

JOB SPECIAL PROVISIONS TABLE OF CONTENTS (ROADWAY)

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

A.	General - Federal JSP-09-02K	1
B.	Contract Liquidated Damages JSP-13-01D	1
C.	Work Zone Traffic Management JSP-02-06N	2
D.	Emergency Provisions and Incident Management JSP-90-11A	7
E.	Project Contact for Contractor/Bidder Questions JSP-96-05	8
F.	Supplemental Revisions JSP-18-01CC	9
G.	Utilities JSP-93-26F	14
H.	Pot Holing For Utility Facilities	22
I.	Concrete Adjacent to Ameren Composite Poles	22
J.	Contractor Verification of Signal Base Locations	23
K.	Liquidated Damages for Pedestrian Impacts	23
L.	Liquidated Damages Specified – A9260 Bridge Staging JSP-93-28A	24
M.	Liquidated Damages Specified – Lane Shift and Bidirectional Lane Closure JSP-93-28A	25
N.	Special Consideration of Change Orders and Value Engineering JSP-21-07	26
O.	Contractor Quality Control NJSP-15-42	26
P.	Winter Months Requirements JSP-15-07A	28
Q.	Delayed Access to Parcels Pending Acquisition	29
R.	Property Owner Agreements	30
S.	Special Conditions for the Sappington Cemetery	32
T.	Property Owner Notification	33
U.	Access to Commercial and Private Entrances	34
V.	Existing Irrigation Systems	35
W.	Coordination with MoDOT Project No. J6S3281 and their Contractor	36
X.	Special Provisions for Protection of BNSF Railway Company Interests	36
Y.	Crestwood and Webster Groves Coordination	49
Z.	Bus Service	50
AA.	Parked Vehicles During Construction	50
BB.	Site Restoration	51
CC.	Balanced Mix Design Requirements for Section 403 Asphaltic Concrete Pavement JSP-24-01	52
DD.	Polymer Modified Emulsion Tack	88
EE.	Linear Grading Class 2 – Modified	88
FF.	Modified Shaping Slopes, Class III	89
GG.	Guardrail Requirements	90
HH.	ADA Compliance and Final Acceptance of Constructed Facilities JSP-10-01C	90
II.	ADA Material Testing Frequency Modifications JSP-23-01	92
JJ.	Median Island Cut-Throughs – St. Louis District Version 10-18-23	93
KK.	ADA Curb Ramp – St. Louis District Version 01-17-24	93
LL.	Paved Approach, 7 in., High Early Strength	96
MM.	Concrete Sidewalk and Curb Jointing at Utility Poles	97
NN.	Ground Improvement	97
OO.	Moment Slab Sidewalk	98
PP.	Drainage Maintenance During Construction	99
QQ.	Metropolitan Sewer District of St. Louis Permit (Job No. 23MSD-00395)	99


RR.	Metropolitan Sewer District of St. Louis As-Built Submittals (Job No. 23MSD-00395)	100
SS.	Sidewalk Trench Drain	100
TT.	Convert Inlet To Manhole	101
UU.	Convert Grate Inlet to Curb Inlet	101
VV.	Special Drainage Structures	102
WW.	Single Inlets	102
XX.	Clean Water Act Requirements	103
YY.	Adjust To Grade Items	104
ZZ.	Lump Sum Temporary Traffic Control JSP-22-01A	105
AAA.	Contractor Designed, Furnished and Installed Steel Plates	106
BBB.	Contractor Designed, Furnished and Installed Shoring for Excavation	107
CCC.	Asphalt Coldmilling / Paving Requirement	109
DDD.	Pavement Marking	109
EEE.	Optional Temporary Pavement Marking Paint NJSP-18-07F	109
FFF.	Island Tubular Marker	111
GGG.	Landscaping Restoration	111
HHH.	Disposition of Existing Signal/Lighting and Network Equipment JSP-15-05A	112
III.	Maintenance of Roadway Lighting	113
JJJ.	Top Mount Luminaire	113
KKK.	Top Mount Light Pole	114
LLL.	Temporary Traffic Signals and Lighting	114
MMM.	Install MoDOT Furnished Traffic Signal Controller	115
NNN.	SL District Traffic Signal Detection System	116
OOO.	MoDOT TS2 Type 1 Cabinet Assembly	132
PPP.	Pedestrian Push Button Stanchion	136
QQQ.	Pedestrian Push Button Extension	136
RRR.	LED Blank Out Sign	137
SSS.	Audible Pedestrian Pushbuttons and Signing (Revised 06.09.2023)	139
TTT.	Countdown Pedestrian Signal Heads	141
UUU.	12-Position Backpanel Flashing Yellow Arrow	142
VVV.	Network Connected Signal Monitor	144
WWW.	Coordination with MoDOT Signal Shop for Cabinet Entry	144
XXX.	Partial Acceptance of Signalized Intersections	145
YYY.	Traffic Signal Maintenance and Programming	145
ZZZ.	Combination Pad Mounted 120V/240V Power Supply and Lighting Controller with Uninterruptible Power Supply (UPS) – TS2 Traffic Signal Cabinet	151
AAAA.	Removal of City of Crestwood Owned License Plate Reader (LPR) Equipment	159
BBBB.	Powder Coated Traffic Signal Equipment for Crestwood	159
CCCC.	Painting of Existing Crestwood Signal Equipment	162
DDDD.	Rectangular Rapid Flashing Beacon Assembly	163
EEEE.	Passive Pedestrian Detection for RRFBs	166
FFFF.	Removal and Delivery of Existing Signs JSP-12-01C	166
GGGG.	Remove and Relocate Existing Ground Mount Sign	167
HHHH.	Removal and Replacement of Traffic Signs	168
IIII.	Signs in Concrete	168
JJJJ.	Install MoDOT Furnished IP-Addressable Power Strip	168
KKKK.	ITS Pull Box	169
LLLL.	ITS Conduit	169
MMMM.	Repair ITS Conduit	173

Job No.: J6S3582

Route: 366

County: St. Louis

NNNN.	Fiber Optic Cable Installation, Relocation, and Replacement	173
OOOO.	Install or Relocate Existing Communication Equipment	180
PPPP.	Contractor-Furnished and Install Closed Circuit Television (CCTV) Assembly	182
QQQQ.	CCTV Camera Relocation	184
RRRR.	CCTV Extension Pole Installation	186
SSSS.	Coordination with ITS Staff and Utility Locates	186
TTTT.	ITS Asset Management Tool	187
UUUU.	MoDOT ITS Equipment within Project Limits	188
VVVV.	MoDOT ITS Assets Relocation	189
WWWW.	Removal of Existing Fiber Optic Cable	191
XXXX.	Remove In-Pavement Wireless Detection System	192
YYYY.	Adjust to Grade MoDOT Pull Boxes	193

 <i>R. Jay Rakers</i> 09/10/2024 11:16:36 AM R. Jay Rakers - Civil MO E - 2002003405	MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION 105 W. CAPITOL AVE. JEFFERSON CITY, MO 65102 Phone 1-888-275-6636
	CRAWFORD, MURPHY & TILLY, INC. <i>One Memorial Drive, Suite 500 St. Louis, MO 63102</i>
	Certificate of Authority: 000631 Consultant Phone: 314-436-5500
	If a seal is present on this sheet, JSP's have been electronically sealed and dated.
	JOB NUMBER: J6S3582 ST. LOUIS COUNTY, MO DATE PREPARED: July 30, 2024
ADDENDUM DATE:	
Only the following items of the Job Special Provisions (Roadway) are authenticated by this seal: All	

JOB SPECIAL PROVISIONS

A. General - Federal JSP-09-02K

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

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

1.2 The following documents are available on the Missouri Department of Transportation web page at 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 2024 Missouri Standard Plans
For Highway Construction

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

B. 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 Contract Completion date specified below. Completion by this date shall be in accordance with the requirements of Sec 108.7.1.

Notice to Proceed Date: December 9, 2024
Contract Completion Date: June 30, 2027

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

Job Number	Calendar Days	Daily Road User Cost
J6S3582	N/A	\$5,400

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 **\$3,000** per calendar day for each calendar day, or partial day thereof, that the work is not fully completed. For projects in combination, these damages will be charged in full for failure to complete one or more projects within the above specified contract completion date or calendar days.

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

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

2.5.1 Traffic Safety.

2.5.1.1 Recurring Congestion. Where traffic queues routinely extend to within 1000 feet of the ROAD WORK AHEAD, or similar, sign on a divided highway or to within 500 feet of the ROAD

WORK AHEAD, or similar, sign on an undivided highway, the contractor shall extend the advance warning area, as approved by the engineer.

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

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

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

3.0 Work Hour Restrictions.

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

Memorial Day
Labor Day
Thanksgiving
Christmas
New Year's Day

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

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

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

3.3 No long-term reduction in the number of through lanes on Route 366 will be allowed unless noted in the following job special provisions, or as allowed by the Engineer:

- Liquidated Damages Specified – A9260 Bridge Staging
- Liquidated Damages Specified – Lane Shift and Bidirectional Lane Closure

3.4 Working hours for weekends will be determined by the engineer. Any work requiring a temporary reduction in the number of through lanes of traffic shall be completed during the following work hours.

