPS shall have a 5-15R receptacle labeled "Optional LA-P" to facilitate a plug-in surge suppressor.
- (h) The MPS shall have a 5-15R receptacle labeled "Optional Battery Heater Mat" to provide non-standby power to a battery heater mat.
- (i) The MPS shall have two (2) positions: one labeled "UPS" to connect the utility line to the UPS, and one labeled "Bypass" to connect the utility line to the load.
- (j) The MPS shall have a 15A circuit breaker labeled "AC Input".
- (k) The MPS shall have a 15A circuit breaker labeled "AC Output".

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

- (a) The ATS shall be rated for 120VAC @ 40A.
- (b) The ATS shall be shelf or rack mountable.
- (c) The ATS shall transfer the load to UPS when the utility line fails or is unqualified.
- (d) The ATS shall transfer the load to utility line when the utility line is available and qualified.
- (e) The ATS shall be activated by a 48VDC input from the UPS.
- (f) The ATS shall have a terminal block labeled "L IN", "NEUT", "GRD" and "L OUT".
- (g) The ATS shall have a six (6) foot line cord labeled "UPS IN".
- (h) The ATS shall have a six (6) foot line cord labeled "UPS OUT".
- (i) The ATS shall have a 5-15R duplex receptacle connected to utility line.
- (j) The ATS shall have a 5-15R receptacle labeled "Optional LA-P" to facilitate a plug-in surge suppressor.
- (k) The ATS shall have a 5-15R receptacle labeled "Optional Battery Heater Mat" to provide non-standby power to a battery heater mat.

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

- (a) The ABS shall be rated for 120VAC @ 20 amps.
- (b) The ABS shall be shelf or rack mountable.
- (c) The ABS shall connect the UPS to the load to allow the UPS to continuously power the load.
- (d) The ABS shall transfer the load to utility line when there is no UPS output voltage.
- (e) The ABS shall be activated by the 120VAC from the UPS.
- (f) The ABS shall have a terminal block labeled "L IN", "NEUT", "GRD" and "L OUT".
- (g) The ABS shall have a six (6) foot line cord labeled "UPS IN".
- (h) The ABS shall have a six (6) foot line cord labeled "UPS OUT".
- (i) The ABS shall have a 5-15R duplex receptacle connected to utility line.
- (j) The ABS shall have a 5-15R receptacle labeled "Optional LA-P" to facilitate a plug-in surge suppressor.
- (k) The ABS shall have a 5-15R receptacle labeled "Optional Battery Heater Mat" to provide non-standby power to a battery heater mat.
- (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 No.	Type	Description
902-99.02	Each	Misc: Combo Power Supply, Lighting Controller and UPS

U. Video Detection System

1.0 Overview. This work shall consist of furnishing, configuring, and placing into operation an integrated, artificial intelligence (AI)-based traffic signal optimization system that has the ability to seamlessly integrate object recognition software (operation of the AI-recognition software to be included in this project), as well as data collection and data-driven timing plan creation (operation of data collection and timing plan creation not included, but capability shall be applicable, if these components are added in the future by the project owner). The single software interface shall have the following integrated modules: object recognition software based on Convolution Neural Networks algorithm, data collection hardware and software (capability for future implementation), and metrics computing module. The selected system shall include the hardware and software components, communication with the controller infrastructure, installation documentation, technical support, and warranty described herein. The two primary workflows managed inside the user interface are ***Vehicle Detection and Signal Timing Plan Generation*** using Convolutional Neural Networks (signal timing plan generation to be added, if desired, by the project owner, in the future, for a mutually-agreeable fee).

The system shall include all equipment listed and described in this document and any incidental items necessary for the satisfactory operation of the system.

2.0 System Components. The Vehicle Detection and Timing Plan Generation system shall consist of up to two IP, panomorphoc cameras with 360° field of vision (FOV), or a series of individual rectilinear cameras or a multi-sensor camera, a Graphical Processing Unit (GPU), mounting hardware, infrastructure to cabinet interface for ensuring input to the traffic signal controller and a single software that is capable of seamlessly managing all functionality. The single software shall handle the following functionalities:

- Perform vehicle detection and counting.
- Permit configuration of field devices.
- Place detection calls to the traffic signal controller.
- Collect Turning Movement Count (TMC) and Automated Traffic Signal Performance Measures (ATSPM) data directly from the camera (capability of implementation in the future).

- Create optimized timing plans for the intersection and the arterial (capability of implementation in the future).
- Download the timing plans to the GPU upon user review and approval (capability of implementation in the future).

The workflow shall be seamless and integrated with all field devices and software. To ensure accurate detection or data collection, it may be necessary to use two cameras at larger intersections.

2.1 System APIs. The process workflow shall trigger four stand-alone events integrated to deliver the following functionalities:

- Detect Vehicles: Recognize, identify, and detect vehicles using Artificial Intelligence.
- Collect Data: Collect and analyze precise data 24/7/365, and then visualize it in ATSPM and TMC graphs and charts (capability of implementation in the future).
- Generate Timing Plans: Using accurate and appropriate data, develop data-driven timing plans for as quickly as 3 minutes (capability of implementation in the future).
- Deploy to the Field: Synchronize the timing plan with the processing unit in just a few seconds and control the intersection (capability of implementation in the future).

2.2 Material Adherence to Quality Standards. Equipment and material supplied shall be of new stock and conform to relevant requirements and standards, including the provisions of Caltrans 170/ATCC/ITSv2, IMSA, ITE, NEMA, RETNA, MUTCD, NEX, and regulations of the National Board of Fire Underwriters and meet the approval of the engineer. The system shall have remote monitoring and configuring capability using IEEE 802.3 standards. The equipment shall meet the NEMA TS2 environmental, power, and surge ratings according to the latest NEMA TS2 Specifications for shock, vibration, temperature, humidity, transient voltage, etc.

2.3 System Compatibility. The System shall be compatible with all major makes and models of traffic controllers and cabinets, including but not limited to those associated with NEMA, Caltrans, 170, 2070, 33X-style, TS-1, TS-2, Econolite, SWARCO, Peek, Cubic, Q-Free, and other prominent controllers and cabinets, manufactured currently or in the last 15 years. The system shall not require the replacement of a traffic signal controller, cabinet, or modification thereof.

2.4 Data Collection (capability of implementation in the future). The system shall process video images from the camera using AI algorithms and specifically Convolution Neural Network (CNN). Depending on the geometry and size of the intersection, the system shall typically utilize one camera but may occasionally require two cameras for data collection. The collected data shall be stored and seamlessly made available to the timing plan generation software on demand.

2.5 Hardware. The system shall consist of a series of color video cameras, a shelf- or rack-mounted GPU processing unit, software, a license for system control via a web browser such as Google Chrome on any authorized computer, and an Ethernet switch. The GPU processor unit (GPU), mounted in the traffic cabinet, connects to the traffic signal controller through external hardware such as detector cards, SDLC modules, and GPIO modules. The processor shall intercept traffic calls, and place calls passively on the traffic controller.

The timing plan generation software shall operate on any authorized computer using a web browser like Google Chrome (capability of implementation in the future).

2.5.1 Graphical Processing Unit (GPU)

2.5.1.1 General. The GPU shall be capable of gathering detection information from the cameras. The GPU shall contain a Graphical Processing Unit chip, be rack or shelf-mounted, and be modular in design. The processor shall submit detector actuation by placing calls passively to the traffic controller and collecting vehicle data. The GPU shall be equipped with a 10/100 Mbps Ethernet port for remote communications and monitoring of system operations at the cabinet. It shall support on-site configuration using a USB keyboard and HDMI monitor or remote configuration over an IP Network. In addition, it shall support on-site backup to/restore from a USB Memory Stick for rapid replacement.

2.5.1.2 Construction. The Processing Unit shall be housed in a durable aluminum profile enclosure with a cooling fan.

2.5.1.3 Dimensions. The housing shall not exceed 6-5/8" (L)x5-5/8" (W)x4" (H)/169x143x102mm – for the economy of mounting space in the cabinet.

2.5.1.4 Operating temperature. The GPU processor shall function properly in temperatures of -40°F to 165°F (-40°C to +74°C) and 90% non-condensing humidity.