Location	Work Zone Hours *			
	Shoulder Closure (Each Direction)		Single Lane Closure (Each Direction)	
	Weekdays	Weekend	Weekdays	Weekend
MO 366 (Western Limits to Lindbergh NB Ramps)	8am to 4pm	No	9am to 2pm	6pm to 9pm
	7pm to 6am	Restriction	7pm to 6am	
MO 366 (Lindbergh NB Ramps to Eastern Limits)	8am to 4pm	No	9am to 4pm	6pm to 9pm
	7pm to 6am	Restriction	7pm to 6am	

* Temporary Traffic Control is picked up when workers are not present

Location	Work Zone Hours *	
	Single Lane Closure	Single Lane Closure
	Weekdays (Mon-Fri)	Weekend (Sat-Sun)
South Geyer Road (only one lane is closed)	6pm to 7am	No Restriction

* Temporary Traffic Control is picked up when workers are not present

3.5 The contractor shall not alter the start time, ending time, or a reduction in the number of through lanes of traffic or ramp closures without advance notification and approval by the engineer. The only work zone operation approved to begin 30 minutes prior to a reduction in through traffic lanes or ramp closures is the installation of traffic control signs. Should lane closures be placed or remain in place, prior to the approved starting time or after the approved ending time, the Commission, the traveling public, and state and local police and governmental authorities will be damaged in various ways, including but not limited to, increased construction administration cost, potential liability, traffic and traffic flow regulation cost, traffic congestion and motorist delays, with a resulting cost to the traveling public. These damages are not easily computed or quantified. Therefore, the contractor will be charged with liquidated damages specified in the amount of **\$250 per 15-minute increment** for each 15 minutes that the temporary lane closures are in place and not open to traffic in excess of the limitation as specified elsewhere in this special provision. It shall be the responsibility of the engineer to determine the quantity of unapproved closure time.

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

4.0 Detours and Lane Closures.

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

4.2 At least one lane of traffic in each direction on Route 115 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 Interchange Exit Ramp Traffic Flow.

The contractor is required to always pay special attention to the traffic flow on the interchange exit ramps at the following interchanges when work is actively taking place and/or roadway restrictions are in place related to work on this project.

I-44 and I-270 at Route 366 near Geyer Road

If at any time the traffic queue along any of the exit ramps at these interchanges exceeds 75% of the storage distance to the pavement gore point from the start of the ramps, immediate corrective action shall be required to modify traffic flow in order to avoid further backup along the ramps which could result in a traffic safety issue. Immediate corrective action means work may need to be abruptly halted to open traffic lanes and/or provide more traffic flow resulting in a reduction of the traffic queue on the ramps. Work will not be allowed to proceed or restrictions reinstated until such time as the traffic queue on the exit ramps is reduced to 25% of the storage length of the ramps to the pavement gore point at the start of the ramps, or at the discretion of the Engineer.

6.0 Allowable Work Zone Posted Speed Reductions

6.1 The current posted speed limit shall be used for erection and placement of all work zone temporary traffic control measures, unless otherwise requiring reduction for A9260 bridge construction.

6.2 The Contractor shall be allowed to reduce the posted speed limit by 10 miles per hour in segments of the project approved by the Engineer.

7.0 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 an accident or emergency situation within the project limits.

Missouri Highway Patrol: 636-300-2800			
St. Louis County Sheriff: 314-615-4724			
City of Sunset Hills	City of Crestwood	City of Webster Groves	Village of Marlborough
Fire 636-343-4188	Fire 314-729-4742	Fire 314-963-5345	Fire See "City of Affton"
Police 314-849-4400	Police 314-729-4800	Police 314-963-5402	Police 314-615-4266

Non-Emergency 314-849-4400	Non-Emergency 314-729-4800	Non-Emergency 314-645-3000	Non-Emergency 636-529-8210
City of Shrewsbury	City of Affton		
Fire 314-645-5077	Fire 314-631-1803		
Police 314-647-5656	Police 314-638-5550		
Non-Emergency 636-529-8210	Non-Emergency 636-529-8210		

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-96-05

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

Aaron Groff, P.E.
 Transportation Project Manager – St. Louis District
 1590 Woodlake Drive
 Chesterfield, MO 63017

Telephone Number: (314) 453-1876
 Email: Aaron.Groff@modot.mo.gov

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

F. Supplemental Revisions JSP-18-01CC

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.

Pavement Marking Paint Requirements for Standard Waterborne and Temporary

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

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

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:

<u>Utility Name</u>	<u>Known Required Adjustment</u>	<u>Type</u>
Ameren Missouri (OH) Mitchell Sudholt Telephone: 618.520.4058 Email: msudholt@ameren.com	Yes See 3.0	Electric
Ameren Missouri (UG) Tensley Robinson Telephone: 314.406.9957 Email: trobenson@ameren.com	Yes See 3.1	
Ameren Missouri (Fiber) Dan Crockett Telephone: 447.287.8641 Email: dcrockett3@ameren.com	No See 3.2	
City of St Louis Water Division Mark Nankivil Telephone: 314-633.9023 Email: mnankivil@stlwater.com	No See 4.0	Water
Charter Communications(Spectrum) Mark Morrow Telephone: 636.667.6298 Email: mark.morrow@charter.com	Yes See 5.0	Communications
AT&T Distribution Braeden Battles Telephone: 314.972.2729 Email: bb6379@att.com	Yes See 6.0	Communications
Lumen (Formerly CenturyLink-National) Rich Obremski Telephone: 314.378.9931 Email: Richard.obermski@lumen.com	No See 7.0	Communications
MCI/Verizon Domenic Nicastro Telephone: 636.459.1600 Email: domenic.nicastro@verizon.com	No See 8.0	Communications

Sho-Me Technologies Brad McGoon Telephone: 417.830.6717 Email: bmgoon@showmepower.com	No See 9.0	Communications
Unite Private Networks Steve.Wilson Telephone: 816.365.1465 Email: steve.wilson@upnll.com	No See 10.0	Communications
I3 Broadband Jon Gibson Telephone: 309.670.0400 engineering@i3broadband.net	No See 11.0	Communications
Everstream Robert Sewell Telephone: 314.546.7927 Email: rsewell@everstream.net	No See 12.0	Communications
Missouri American Water Company Chris Turner Telephone: 314.996.2440 Email: Christopher.Turner@amwater.com	Yes See 13.0	Water
Metropolitan Sewer District Steve Roberts Telephone: 314.768.6310 Email: sroberts@stlmsd.com (Permit Reviewer)	Yes See 14.0 Work Included in Contract	Sewer 23MSD-00395
Spire Energy Nathan Tenholder Telephone: 314.575.0975 Email: Nathan.Tenholder@spireenergy.com	Yes See 15.0	Gas
St Louis County Highway – Traffic Division Scott Halter Telephone:314.615.5000 Email: shalter@stlouiscountymo.gov	No See 16.0	Communication

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: The Contractor shall be aware there are numerous utilities present within the project limits.

3.0 Ameren-OH

Ameren has one pole conflict with 11 dusk-to-dawn light poles to relocate in the project limits. Ameren advised they plan to complete these relocations by December 9, 2024.

PLAN SHEET

NO.	Item	Station	Side
25	UTILITY POLE	2097+47.65	RT
32	DUSK-DAWN LIGHT	2133+25.00	LT
34	DUSK-DAWN LIGHT	2146+00.00	RT
35	DUSK-DAWN LIGHT	2149+00.00	RT
35	DUSK-DAWN LIGHT	2150+00.00	LT
38	DUSK-DAWN LIGHT	2164+00.00	LT
49	DUSK-DAWN LIGHT	2221+25.68	LT
50	DUSK-DAWN LIGHT	2227+34.35	RT
62	DUSK-DAWN LIGHT	2279+10.82	RT
63	DUSK-DAWN LIGHT	2283+51.99	RT
64	DUSK-DAWN LIGHT	2288+23.30	RT
65	DUSK-DAWN LIGHT	2292+50.00	RT

Ameren has four (4) new dusk to dawn lights to install in the project limits. Ameren advised they plan to complete these relocations by December 9, 2024.

One (1) - Sappington/Watson intersection

Two (2) - Elm/Watson intersection

One (1) - Pardee/Watson intersection.

Ameren has five (4) guy anchor relocations in the project limits. Ameren plans to complete these relocations by December 9, 2024.

PLAN SHEET

NO.	Item	Station	Side
11	GUY ANCHOR	2037+00.00	RT
13	GUY ANCHOR	705+86.00	RT

26	GUY ANCHOR	2102+06.00	RT
55	GUY ANCHOR	6+25.00	RT

3.1 Ameren-UG

Ameren has underground facilities located on Watson Road, just west of Blackthorn Drive, as shown on plan sheet 41 of 73. These facilities are in conflict with the proposed drainage adjacent to the proposed retaining wall (Grated inlet SP10 and GI11). Ameren advised they have three weeks of work to complete the relocation and the new duct bank will be located within the pavement (EB Watson, outside lane). Ameren plans to do the work in conjunction with the road contractor's adjacent retaining wall/drainage work. After the road contractor shifts traffic outside of the EB outside lane, Ameren plans to complete the work within three weeks. Ameren is planning to do the work after March 3, 2025. See wall location on Sheet 45. See traffic control plans for typical lane closure applications.

3.2 Ameren-FO

Ameren will be installing a new fiber along Watson Road from Windward Ridge Drive (sheet 19 of 73) to east of Pardee Road (sheet 36 of 73). Black and McDonald will be installing the fiber. They were advised where to install all proposed hand holes and fiber to miss the planned improvements on this project. This work is expected to be completed before the road contractor's NTP date on December 9, 2024.

4.0 City of St. Louis Water Division

The City of St Louis Water Division has water main facilities on the south side of Watson Road, west of Creighton Drive to the River Des Peres. City Water advised they do not anticipate any utility conflicts within the project limits.