2.5.1.5 Communications (capability of implementation in the future). Communications from the GPU to any computer shall be through an RJ45 (8P8C) connector over a regular IP network connection at the installation location or over a network. The Processing Unit shall support at least 1x power, 1x RS232 serial port, 2x 10/100 network ports, 1x USB-C port, and 1x HDMI output interfaces. The user shall also be able to connect directly to the cameras over the IP network and display color video streaming.

2.5.1.6 Compatibility with NEMA Standards. The GPU shall be available with Caltrans 170, NEMA TS1/TS2, 330x, and ITSv2 detector interface.

Output levels shall be compatible with the following cabinet standards: Caltrans 170, NEMA TS1 over Detector Cards, NEMA TS2 Type 2 over SDLC interface and cabling, 330x-style over Detector Cards, and ITSv2 over SDLC interface and cabling.

2.5.1.7 Free Mode Controller Operations. The GPU shall input optimized detector calls into a controller running in free mode.

2.5.1.8 Suspension of Inputs When Needed. The GPU shall suspend, for the necessary time, its inputs to a controller when higher priority calls are put into the controller by preemption vehicles or the pre-determined parameters set by traffic officials.

2.5.1.9 Pedestrian Calls. The GPU shall incorporate the capability to include pedestrian calls in the optimization algorithms.

2.5.2.0 Time Clock Synchronization. The GPU shall keep accurate time using a mechanism that synchronizes the clocks at least weekly.

2.5.2.1 Time of Day Operation. The GPU shall be capable of recognizing vehicles and collecting accurate detection inputs every 10th of a second. The algorithm of the GPU shall provide detection results without limitation in the day of the week or another time-driven requirement. The GPU shall be capable of running timing plans for each day of the week and each season.

2.6 Video Camera

2.6.1 General. The system must include in its base product standard Internet protocol (IP) cameras allowing real-time images to be viewed remotely via the Internet using a standard browser, not proprietary software. The video cameras shall be digital cameras, and their video feeds shall be available over standard Internet Protocol (IP) connection in Motion JPEG and MPEG 4 formats using the latest IP technology. All camera views shall be obtainable simultaneously without cable swaps. The system shall be capable of displaying video on a web browser such as Google Chrome. The camera shall produce a usable color video image of traffic under normal roadway lighting conditions regardless of the time of day.

2.6.2 Construction. The camera shall be housed in a die-cast aluminum with a polycarbonate lens (for 360-degree panomorphoc cameras). The camera shall come with a shield to prevent moisture from accumulating on the lens.

2.6.3 Weight and Dimensions. The camera shall not exceed 2.2 lbs (1 kg) in weight and Ø5 3/16" x 10 1/4" (Ø132 x 260 mm) in size.

2.6.4 Operating Temperature. The camera shall be able to perform in the temperature range of -40°F to 165°F (-40°C to +74°C) and 90% non-condensing humidity.

2.6.5 Camera System Sensing and Video Streams. The camera system shall be capable of delivering MJPEG and MPEG 4 video streams simultaneously at a compression rate of H.264 for video recording transfer and storage.

2.6.6 Camera Lens and Control. The camera shall have an RGB CMOS - 1/2.5" progressive scan lens and 2.8–9.8 mm, F1.6 (1/8" – 3/8") with 25/30 fps. The camera image shall utilize image stabilization features.

2.6.7 Camera Access and Security. The camera system shall be Ethernet-centric. The user shall be able to access the camera directly over the network and configure the camera parameters from the configuration utility available for a laptop or a mobile device.

2.7 RJ-45. The RJ-45 plug connectors specifically for Cat 6A cables shall be used at both the camera and cabinet ends. The supplier of the video detection systems shall approve the Category 6A cable, RJ-45 connector, and crimping tool, and the manufacturer's instructions must be followed to ensure proper connection.