5.0 Charter Communications

Charter advised they have aerial facilities on Ameren poles along the entire project limits. Charter has various locations with buried facilities within the project limits and three hand holes need to be adjusted with the proposed sidewalk improvements. Charter requested two (2) weeks' notice to allow their contractor to ATG any existing Charter hand holes. Charter also advised they have one buried conflict adjacent to the proposed retaining wall on Watson Road, west of Blackthorn. Charter plans to relocate their cable in conflict prior to the contractors NTP.

6.0 AT&T-d

AT&T-d has underground and aerial facilities in the entire project limits. AT&T advised there are twelve (12) manhole/hand hole adjustments (8 handholes and 4 manholes) in the project limits due to sidewalk improvements. AT&T does not anticipate direct conflict with AT&T's buried cables. ADB has been retained by AT&T to adjust manholes and hand holes to new sidewalk grades. AT&T requested two weeks to notice to ADB of necessary adjustments and ADB anticipated taking one day per manhole/hand hole adjustment in non-pavement areas. AT&T advised they do not have any manholes in the pavement along this corridor project.

7.0 Lumen

Lumen advised they have buried fiber facilities located on Lindbergh Boulevard under Watson Road Bridge. Lumen advised that they do not anticipate any conflicts with their facilities.

8.0 MCI/Verizon

MCI advised they have buried facilities along various sections of the project limits.. MCI advised they do not anticipate their facilities having any direct conflicts with MoDOT’s improvement project limits.

9.0 Sho-Me Technologies

Sho-Me Technologies advised they have buried facilities along Watson Road. Sho-Me advised they do not anticipate their facilities having any direct conflicts with improvement project.

10.0 Unite Private Networks

Unite Private Networks advised they have aerial facilities within the project limits. Unite Private Networks advised they do not anticipate their facilities having any direct conflicts with the improvement project.

11.0 I3 Broadband

I3 Broadband advised they have buried facilities within project limits, but no conflicts are anticipated.

12.0 Everstream

Everstream advised they have buried facilities along the project limits. Everstream advised they do not anticipate their facilities having any direct conflicts with the improvement project.

13.0 Missouri American Water Company

13.1 Water Main Existing Facilities

MAWC advised they have water main facilities within the entire project limits. Existing water main facilities vary in size from 6 inch to 20 inch and can be located within the roadway or outside of the roadway, depending on location. Existing water mains and sizes are shown on the plans.

13.2 Fire Hydrant Conflicts

MAWC advised they have three (3) fire hydrant conflicts that require relocation within the project limits. MAWC advised they anticipate relocating each fire hydrant prior to the contractor’s NTP. The fire hydrants are noted as follows:

PLAN SHEET NO.	ITEM	STATION	SIDE
24	Hydrant	2093 + 14	RT
32	Hydrant	2135 + 70	RT
32	Hydrant	2134+92	LF

MAWC also advised that they plan to remove the fire hydrant without replacement at approx. STA 2134 + 95 LT, prior to the contractor’s NTP.

13.3 Water Valve Adjustments – Main

If water main valves (main line valves) need to be adjusted due to grade changes with the road improvement project, MAWC advised they need five (5) working days prior notice in order to have a crew on site to adjust the water valve vertically.

13.4 Private Water Service Meters/Valves

There are over 60 private water meters and 60 private water valves shown in the plans. The majority of the private service meters/valves will not need to be adjusted due to grade changes. Each individual water service meter/valve is not detailed individually on the contract quantity sheets. But, all known private water service lines for meter/valves are shown on the plans. Five (5) water service meters and fifty-nine (54) water service valves are estimated in the road contract to be adjusted due to grade change for sidewalk, green space, concrete approach entrance or in asphalt parking lots.

14.0 Metropolitan Sewer District

MSD has work included in the road contract, referenced as MSD Job No. 23MSD-00395 and quantities are shown on the drainage plans. Steve Roberts is the MSD permit reviewer assigned to this project.

15.0 Spire

15.1 Spire Existing Gas Facilities

Spire has existing gas main facilities located in the entire project limits. Existing gas mains & sizes are shown on the construction plans.

The proposed signal base at the Northwest corner of the ramp to Northbound Lindbergh Blvd and Watson Rd (as shown on Plan Sheet 12 of 73) is located in close proximity to a 16" steel transmission gas main. Spire advised they do not anticipate a conflict with this gas main.

The proposed signal based at the Northwest corner of Glenwood Dr and Watson Rd (as shown on Plan Sheet 25 of 73) is located in close proximity to an 8" steel gas main. Spire advised they do not anticipate a conflict with this gas main.

The proposed signal base at the Southwest corner of Grant Rd and Watson Rd (as shown on Plan Sheet 37 of 73) is located in close proximity to a 2" plastic gas main. Spire advised they do not anticipate a conflict with this gas main.

The proposed signal base at the Northwest corner of Grant Rd and Watson Rd (as shown on Plan Sheet 37 of 73) is located in close proximity to a 6" steel gas main. Spire advised they do not anticipate a conflict with this gas main.

15.2 Gas Main Valve Adjustments or Gas Service Line Adjustments

Various gas main valves and gas service lines valves will need to be adjusted due to changes in the grades of sidewalk, green space, paved approaches, and parking lots. Spire is responsible for performing all necessary gas main valve and gas service line valve adjustments. Spire advised at the preconstruction meeting a Spire maintenance person will be assigned to this project to be the Spire contact to adjust gas valves. Spire is requesting two (2) days advanced

notice to adjust any gas main valves or gas service line valves. Gas valves and gas service lines (36 locations) are shown on the plans.

- Gas Valve ATG at STA. 2030 + 30 RT (Sheet 14)
- Gas Valve ATG at STA. 2036 + 71 RT (Sheet 15)
- Gas Valve ATG at STA. 601 + 22 RT (Sheet 16)
- Gas Valve ATG at STA. 601 + 24 RT (Sheet 16)
- Gas Valve ATG (x2) at STA. 601 + 31 RT (Sheet 16)
- Gas Valve ATG at STA. 2053 + 84 RT (Sheet 21)
- Gas Valve ATG at STA. 2064 + 24 RT (Sheet 23)
- Gas Valve ATG at STA. 2076 + 10 RT (Sheet 25)
- Gas Valve ATG at STA. 2079 + 76 RT (Sheet 26)
- Gas Valve ATG at STA. 2119 + 87 RT (Sheet 33)
- Gas Valve ATG at STA. 2131+38.18 RT (Sheet 36)
- Gas Valve ATG at STA. 2134+38.18 RT (Sheet 36)
- Gas Valve ATG at STA. 2135+09.17 LT (Sheet 36)
- Gas Valve ATG at STA. 2149+15.28 LT (Sheet 39)
- Gas Valve ATG at STA. 2168+17.52 LT (Sheet 43)
- Gas Valve ATG at STA. 2168+99.88 LT (Sheet 43)
- Gas Valve ATG at STA. 2175+42.69 RT (Sheet 44)
- Gas Valve ATG at STA. 2179+96.22 LT (Sheet 45)
- Gas Valve ATG at STA. 2181+28.19 RT (Sheet 46)
- Gas Valve ATG at STA. 2181+47.95 LT (Sheet 46)
- Gas Valve ATG at STA. 2194+60.16 RT (Sheet 48)
- Gas Valve ATG at STA. 2206+03.46 RT (Sheet 50)
- Gas Valve ATG at STA. 2216+44.12 LT (Sheet 52)
- Gas Valve ATG at STA. 2216+94.58 LT (Sheet 52)
- Gas Valve ATG at STA. 2217+33.05 RT (Sheet 52)
- Gas Valve ATG at STA. 2217+35.17 RT (Sheet 52)
- Gas Valve ATG at STA. 2217+45.00 LT (Sheet 52)
- Gas Valve ATG at STA. 2218+03.00 RT (Sheet 53)
- Gas Valve ATG at STA. 2219+44.71 LT (Sheet 53)
- Gas Valve ATG at STA. 2221+25.39 LT (Sheet 53)
- Gas Valve ATG at STA. 2225+37.58 RT (Sheet 54)
- Gas Valve ATG at STA. 06+45.53 RT (Sheet 59)
- Gas Valve ATG at STA. 07+01.18 RT (Sheet 59)
- Gas Valve ATG at STA. 2333+79.09 RT (Sheet 77)
- Gas Valve ATG at STA. 2333+84.45 LT (Sheet 77)

Total: 36 potential ATG Gas Valves

16.0 St. Louis County Highway

St. Louis County Highways and Traffic has fiber located at two Watson intersections (New Sappington Road, Laclede Station Road). New traffic signals are also planned at Grant Road.

St. Louis County Highway recently joined Missouri One Call along MoDOT corridors. However, St. Louis County Highway still requests that the contractor directly contact the County with the One Call Ticket numbers at the two Watson locations to get the County to locate their fiber.

The contractor is advised to email Signal_locates@stlouiscountymo.com with each one call ticket number needing St Louis County Traffic facilities located in the project limits.

H. Pot Holing For Utility Facilities

1.0 Description. The contractor shall field verify that the proposed traffic signal bases, light poles, RRFB's, sign posts and roadway drainage structure locations (inlets, manholes or pipes) will not need to be shifted to avoid utilities prior to ordering any necessary RRFB's, sign posts, drainage structures, light poles, or signal equipment. The contractor shall be proactive in the discovery of potential utility conflicts. The contractor shall submit One Call tickets where existing utilities are located in close proximity to proposed improvements 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 whether conflicts exist with proposed roadway improvement locations.

If utility facilities are discovered the contractor shall contact the Utility Coordinator (Crawford, Murphy & Tilly, Inc. design consultant), Matt Ottsen at (314) 437-0858. The engineer will determine whether relocation of the utility is necessary to accommodate construction or if the work can be installed in accordance with Missouri Standard Plans for Highway Construction for the item of work specified. 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 shall not order materials until measurements are field verified.

2.0 Basis of Payment.

2.1 All labor, equipment, materials, and restoration necessary to pothole buried utilities at proposed signal bases, light poles and drainage structure (inlets, manholes or pipes) locations shall be paid for under:

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

I. Concrete Adjacent to Ameren Composite Poles

1.0 Description. There are approximately three (3) Ameren composite poles located in the project limits that will be located adjacent to proposed sidewalk. Ameren requires 1" of separation between the new sidewalk and composite poles. Ameren is requiring the Contractor to double up ½ mastic (flex board) around each composite pole prior to pouring the concrete sidewalk adjacent to the composite poles.

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 documents.

J. 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 submit One Call tickets where existing utilities are located in close proximity to proposed signal base locations 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. All labor, equipment, materials and restoration necessary to pot hole buried utilities at proposed signal base locations shall be paid for under:

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

K. Liquidated Damages for Pedestrian Impacts

1.0 Description. Providing work zone protection for pedestrians will be a primary component of this project. This work shall consist of staging/managing construction timelines to minimize the project's impacts to pedestrian traffic where construction activities make walkways impassible. Nothing in this provision shall be construed to limit contractor innovation in mitigating pedestrian traffic impacts.

2.0 Prosecution of Work. At locations where construction makes walkways impassible, the contractor shall have all necessary personnel, equipment, and materials at hand for all work at each location before the work begins so that work may proceed without delay. Work requiring the mitigation of pedestrian traffic impacts includes, but shall not be limited to, removal of sidewalk, curb ramp, or other paved pedestrian pathway.

3.0 Time of Disruption of Pedestrian Facilities. Regardless of construction methods chosen, once a section of sidewalk has been closed to pedestrian traffic, the contractor shall prosecute

the work and minimize delays and the inconvenience it causes to the traveling public. The contractor, with approval from the engineer, shall specify the length of a given sidewalk section to be reconstructed. Once a corner has been closed to pedestrian traffic, the contractor shall have a maximum of three weeks, regardless of weather or other delays, to reopen that corner/section to pedestrian traffic.

4.0 Work Area Safety. The contractor shall maintain a work area that is safe for pedestrians. To provide this, the contractor shall work on only one side of Route 366 at a given time to improve the sidewalks along either the north or south sides and to allow a walkable path on the other side during construction. The areas adjacent to the contractor's physical work site shall also be maintained to provide access to adjoining properties, regardless of whether a detour route is in place. All holes shall be covered with secured plywood or steel plates, and the work area walkways shall be free of trip hazards, loose debris, vehicles, materials, and equipment when the contractor is not in the work area. A 3-foot minimum path shall be maintained on any used-in-place walkway needed for access. The contractor shall not be permitted to park on any walkway.

5.0 Liquidated Damages. If work associated with new sidewalk or curb ramps along a given side of Route 366 begins, but is not complete and open to pedestrian traffic within 3 weeks of commencement, 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, and pedestrian delay, with its resulting cost to the traveling public. These damages are not reasonably capable of being computed or quantified.

Therefore, the contractor will be charged with liquidated damages specified in the amount of **\$500.00 per day** for a delay that closes a walkway for more than **3 weeks**. The contractor's superintendent and the engineer shall be on site at the time of any closures and shall both record an agreed time when the walkway was closed. It shall be the responsibility of the engineer to determine the quantity of excess closure time.

5.1 The said liquidated damages specified will be assessed regardless of whether it would otherwise be charged as liquidated damages under the Missouri Standard Specification for Highway Construction. There shall be no permitted excuse for delay of the work, including weather.

6.0 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.

L. Liquidated Damages Specified – A9260 Bridge Staging JSP-93-28A

1.0 Description. The traffic control plans and construction staging layout for Bridge A9260, which is replacing Bridge J0228, show that the contractor can reduce Route 366's thru lanes down to one lane in each direction (with a left turn lane) as shown in Stages 1A through Stage 3. If the demolition of Bridge J0228 and the construction of Bridge A9260 over Gravois Creek (Stages 1A through 3) is not completed within **160 consecutive calendar days** of Stage 1A commencing as

shown on the traffic control plan sheets, and Route 366 is not safely back open to traffic with its final lane configuration within the 160 consecutive calendar days (including Engineer-approved signal operations at the first signal beyond each side of the A9260 Bridge), the Commission, the traveling public, and state and local police and governmental authorities will be damaged in various ways, including but not limited to potential liability, traffic and traffic flow regulation cost, traffic congestion and motorist delay, with its resulting cost to the traveling public.

1.1 All necessary work to return Route 366 to its existing lane configuration shall be completed to the satisfaction of the Engineer including bridge construction, roadside and roadway elements, pavement marking, and necessary signal work at Watson Industrial Park and Pardee Lane to efficiently move traffic.

1.2 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 **\$1,000 per day** for each full day, or partial day thereof, that the work described above in Sections 1.0 and 1.1 is not complete and open to traffic in excess of the limitation as specified elsewhere in this special provision. It shall be the responsibility of the engineer to determine the quantity of excess closure time.

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

M. Liquidated Damages Specified – Lane Shift and Bidirectional Lane Closure JSP-93-28A

1.0 Description. Per JSP C – Work Zone Traffic Management, the contractor will be allowed to shift Route 366 westbound traffic by closing the bidirectional lane in the specified station range shown below and reducing the typical section to two through lanes in each direction. This is to allow the contractor to construct seven (7) narrow private entrances in a short timeframe on the north side of Route 366 within the specified station range listed below in this provision. The completed driveway work shall include all the necessary removal work, curb and gutter work, sidewalk work, drainage work, and miscellaneous roadside work inside the specified station range on the north side of Route 366. If the work described in the preceding sentence is not completed within **twenty-one (21) consecutive calendar days** of the traffic control lane shift and bidirectional lane closure commencing, the Commission, the traveling public, and state and local police and governmental authorities will be damaged in various ways, including but not limited to potential liability, traffic and traffic flow regulation cost, traffic congestion and motorist delay, with its resulting cost to the traveling public.

1.1 For clarification purposes, the locations on this project where the seven (7) narrow private entrances are located are:

Route 366 from Sta. 2214+94 to Sta. 2219+83 North Side

The contractor will be allowed to close multiple narrow private entrances at a time. Once any of the seven (7) narrow private entrances are closed, the closure timeframe and parking

accommodations provided within JSP – Access to Commercial and Private Entrances must also be followed.

1.2 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 **\$1,000 per day** for each day, or partial day thereof, that the lane shift and bidirectional lane closure is in place and all lanes are 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 excess closure time.

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

N. Special Consideration of Change Orders and Value Engineering JSP-21-07

1.0 Description. Increased Federal Share has been approved by the FHWA for an innovative technology or practice. The Commission will receive an additional five percent Federal Share of the overall contract value due to innovations within the following pay item(s).

Pay Item Number	Pay Item Description	Innovation
109-99.02	MoDOT Furnished Traffic Signal Controller	Automated Traffic Signal Performance Measures (ATSPMs)

Due to the increased Federal Share, the project components related to the innovation(s) described above must be constructed with the materials, quantities, methods and innovations as shown on the project plans and specifications. If the contractor requests materials, quantities, methods or innovations other than those included in the plans and specifications, the request must be reviewed and approved by the Commission and FHWA. Approved changes to the innovation items above shall be at no additional cost to the Commission and shall not increase the contract time.

2.0 Special Consideration of Change Orders and Value Engineering Change Proposals (VECP). Change ordering and/or value engineering the pay item(s) listed in section 1.0 jeopardize the ability for the Commission to receive an additional Federal Share for the overall contract value. Special consideration should be given to the change order value for removing or modifying such item(s) from the contract ensuring the benefit outweighs the cost.

3.0 Contacting Financial Services. If it is determined that the proposed change order and/or VECP outweighs the additional overall five percent Federal Share value, the Engineer shall notify the MoDOT project manager.

O. 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 requires 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.

P. Winter Months Requirements JSP-15-07A

1.0 Description. This project contains work which spans the winter months.

2.0 Work to be Completed. When the contractor ceases operations for the winter months, any paving operation performed by the contractor shall not result in a lane height differential between adjacent lanes.

3.0 Maintenance of Pavement Marking. Prior to ceasing operations for winter months, a permanent or temporary stripe shall be provided on any completed length to the point that the original stripe was obliterated or obscured by the contractor's operation. Temporary striped areas shall be re-striped with the remaining route upon performance of the final striping.

4.0 Winter Related Maintenance Activities. The contractor shall have the project in a condition as not to interfere with the plowing of snow. The contractor shall also provide a taper at the end of his paving that will not be damaged by the plowing of snow.

5.0 Basis of Payment. There will be no direct pay for compliance with this provision.

Q. Delayed Access to Parcels Pending Acquisition

1.0 Description. Acquisition is pending for the parcels listed below on the project. The contractor shall not be permitted to begin work within any designated Temporary Construction Easement or Permanent Easement on any of these parcels until the Right of Way acquisition has been completed. An anticipated date of possession has been provided for each parcel to assist with scheduling purposes.