2.8 Cable. Any Ethernet cable running outside the traffic cabinet must be of 500 MHz Category 6A F/UTP (unshielded twisted pairs) cable with shielded RJ-45 connectors on both ends of the cable, terminated with the T-568B pinout. The cable shall be minimally 23 AWG solid copper, direct burial rated, UV and oil resistant polyethylene-based jacket. Pair 1 shall be Blue, White/Blue, Pair 2 shall be Orange, White/Orange, Pair 3 shall be Green, White/Green, and Pair 4 shall be Brown, White/Brown. The operating temperature shall be from -40 °C to +74 °C, and the Storage temperature - 45°C to +85°C. The cable shall conform to the following standards: ISO/IEC 11801 Category 6A, NEMA WC 66, and ANSI/TIA/EIA 568-C.2 Category 6A. The cable shall be without splicing or joints for any single run. The contractor shall obtain instructions from the manufacturer about alternate architecture when the length of a single run of CAT6A cable exceeds 328 feet (100 m).

2.9 Software Requirements. The software shall seamlessly collect data, create timing plans, and download them to the GPU for intersection control and operations using the designed timing

plans. The software shall work with intersection-level data and arterial-level data. The user shall initially define the geometry of the intersection, vehicle speed, phasing details, and arterial geometry. This task shall be done once, and the software shall retain all input data. The software shall permit multiple, if not all timing plans to be created by using this data but only changing the volume data.

The software shall conduct a Highway Capacity Manual analysis and report the Level of Service (LOS) for movements and the intersection (capability of implementation in the future). The software shall display an editable Time-Space Diagram (TSD) and Phase Sequence Diagram (PSD) graphically (capability of implementation in the future).

The software architecture underpinning the system shall incorporate several modules covering the workflow logic:

- Data acquisition module for fetching detection inputs, performance statistics, and turning movement count data from the field for the day-of-the-week, time-of-day, and timing plan generation (capability of implementation in the future).
- Local Optimizer module for computing intersection level parameters, e.g., optimal cycle lengths, green splits, critical phase volumes, etc., for each movement.
- Global optimizer module for creating time tunnels through the coordinated signals, enabling progression. It computes the optimal tunnel duration, effective band, and other coordination specs.
- Timing Plan deployment module for automatic download and management of the timing plan in the field.

2.9.1 Video Recognition Algorithm. The software shall be based on the AI object recognition method. It shall seamlessly integrate detection data collection and computing of accurate count statistics. The software shall incorporate a tracking method that can be configured to match the geometry and specifics of the intersection. The tracking of objects shall capture vehicle movements from entering the detection zone to the exit/departing region. The algorithm shall be capable of differentiating movements along opposing directions.

2.9.2 Configuration Utility. The configuration utility shall be accessible through a web interface, preferably Google Chrome. It shall allow the user to initially define the detection zones, counting zones, movement vectors and count lines, and vehicle details. This task shall be done once, and the software shall retain all input data. The software, however, shall permit modifying of existing configurations.

2.9.3 Detection Inputs. The detection input accuracy shall be guaranteed by incorporating several prerequisites:

- Configuration of both rectangular and irregular polygon-shaped zones.
- AI algorithm based on Convolution Neural Networks.
- Counting vehicles and tracking them until they reach the exit/departure region.
- Assigning a unique ID to each object – to avoid overcounting.
- Detect poor environmental conditions which inhibit accurate detection.
- Data analytics module, processing detection inputs, and providing vehicle data reports.

2.9.4 Actuation. The video detection system shall support the following options:

- a) Actuation via SDLC or direct wiring into the traffic cabinet.
- b) Up to 64 actuation outputs over SDLC (NEMA) and 128 over SDLC (ITS).
- c) Actuation via Detector Cards.

- d) Up to 8 actuation outputs over GPIO direct wiring with constant call fail active capability.
- e) Up to 64 Vehicle Detection actuation outputs via NTCIP.
- f) Continuous output presence actuation.
- g) The output of a constant call on all detection channels within 1 second, in the event that a loss of video signal occurs.
- h) The output of a constant call on only the affected detection channels in loss of visibility conditions.
- i) Delayed or extended actuation for each zone.
- j) Minimum and Maximum Hold for Phase Hold Call Actuation.
- k) Delay, Lock, Extend, and Maximum Object Hold Output configurations per detection zone.