2.0 Construction Requirements. The contractor shall verify with the engineer prior to beginning work on any of the parcels listed in this provision. The contractor will not be permitted access to work on any of these parcels until notification has been given by the engineer that the parcel has been cleared from this list.

3.0 Parcels. The following is the list of the parcels where acquisition is pending.

- Parcel 2, anticipated possession March 31, 2025
- Parcel 3, anticipated possession March 31, 2025
- Parcel 5, anticipated possession March 31, 2025
- Parcel 7, anticipated possession March 31, 2025
- Parcel 19, anticipated possession December 9, 2024
- Parcel 21, anticipated possession December 9, 2024
- Parcel 25, anticipated possession March 31, 2025
- Parcel 26, anticipated possession December 9, 2024
- Parcel 32, anticipated possession December 9, 2024
- Parcel 34, anticipated possession December 9, 2024
- Parcel 35, anticipated possession December 9, 2024
- Parcel 36, anticipated possession December 9, 2024
- Parcel 37, anticipated possession December 9, 2024
- Parcel 39, anticipated possession March 31, 2025
- Parcel 48, anticipated possession December 9, 2024
- Parcel 52, anticipated possession December 9, 2024

Parcel 54, anticipated possession December 9, 2024
Parcel 58, anticipated possession December 9, 2024
Parcel 60, anticipated possession December 9, 2024
Parcel 61, anticipated possession December 9, 2024
Parcel 65, anticipated possession December 9, 2024
Parcel 68, anticipated possession March 31, 2025
Parcel 69, anticipated possession December 9, 2024
Parcel 70, anticipated possession December 9, 2024
Parcel 71, anticipated possession March 31, 2025
Parcel 75, anticipated possession March 31, 2025
Parcel 78, anticipated possession March 31, 2025
Parcel 79, anticipated possession March 31, 2025
Parcel 80, anticipated possession December 9, 2024
Parcel 82, anticipated possession December 9, 2024
Parcel 83, anticipated possession March 31, 2025
Parcel 85, anticipated possession December 9, 2024
Parcel 90, anticipated possession March 31, 2025
Parcel 92, anticipated possession March 31, 2025
Parcel 98, anticipated possession March 31, 2025
Parcel 99, anticipated possession March 31, 2025
Parcel 102, anticipated possession December 9, 2024
Parcel 104, anticipated possession March 31, 2025
Parcel 107, anticipated possession December 9, 2024
Parcel 111, anticipated possession March 31, 2025
Parcel 112, anticipated possession December 9, 2024
Parcel 115, anticipated possession December 9, 2024
Parcel 116, anticipated possession December 9, 2024
Parcel 118, anticipated possession December 9, 2024
Parcel 120, anticipated possession December 9, 2024
Parcel 121, anticipated possession December 9, 2024
Parcel 122, anticipated possession December 9, 2024
Parcel 124, anticipated possession December 9, 2024
Parcel 128, anticipated possession December 9, 2024
Parcel 129, anticipated possession December 9, 2024
Parcel 130, anticipated possession December 9, 2024
Parcel 132, anticipated possession March 31, 2025

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

R. Property Owner Agreements

1.0 Description. During the negotiations of easements and rights of way, MoDOT entered into agreements with certain property owners. The Contractor shall abide by the following commitments:

Parcel 12 (10415 Watson Road, St. Louis, MO 63127)

1. This temporary easement is for the purpose of allowing grantee to make roadway and sidewalk improvements and grantee shall not cause grantor's property to be without ingress and egress to and from Watson Road at any time during grantee's work to the roadway and sidewalk in front of grantor's property.

Parcel 19 (10100 Watson Road, St. Louis, MO 63127)

1. The Contractor shall be directed to ensure that the entrances located at 10100 Watson Road (Sunset Hills Subaru) will remain accessible during construction. This will allow Sunset Hills Subaru to receive deliveries during construction and operate in a safe manner for its customers.

Parcel 24 (9965 Watson Road, St. Louis, MO 63126)

1. The Contractor will work with the property owner(s) to construct the driveway located at 2073+28 LT. one half at a time, allowing the other half of the driveway to provide ingress/egress to the parcel during construction. The contractor will work with the property owner(s) to not prohibit customer ingress/egress during the construction process.

Parcel 35 (9901 Watson Road, St. Louis, MO 63126)

1. Any impacted driveways are to be constructed ½ at a time.
2. The contractor shall not park any construction vehicles or equipment on grantor's property.

Parcel 36/37 (9897-9901 Watson Road, St. Louis, MO 63126)

3. Any impacted driveways are to be constructed ½ at a time.
4. The contractor shall not park any construction vehicles or equipment on grantor's property.

Parcel 50 (9760 Watson Road, St. Louis, MO 63126)

1. The temporary easement will expire at the earlier of project completion, or **December 31, 2026**.

Parcel 66 (9282 Watson Road, St. Louis, MO 63126)

1. The existing business sign located within the proposed TCE will not be disturbed as noted on the construction plans.

Parcel 76 (9052 Watson Road, St. Louis, MO 63126)

1. No construction vehicles are to transit the parking lots or be stored on the lots.

Parcel 95 (8300 Watson Road, St. Louis, MO 63119)

1. The driveway is to be constructed ½ at a time leaving the other ½ open allowing cars to access the property.

Parcel 97 (8271 Watson Road, St. Louis, MO 63119)

1. All the areas used by MoDOT's contractor shall be restored to the same condition that existed prior to the execution of the temporary easement.

Parcel 105 (1449 Edgar Road, St. Louis, MO 63119)

1. A guarantee that their land will be restored after construction activities are completed.

Parcel 118 (7918 Watson Road, St. Louis, MO 63119)

1. Construction on the entrance located at 2247+38 RT. will be performed ½ at a time, leaving the other half always open for use.
2. All the areas used by MoDOT's contractor shall be restored to the same condition that existed prior to the execution of the temporary easement.

Parcel 120 (7894 Watson Road, St. Louis, MO 63119)

1. Construction on the entrances located at 2250+44 RT. and 2252+17 RT. will be performed ½ at a time, leaving the other half always open for use.

Parcel 121 (7800 Watson Road, St. Louis, MO 63119)

1. Construction on the entrance located at 2260+79 RT. will be performed ½ at a time, allowing vehicles to access the property using the other half during construction.
2. The area between the proposed curb cut and the existing curb cut on each side of the driveway located at 2260+79 RT. will be filled with sod.

Parcel 123 (963 Oak Knoll Manor Drive, St. Louis, MO 63119)

1. The holly tree located near the slope limit in the garden is not to be removed.

Parcel 124 (7748 Watson Road, St. Louis, MO 63119)

1. Construction on the entrance located at 2266+57 RT. will be done ½ at a time, leaving the other ½ open for use.
2. A two-week notice will be given to John Serafin at j.g.serafin.jr@gmail.com or (314) 348-0623 before any construction starts at the property.

Parcel 133 (7201 Watson Road, St. Louis, MO 63119)

1. A two-week notice will be given to Mike Goldman at mike@waterway.com or (314) 267-8365 before any construction starts at the property.
2. The construction on the entrance located at 2333+90 LT. will be performed ½ at a time leaving the other ½ open allowing cars to access the property. If needed, the contractor shall also plate the cut on the entrance to allow cars to use the entrance outside of construction hours.

2.0 Basis of Payment. Payment for the above-mentioned items are to be completely paid for under the unit bid prices. If there are no bid items for the above-mentioned work, the work will be considered incidental and there will be no direct payment.

S. Special Conditions for the Sappington Cemetery

1.0 Description. The contractor is notified that a National Register of Historic Places (NRHP) eligible cemetery is present at the Sappington Cemetery, 9111 Watson Road

Crestwood, Missouri, listed as Parcel 74 in the project plans. The cemetery is located between stations 2146+00 and 2148+00. This special provision has been written to keep this project in compliance with Section 106 of the National Historic Preservation Act of 1966, as amended (16 U.S.C. §§ 470 et seq.). Cemeteries are protected under Missouri's state cemetery law (RSMo 214) and guidance can be found in the Engineering Policy Guide (EPG) section 127.2.3.3. The intent of this special provision is to minimize construction impacts to the cemetery and to preserve the site in place. Prior to implementation of any exceptions, changes, or modifications to this job special provision the contractor, the MoDOT Resident Engineer (or their designee) and the MoDOT Historic Preservation Manager (or their designee) must mutually agree, and that agreement must be formally documented. If the contractor fails to comply with this provision, federal funding could be jeopardized.

2.0 Construction Requirements. The contractor shall use extreme care in this area by prohibiting activity past MoDOT right of way towards the cemetery.

2.1 Do Not Disturb Area Delineation. The cemetery shall be marked Do Not Disturb (DND) on the project plans. The contractor shall physically delineate the cemetery with orange construction fencing with the Historic Preservation Manager (or their designee) present. The Historic Preservation Manager (or their designee) shall assist the contractor by delineating the Cemetery. The fence shall be constructed in a manner that will not rut the surface of the ground.

2.2 Completion of the work to delineate the cemetery shall be the first order of work on the project. If the contractor fails to comply with this provision, MoDOT will suspend the project until the issue is resolved. No time extensions will be granted due to the contractor's failure to comply with this provision.

3.0 Method of Measurement. These items will not be measured for payment.

4.0 Basis of Payment. No direct pay shall be provided for any labor, equipment, time, or materials necessary to complete the delineation of the cemetery, including fence installation and removal. The work shall be completed to the satisfaction of the Resident Engineer (or their designee) and Historic Preservation Manager (or their designee).

T. Property Owner Notification

1.0 Description. It shall be the contractor's responsibility to inform and notify the adjacent property owner at least one week prior to starting any construction activities that may impact driveway and parking lot access or occur along the frontage of the property owner's parcel, unless specified more specifically in the Property Owner Agreements provision. The notification shall be in written form and include the contractor's contact information, the Engineer's contact information, and an estimated schedule of work and the associated impacts.

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

U. Access to Commercial and Private Entrances

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

2.0 Construction Requirements

2.1 Commercial Entrances and Private/Residential Entrances over 20 Feet Wide. The contractor shall always provide ingress and egress for each property owner along the project either by constructing the new approach half at a time or by providing temporary access as approved by the engineer.

2.1.1 For properties with more than one entrance, the contractor may construct one entire entrance at a time with the approval of the property owner and the engineer. However, in the case of a property having one approach used exclusively as an entrance and another approach used exclusively as an exit, the approaches shall be built one half at a time to provide for safe traffic movement into and out of the properties.

2.1.2 On commercial entrances less than 20 feet wide, it may be necessary for the contractor to provide temporary aggregate to provide access to the property. The contractor shall remove and dispose of the temporary aggregate following the completion of the entrance.

2.2 Private/Residential Entrances less than 20 Feet Wide. The contractor may completely close a residential entrance to remove and replace. The contractor shall work diligently and continuously to complete this work. The contractor shall have a maximum of **seventy-two (72) consecutive hours** to remove and replace each residential driveway unless otherwise approved by the engineer and property owner. This may require the use of concrete strength accelerators.

2.2.1 The contractor shall provide temporary parking area for the residents during the closure. This may include staging the parking lane construction so that residents are able to use during entrance construction.

2.3.1 Completion Time (Greater than 20-Foot Wide Residential or Commercial Entrances). The contractor shall complete the entrances as quickly as possible and shall take no longer than 28 consecutive calendar days to complete any one entrance over 20 feet wide once the entrance is disturbed and the improvement process begins.

2.3.2 Completion Time (Less than 20-Foot Wide Residential or Commercial Entrances). The contractor shall take no longer than 72 consecutive hours to complete any one narrow residential or commercial entrance with a width less than 20 feet once the narrow entrance is disturbed and the improvement process begins.

2.4 Property Owner Agreements. Agreements made with property owners during the negotiations of easements and rights of way listed in the Property Owner Agreements special

provision shall be adhered to and shall supersede the requirements in the Access to Commercial and Private Entrances special provision.

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

V. Existing Irrigation Systems

1.0 Description. This work includes the relocation or replacement of all sprinkler heads and sprinkler system pipes associated with existing irrigation systems that are impacted by construction activities and installation of improvements along Route 366 and its adjacent side streets.

2.0 The contractor is advised that various properties along the project length have irrigation systems whose sprinkler heads and associated pipe systems are located within or in close proximity to the proposed sidewalk. The contractor shall relocate undamaged sprinkler heads or replace damaged sprinkler heads as directed by the engineer.

2.1 The contractor shall check with individual property owners to shut off watering as necessary and be aware of the location of said systems. Any damage to the watering system, sprinkler heads, etc. will be repaired or replaced at the contractor's expense and at no direct cost to MoDOT.

2.2 The contractor is strongly advised to drive the project to determine the extent of impact to the existing sprinkler systems located along the route and adjust the bid accordingly.

2.3 The contractor shall then exercise reasonable care installing any new roadside items (sidewalk, curb, etc.) and equipment (signals, signing, ITS, etc.) as shown in the plans.

2.4 If irrigation systems in a temporary easement are damaged by the contractor, then the contractor shall replace the damaged portion within a 2-week period.

2.5 Irrigation systems discovered inside MoDOT right of way that are damaged shall be capped by the contractor at the right of way line. If this occurs, the contractor shall notify the property owner and inform them the irrigation system inside MoDOT's right of way will need to be repaired at the property owners' expense and kept off of MoDOT's right of way.

3.0 Method of Measurement. No final measurement shall be made.

4.0 Basis of Payment. No direct payment will be made for the relocation or replacement of irrigation systems located along the project limits. All costs associated with this work shall be considered incidental to other pay items provided in the contract.

W. Coordination with MoDOT Project No. J6S3281 and their Contractor

1.0 Description. MoDOT may have an active construction project on Lindbergh Boulevard that intersects with the Route 366 (Watson Road) project limits. However, it is expected to be completed in advance of this project beginning.

2.0 Requirements. If necessary, the J6S3582 contractor shall coordinate with MoDOT and the J6S3281 contractor at least 14 days in advance of foreseeing any overlap in temporary traffic control and/or active construction staging.

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

X. Special Provisions for Protection of BNSF Railway Company Interests

To Report an Emergency on the railroad call: (800) 832-5452
St. Louis Co. Route 366/Watson Road, US DOT# 663828H MP 8.84 BNSF River Sub in Shrewsbury, MO. **Current FRA data shows 3 daytime trains and 3 nighttime trains and 0 passenger trains.**

1.0 Authority of Railroad Engineer and Commission's Representative.

1.1 The authorized representative of BNSF Railway Company, herein called "Railroad Engineer", shall have final authority in all matters affecting the safe maintenance and operation of railroad traffic including the adequacy of the foundations and structures supporting the railroad tracks.

1.2 The authorized representative of the Missouri Highways and Transportation Commission, herein called "Engineer", shall have authority over all other matters as prescribed herein and in the project specifications.

1.3 The Contractor must adhere to all other BNSF Railway policies and procedures not specifically mentioned in these special provisions. These can be found at <http://www.bnsf.com/in-the-community/public-projects/index.page>.

2.0 Contractor's indemnity Obligations to the Railroad.

2.1 The term "contractor" as used in this special provision includes any and all subcontractors. The contractor shall indemnify, defend and hold harmless the Railroad from and against any and all loss, damage, claims, demands, causes of action, costs and expenses of whatsoever nature arising out of injury to or death of persons whomsoever, or out of damage to or destruction of property whatsoever, including, without limitation, damage to fiber optic, communication and other cable lines and systems, where such injury, death, damage or destruction results from any cause arising out of work performed by the contractor pursuant to the agreement between Railroad and the Commission for the project, and shall also release the Railroad from and shall waive any claims for injury or damage to equipment or other property, which may result from the construction, maintenance and operation of railroad tracks, wire lines, fiber optic cable, pipe lines and other facilities on said right of way of the Railroad by the contractor. **THE LIABILITY**

ASSUMED BY THE CONTRACTOR WILL NOT BE AFFECTED BY THE FACT, IF IT IS A FACT, THAT THE DAMAGE, DESTRUCTION, INJURY, DEATH, CAUSE OF ACTION OR CLAIM WAS OCCASIONED BY OR CONTRIBUTED TO BY THE NEGLIGENCE OF THE RAILROAD, THE RAILROAD'S AGENTS, SERVANTS, EMPLOYEES OR OTHERWISE, EXCEPT TO THE EXTENT THAT SUCH CLAIMS ARE PROVEN BY ANY CLAIMANT TO HAVE BEEN PROXIMATELY CAUSED BY THE INTENTIONAL MISCONDUCT OR SOLE OR GROSS NEGLIGENCE OF THE RAILROAD. The contractor's indemnity shall include loss of profits or revenue arising from damage or destruction to fiber optic, communication and other cable lines and systems.

2.2 In addition to the indemnity obligations contained in the preceding paragraph, the contractor shall indemnify, defend and hold harmless the Railroad from any claims, expenses, costs, actions, demands, losses, fines, penalties, and fees, of whatsoever nature arising from, related to or connected, in whole or in part, with the following:

- (a) The removal of the contractor's agents, servants, employees or invitees from the Railroad's property for safety reasons.
- (b) Contractor's compliance or failure to comply with the provision of applicable law in connection with the performance of contractor's work.

3.0 Notice of Starting Work.

3.1 The contractor shall not commence any work on Railroad's right of way until the contractor has complied with the following conditions:

- (a) The contractor shall be required to apply for, execute and comply with all provisions of a permit obtained by accessing the following link: <http://bnsf.railpermitting.com>

3.2 The Railroad's written authorization to proceed with the work, with a copy to the Engineer, will include the names, addresses and telephone numbers of the Railroad's representatives who are to be notified as hereinafter required. Where more than one representative is designated, the area of responsibility of each representative shall be specified.

4.0 Interference with Railroad Operations.

4.1 The contractor shall arrange and conduct all work so that there shall be no interference with the Railroad's operations, including train, signal, telephone and telegraphic services; or damage to the Railroad's property; poles, wires and other facilities of tenants, licensees, easement grantees and invitees on the Railroad's right of way. Whenever work may affect the operations or safety of trains, the method of doing such work shall first be submitted to the Railroad Engineer for approval, but such approval shall not relieve the contractor from liability. Any work to be performed by the contractor that requires flagging service or inspection service shall be deferred by the contractor until the flagging service required by the Railroad is available at the job site.

4.2 Whenever work within the Railroad's right of way is of such a nature that impediment to the Railroad's operations is unavoidable, such as use of runaround tracks or necessity for reduced

speed, the contractor shall schedule and conduct these operations so that such impediment is reduced to the absolute minimum.

4.3 Should conditions arising from, or in connection with the work require that immediate and unusual provisions be made to protect the Railroad's operations and property, the contractor shall make such provisions. If in the judgment of the Railroad Engineer, or the Engineer if the Railroad Engineer is absent, such provision is insufficient, the Railroad Engineer or Engineer may require or provide such provisions as deem necessary. In any event, such provisions shall be at the contractor's expense and without cost to the Railroad or the Commission.