2.9.5 Data Analytics Module (capability of implementation in the future). This shall be a web-based module running on a dedicated system that can be accessed on either a Windows, a Mac, or a Linux platform using a web browser such as Google Chrome. The software shall support viewing simultaneous feeds from the video detection devices. The AI object-recognition algorithm shall provide differentiation between vehicle, pedestrian, and bike occupancy, based on which reports shall be generated.

The analysis shall provide capabilities for processing intersection data with the following features:

- Conduct data analysis of the intersection/corridor.
- Visualize reports and graphical charts for the following metrics: Vehicle Counts, TMC (Vehicles).
- Group statistics into time bins for the Last Hour, Today, Yesterday, This Week, Last Week, and This Month.
- Download reports in an Excel or PDF file format.
- Keep detection data and reports on a local data server or in the cloud.
- Secure the data by using the login authentication process.

2.9.6 Timing Plan Generation (capability of implementation in the future). The software shall have all functionality required to seamlessly connect to the field camera and GPU over an Ethernet network from any authorized computer on the network over a web browser such as Google Chrome.

The web-based software shall fully operate on either a Windows or a Mac platform using a web browser such as Google Chrome. The software shall have the following:

- The data entry capabilities for entering all relevant arterial and intersection data.
- The ability to acquire data directly from the field through seamless integration with the GPU and camera.
- The ability to conduct data analysis of the intersection.
- The ability to compute optimized intersection and arterial timing plans.
- The ability to present such timing plans for review, modification, and approval before deployment.
- The ability to download such timing plans to the GPU for intersection operations.
- The ability to store and report deployed timing plans.

2.9.7 Timing Plan Download and Intersection Operation (capability of implementation in the future). The system software shall seamlessly collect data from the field, create timing plans, and then download the timing plans to the GPU over an Ethernet network. The GPU shall use the

timing plans and control the traffic signal controller to operate the intersection based on the downloaded traffic signal timing plans.

This shall be achieved by putting detector calls on the signal controller operating in free mode.

2.9.8 Cabinet and Controller Interface and Traffic Signal Control. The system shall interface fully with Caltrans 170, NEMA TS1/TS2 detector interface, or other system installed on this project. Output levels shall be compatible with the Caltrans 170, NEMA TS1, and NEMA TS2 Type 2 standards, or other system installed on this project. For 332 Cabinets, the GPU shall interact with the Cabinet and Traffic Signal Controller using detector cards and I/O hardware. For NEMA TS1 cabinets, the GPU shall interact with the Cabinet and Traffic Signal Controller using detector cards. For NEMA TS2 cabinets, the GPU shall communicate over SDLC to the cabinet and the controllers. GPIO modules provide up to 8 more additional inputs and outputs. The system also provides detection via NTCIP for Controllers that support it.

2.9.9 Software/Technology Licensing. The AI object recognition, video detection, counting, and timing plan generation software shall be licensed to operate on multiple computers owned by the agency and operated by agency employees. Employees shall be provided with remote training and documentation.

3.0 Installation

3.1 General. The system shall be installed as recommended by the manufacturer and as documented in the installation materials provided by the supplier. A factory-certified representative from the supplier shall provide remote support before and during the installation. Depending on needs, the system shall allow flexible mounting, either at a vertical pole or with hardware fixtures for horizontal mast arm mounting. Mounting locations should seek to keep the network cable length less than 100 m (328 ft.). If the network cable exceeds this length, an Ethernet repeater should be installed.

3.2 Cable. When extended fully between the camera and the GPU, the Ethernet cable along the mounting pole or mast arm shall be of flexible length, allowing for different position builds and adjustments.

3.3 Mounting Brackets. A mounting bracket shall be included and support all-axis mounting, regardless of whether the camera is attached to a vertical pole or a horizontal mast arm. The bracket shall be constructed of durable, weather-resistant aluminum alloy with stainless steel washers and fasteners. The bracket shall have a saddle piece – for precise and stable laying and fastening of the camera into the bracket. Additional mounting plates and tubes may be required to achieve an optimal view of the areas of interest.

3.4 Failure Mitigation Mechanism. The system shall automatically generate an alert when it detects disruption of the communications network, failure of other GPUs, or inaccurate detection operation.