4.4 The contractor shall be responsible for any damage to the Railroad as a result of work on the project, which shall include but not be limited to interference with the normal movement of trains caused exclusively by the work performed by the contractor. The contractor shall be responsible for damages for the Railroad's train delays that are caused exclusively by the contractor. The Railroad agrees not to perform any act to unnecessarily cause any train delay. The damages for train delays per freight hour will be billed at an average rate per hour as determined from the Railroad's records. These records shall be provided by the Railroad, upon request, to the Commission or the Commission's contractor.

5.0 Track Clearances.

5.1 The minimum track clearances to be maintained by the contractor during construction are shown on the project plans. However, before undertaking any work within Railroad's right of way, or before placing any obstruction over any track, the contractor shall:

- (a) Notify the Railroad Engineer at least 72 hours in advance of the work.
- (b) Receive assurance from the Railroad Engineer that arrangements have been made for flagging service as may be necessary.
- (c) Receive permission from the Railroad Engineer to proceed with the work.
- (d) Ascertain that the Engineer has received copies of notice to the Railroad and of the Railroad's response.

5.2 The contractor shall fully comply with any horizontal and vertical clearance requirements imposed by Missouri state statutes and regulations and Federal statutes and regulations regarding the placement of structures or equipment near or over railroad tracks.

6.0 Construction Procedures.

6.1 General. Construction work on the Railroad's property shall be:

- (a) Subject to the inspection and review of the Railroad.
- (b) In accordance with the Railroad's written outline of specific conditions.

(c) In accordance with this special provision.

6.2 Excavation. The subgrade of an operated track shall be maintained with the berm edge at least 12 feet from centerline of track and not more than 26 inches below top of the rail. The contractor will not be required to make existing section meet this specification if substandard, in which case the existing section will be maintained. The contractor shall cease all work and notify the Railroad immediately before continuing excavation in the work area if obstructions are encountered which do not appear on the drawings. If the obstruction is a utility and the owner of the utility can be identified, then the contractor shall also notify the owner immediately. If there is any doubt about the location of underground cables or lines of any kind, no work shall be performed until the exact location has been determined. There will be no exceptions to these instructions. Additionally, all excavations shall be conducted in compliance with applicable Occupational Safety and Health Act regulations and, regardless of depth, shall be shored where there is any danger to tracks, structures or personnel. Any excavations, holes or trenches on the Railroad's property shall be covered, guarded and/or protected when not being worked on. When leaving work site areas at night and over weekends, the areas shall be secured and left in a condition that will ensure that Railroad's employees and other personnel who may be working or passing through the area are protected from all hazards. All excavations shall be back filled as soon as possible.

6.3 Excavation for Structure. The contractor shall be required to take special precaution and care in connection with excavating, shoring pits and in driving piles for footings adjacent to tracks to provide adequate lateral support for the tracks and the loads which the tracks carry, without disturbance of track alignment and surface, and to avoid obstructing track clearances with working equipment, tools or other material. The procedure for doing such work, including need of and plans for shoring, shall be approved by the Railroad Engineer before work is performed, but such approval shall not relieve the contractor from liability. Before submission of plans to the Railroad Engineer for approval, the Engineer will first review such plans in accordance with the Missouri Standard Specifications for Highway Construction, hereinafter called "Standard Specifications". The responsibility for the design and construction of the sheeting rests solely with the contractor. The temporary shoring along the railroad tracks shall be designed for the Cooper E80 loading. The design shall insure that the shoring is braced or substantially securely to prevent movement. The contractor shall submit plans for the temporary shoring that shall be signed, sealed, and stamped in accordance with the laws relating to Architects and Professional Engineers, Chapter 327, RSMo. and then submitted for review by the Engineer.

6.4 Demolition of Existing Structures. The contractor shall be required to take special precaution and care in connection with demolition of existing structures. The procedure for doing such work, including need of and plans for temporary falsework, shall first be approved by Railroad Engineer before work is performed, but such approval shall not relieve the contractor from liability. Before submission of plans to the Railroad Engineer for approval, the Engineer will first review such plans.

6.5 Falsework. The contractor shall be required to take special precaution and care to prevent any material from falling on the Railroad's right of way. The procedure for preventing material from falling, including need of and plans for temporary falsework, shall first be approved by the Railroad Engineer, but such approval shall not relieve the contractor from liability. Before

submission of plans to the Railroad Engineer for approval, the Engineer will first review such plans.

6.6 Blasting.

6.6.1 The contractor shall obtain advance approval of the Railroad Engineer and the Engineer for use of explosives on or adjacent to the Railroad's property. If permission for use of explosives is granted, the contractor shall be required to comply with the following:

(a) Blasting shall be done with light charges under the direct supervision of a responsible officer or employee of the contractor.

(b) Electric detonating fuses shall not be used because of the possibility of premature explosions resulting from operation of two-way train radios.

(c) No blasting shall be done without the presence of the Railroad Engineer. At least 72 hours advance notice to the person designated in the Railroad's notice of authorization to proceed as mentioned in Section 2.2 of this job special provision, the contractor shall be required to arrange for the presence of the Railroad Engineer and such flagging as the Railroad may require.

(d) The contractor shall have at the job site adequate equipment, labor and materials and allow sufficient time to clean up debris resulting from the blasting without delay to trains, as well as correcting, at contractor's expense, any track misalignment or other damage to the Railroad's property resulting from the blasting as directed by the Railroad Engineer. If contractor's actions result in delay of trains, the contractor shall bear the entire cost thereof.

6.6.2 The Railroad Engineer will:

(a) Determine the approximate location of trains and advise the contractor the approximate amount of time available for the blasting operation and clean-up.

(b) Have the authority to order discontinuance of blasting if blasting is too hazardous or is not in accordance with this special provision.

6.7 Maintenance of Railroad Facilities. The contractor shall be required to maintain all ditches and drainage structures free of silt or other obstructions which may result from contractor's operations. The contractor shall promptly repair eroded areas within Railroad's right of way and repair any other damage to the Railroad's property, tenants, licensees, easement grantees and invitees. All such maintenance and repair of damages due to the contractor's operations shall be done at the contractor's expense.

6.8 Storage of Materials and Equipment.

6.8.1 The contractor shall not store or stockpile construction materials or equipment closer than 25 feet to the centerline of the nearest railroad track or on the Railroad's property not covered by construction easement, contractor's permit, lease or agreement. Additionally, the contractor shall not store or leave materials or equipment within 250 feet of the edge of any highway/rail at-grade

crossings. Further, both sides of a main track shall remain unobstructed for a distance of 10 feet from the exterior edge of the track at all times to allow for stopped train inspection.

6.8.2 Machines or vehicles shall not be left unattended with the engine running. Parked machines or equipment shall be in gear with brakes set and with blade, pan or bucket lowered to the ground if so equipped. All grading or construction machinery that is left parked near the track unattended shall be effectively immobilized so that unauthorized persons cannot move such equipment.

6.9 Cleanup. Upon completion of the work, the contractor shall remove from within the limits of the Railroad's right of way, all machinery, equipment, surplus materials, falsework, rubbish or temporary buildings of the contractor, and leave said right of way in a neat condition satisfactory to the Railroad Engineer.

6.10 Buried Cable and Other Buried Facilities.

6.10.1 The contractor is placed on notice that fiber optic, communication and other cable lines and systems, collectively the "Lines", owned by various telecommunications companies may be buried on Railroad's property or right of way. The locations of the buried Lines, pipelines or utility facilities have been included on the plans based on information from the telecommunications companies, pipeline operators, or utilities, as the case may be. The contractor shall be responsible for contacting the Railroad Engineer, the Railroad's 24-hour information number (1-800-533-2891), the telecommunications companies, pipeline operators and utilities and notifying them of any work that may damage the buried Lines, pipelines, utility facilities and/or interfere with their service. The contractor shall verify the location of all buried Lines, pipelines and utility facilities shown on the plans or marked in the field in order to establish their exact locations prior to or while doing work on the Railroad's property or right of way. The contractor shall also use all reasonable methods when working on the Railroad's property or right of way to determine if any other buried Lines, pipelines or utility facilities exist on the Railroad's property or right of way.

6.10.2 Failure to mark or identify the buried Lines, pipelines or utility facilities will be sufficient cause for the Railroad Engineer to stop construction at no cost to the Commission or Railroad until these items are completed. The contractor shall be responsible for the rearrangement of any buried facilities, Lines, pipelines or utility facilities determined to interfere with the construction. The contractor shall cooperate fully with any telecommunications companies, pipeline operators and utility facility owners in performing such rearrangements.

7.0 Damages. The Railroad will not assume liability for any damages to the contractor, contractor's work, employees, servants, equipment and materials caused by railroad traffic. Any cost incurred by the Railroad for repairing damages to Railroad's property or to property of the Railroad's tenants, licensees, easement grantees and invitees caused by or resulting from the contractor's operations shall be paid directly to the Railroad by contractor.

8.0 Flagging Services.

8.1 When Required. Under the terms of the agreement between the Commission and the Railroad, the Railroad has sole authority to determine the need for flagging required to protect the Railroad's operations. In general, the requirements of such services will be whenever the

contractor's personnel or equipment are, or are likely to be, working on the Railroad's right of way within 25 feet of the centerline of any track, or across, over, adjacent to, or under a track, or when such work has disturbed or is likely to disturb a railroad structure or the railroad roadbed or surface and alignment of any track to such extent that the movement of trains must be controlled by flagging, or reasonable probability of accidental hazard to Railroad's operations or personnel. Normally, the Railroad will assign one flagger to a project; but in some cases, more than one may be necessary, such as yard limits where 3 flaggers may be required. However, if the contractor works within distances that violate instructions given by the Railroad Engineer or performs work that has not been scheduled with the Railroad Engineer, flaggers may be required full time until the project has been completed.