4.0 Warranty and Support: The video detection system shall be warranted to be free of defects in materials as described below:

- Software for Vehicle Detection and Timing Plan Generation shall be serviced free of charge for one year by the supplier by providing software updates, functionality upgrades, and fixes. The supplier shall provide post-warranty support options to ensure business continuity and long system life.

- Hardware components shall be warranted for two years. The supplier shall provide post-warranty support options to ensure business continuity and long system life.
- Documentation resources such as user guides, configuration and installation manuals, spec sheets, and other learning aids shall be provided by the supplier.

The system supplier shall maintain a 24/7/365 remote support hotline available during the warranty period. This support shall be provided by factory-certified personnel.

5.0 Method of Measurement. Measurement of the video detection system shall be made per each.

6.0 Basis of Payment. Payment for furnishing and installing the Traffic Signal Video Detection System shall include all materials, equipment, tools, labor, and work incidental thereto, and shall be considered to be completely covered by the contract unit price for:

Item No.	Type	Description
902-99.02	Each	Misc: NW District Traffic Signal Video Detection System

V. Retroreflective Blackplates

1.0 Description. This work shall consist of installing retroreflective back plates on all the signal heads as indicated on the plans.

2.0 Method of Measurement. Measurement of the retroreflective backplate shall be made per each as indicated on the plans.

3.0 Basis of Payment. No direct pay will be made to the contractor to recover the cost of the equipment, labor, materials or time required to fulfill the above provision unless specified elsewhere in the contract documents.

W. Advance Warning Flasher Assembly

1.0 Description. This work shall consist of installing new advance warning flasher assemblies as indicated on the plans.

1.1 An advance warning flasher will be used to notify approach traffic when the signal is yellow or red.

2.0 Construction Requirements. WB advance beacons shall flash during WB yellow and WB red intervals. The beacons and W3-3 signs (as shown below) shall comply with MUTCD and state specifications.



(W3-3 sign)

3.0 Method of Measurement. Measurement of the advance warning flasher assembly shall be made per each.

3.0 Basis of Payment. All costs associated with this work shall be considered completely covered as follows:

Item No.	Type	Description
902-99.02	Each	Misc: Advance Warning Flasher Assembly

X. Advanced Detection System

1.0 Description. This work shall consist of furnishing and installing advanced detection systems on Route 36 at Bob Griffin Rd to support advance traffic signal performance measures (ATSPM). All detection systems shall comply with the Missouri Standard Specifications for Highway Construction and be installed per the project plans or as directed by the Engineer. This JSP supersedes Section 902 where conflicts arise.

2.0 Detector Zones. The following detector zones shall be implemented:

- Advance Upstream Detection (performance measures)
- Dilemma Zone Detection (if applicable based on approach speed)
- Radar Zones (if applicable)
- Advance Data Collector (if applicable)

2.1 Dilemma Zones. Dilemma zone detection shall be required for approaches with speeds $\geq$ 45 MPH or where engineering judgment dictates. Detectors shall be placed at 5 and 8 seconds travel time before the stop bar:

Approach Speed (MPH)	5 sec Distance (ft)	8 sec Distance (ft)
45	330	530
50	370	590
55	405	645
60	440	705

3.0 Performance Measures. The detection system shall provide real-time data to the traffic signal controller for:

- Speed
- Volume
- Lane Occupancy
- Vehicle Classification

All data must be exportable and integrated into the MoDOT NW District's ATSPM platform. The contractor shall provide a final detector assignment schedule in PDF format and confirm operational status.

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

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

4.1.1 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.

4.1.2 Material

4.1.2.1 Advance Detector. Installation of radar detection systems shall follow both the below specifications and the manufacturer's instructions.

- WAVETRONIX SmartSensor
 - Matrix
 - Advance
 - Advance Extended
- Iteris Vector

Provide an advanced 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 range shall cover the dilemma zone distances covered in section 2.1
- 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

4.1.2.2 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.

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

4.1.2.4 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.

4.1.4 Construction Requirements.

4.1.4.1 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.

4.1.4.2 Induction Card Rack Interface 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.

4.1.4.3 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.

4.1.4.4 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.

4.1.5 Documentation and Software.

4.1.5.1 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.

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

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

4.1.5.4 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	Misc: Advance Radar Detection