8.2 Scheduling and Notification.

8.2.1 Not later than the time that approval is initially requested to begin work on the Railroad's right of way (30 days), contractor shall furnish to the Railroad and the Commission a schedule for all work required to complete the portion of the project within Railroad's right of way and arrange for a job site meeting between the contractor, the Engineer, and the Railroad Engineer. Flaggers may not be provided until the job site meeting has been conducted and the contractor's work scheduled.

8.2.2 The contractor shall be required to give the Railroad Engineer at least 30 days of advance written notice of intent to begin work within Railroad's right of way in accordance with this special provision. Once begun, if such work is then suspended at any time, or for any reason, the contractor shall be required to give the Railroad Engineer at least 5 working days of advance notice before resuming work on Railroad's right of way. Such notices shall include sufficient details of the proposed work to enable the Railroad Engineer to determine if flagging will be required. If such notice is in writing, the contractor shall furnish the Engineer a copy; if notice is given verbally, the notice shall be confirmed in writing with copy to the Engineer. If flagging is required, no work shall be undertaken until the flagger or flaggers are present at the job site. Obtaining a flagger or flaggers may take up to 30 days to obtain initially from the Railroad. When flagging begins, the flagger is usually assigned by the Railroad to work at the project site on a continual basis until no longer needed and cannot be called for on a spot basis. If flagging becomes unnecessary and is suspended, obtaining a flagger or flaggers may take up to 30 days to again obtain from the Railroad. Due to Railroad labor agreements, 10 working days notice may be necessary before flagging services may be discontinued and responsibility for payment stopped. Notification for flagging should be addressed to:

Mr. Joe Day
BNSF Railroad
573-352-0003
Joseph.day@bnsf.com

8.2.3 If, after the flagger is assigned to the project site, emergencies arise which require the flagger's presence elsewhere, then the contractor shall delay work on the Railroad's right of way until such time as the flagger is again available. Any additional costs resulting from such delay shall be borne by the contractor and not the Railroad.

8.3 Payment.

8.3.1 The Contractor will pay the Railroad or appropriate flagging contractor directly for the cost of flagging services associated with the project and notify the MoDOT Resident Engineer of such payments.

8.3.2 The Contractor shall be responsible for arranging needing flagging services as required by the Railroad to accomplish the highway improvement.

8.3.3 The cost of flagging service is estimated at approximately \$1,500 per day based on an 8-hour work day and a 40-hour work week. This cost includes the base pay for the flagger, overhead, and per diem charge for travel expenses, meals and lodging. The charge to the contractor by the Railroad will be the actual cost based on the rate of pay for the Railroad's employees who are available for flagging service at the time the service is required. Work by a flagger in excess of 8 hours per day or 40 hours per week but not more than 12 hours a day will result in overtime pay at 1 1/2 times the appropriate rate. Work by a flagger in excess of 12 hours per day will result in overtime pay at 2 times the appropriate rate. If work is performed on a holiday, the flagging rate is 2 1/2 times the normal rate. Railroad expenses incurred preparing and handling invoices will also be charged to the contractor and/or the Commission. Charges to the contractor and/or the Commission by the Railroad shall be in accordance with applicable provisions of Volume 1, Chapter 4, §3 and Volume 6, Chapter 6, §2, Subsection 1 of the Federal-Aid Highway Program Manual issued by the Federal Highway Administration, including all current amendments. Flagging costs are subject to change. The above estimates of flagging cost are provided for information only and are not binding in any way. Each time a flagger is called, the minimum period for billing will be the 8 hour basic day unless the flagger can be assigned to other Railroad work during the work day.

8.3.4 In addition to the hours of providing flagging at the construction site, the flagger hours will include, but is not limited to, travel time to and from the project, time to complete paperwork for the flagging operations and time for setting warning signs/flags for the train traffic.

8.4 Verification.

8.4.1 Any complaints concerning a flagger shall be resolved in a timely manner. If need for a flagger is questioned, please contact the Railroad Engineer and Ms. Kare Brockamp, Manager of Public Projects at (913) 551-4484. All verbal complaints shall be confirmed in writing by the contractor within 5 working days with copy to the Railroad Engineer and Engineer. All written correspondence shall be addressed to Ms. Brockamp as shown in Section 2.1 of this job special provision.

8.4.2 The Railroad flagger assigned to the project will be responsible for notifying the Engineer upon arrival at the job site on the first day, or as soon thereafter as possible, that flagging services begin and on the last day that flagger performs such services for each separate period that services are provided. The Engineer will document such notification in the project records.

9.0 Haul Across Railroads.

9.1 Where the plans show or imply that materials of any nature must be hauled across the Railroad's tracks, unless the plans clearly show that the Commission has included arrangements for such haul in the agreement with the Railroad, the contractor shall be required to make all necessary arrangements with the Railroad regarding means of transporting such materials across the Railroad's tracks. The contractor shall be required to bear all costs incidental to such crossings, including flagging, whether services are performed by contractor's own forces or by Railroad's personnel.

9.2 No crossing may be established for use of the contractor for transporting materials or equipment across the tracks of the Railroad unless specific authority for the installation, maintenance, necessary watching and flagging thereof and removal, all at the expense of the contractor, is first obtained from the Railroad Engineer.

10.0 Work for the Benefit of the Contractor. All temporary or permanent changes in wire lines or other facilities which are considered necessary to the project are shown on the plans, and are included in the agreement between the Commission and the Railroad or will be covered by appropriate revisions to same which will be initiated and approved by the Commission and/or the Railroad. Should the contractor desire any changes in addition to the above, then contractor shall make separate arrangements with the Railroad for same to be accomplished at the contractor's expense.

11.0 Cooperation and Delays. The contractor shall arrange a schedule with the Railroad for accomplishing staged construction involving work by the Railroad or tenants, licensees, easement grantees and invitees of the Railroad. In arranging a schedule, the contractor shall ascertain, from the Railroad, the lead time required for assembling crews, materials and make due allowance. No charge of claims of the contractor against the Railroad will be allowed for hindrance or delay on account of railway traffic for any work done by the Railroad, other delay incident to or necessary for safe maintenance of railway traffic, or for any delays due to compliance with this special provision.

12.0 Trainman's Walkways. Along the outer side of each exterior track of multiple operated track and on each side of single operated track, an unobstructed continuous space suitable for trainman's use in walking along trains shall be maintained extending to a line not less than 12 feet from centerline of track. Any temporary impediments to walkways and track drainage encroachments or obstructions allowed during work hours while Railway's protective service is provided shall be removed before the close of each workday. Any excavation near the walkway, the contractor shall install a handrail with a 12 feet minimum clearance from centerline of track.

13.0 Insurance. The amount of work to be performed upon, over or under Railroad's right of way is estimated to be 1 percent of the contractor's total bid for the project.

13.1 In addition to any other forms of insurance or bonds required under the terms of the contract and specifications, Contractor must, at its sole cost and expense, procure and maintain during the life of this Agreement the following insurance coverage:

- (a) Commercial General Liability insurance. This insurance shall contain broad form contractual liability with a combined single limit of a minimum of \$5,000,000 each

occurrence and an aggregate limit of at least \$10,000,000 but in no event less than the amount otherwise carried by the contractor. Coverage must be purchased on a post 2004 ISO occurrence form or equivalent and include coverage for, but not limit to the following:

- Bodily Injury and Property Damage
- Personal Injury and Advertising Injury
- Fire legal liability
- Products and completed operations

This policy must also contain the following endorsements, which must be indicated on the certificate of insurance:

- The definition of insured contract must be amended to remove any exclusion or other limitation for any work being done within 50 feet of railroad property.
- Waiver of subrogation in favor of and acceptable to Railway.
- Additional insured endorsement in favor of and acceptable to Railway.
- Separation of insureds.
- The policy shall be primary and non-contributing with respect to any insurance carried by Railway.

It is agreed that the workers' compensation and employers' liability related exclusions in the Commercial General Liability insurance policy(s) required herein are intended to apply to employees of the policy holder and shall not apply to Railway employees.

No other endorsements limiting coverage as respects obligations under this Agreement may be included on the policy with regard to the work being performed under this agreement.

(b) Business Automobile Insurance. This insurance must contain a combined single limit of at least \$1,000,000 per occurrence, and include coverage for, but not limited to the following:

- Bodily injury and property damage
- Any and all vehicles owned, used or hired

The policy shall also contain the following endorsements or language, which shall be indicated on the certificate of insurance:

- Waiver of subrogation in favor of and acceptable to Railway.
- Additional insured endorsement in favor of and acceptable to Railway.
- Separation of insureds.
- The policy shall be primary and non-contributing with respect to any insurance carried by Railway.

(c) Workers Compensation and Employers Liability insurance including coverage for, but not limited to:

- Contractor's statutory liability under the worker's compensation laws of the state(s) in which the work is to be performed. If optional under State law, the insurance must cover all employees anyway.
- Employers' Liability (Part B) with limits of at least \$500,000 each accident, \$500,000 by disease policy limit, \$500,000 by disease each employee.

This policy shall also contain the following endorsements or language, which shall be indicated on the certificate of insurance:

- Waiver of subrogation in favor of and acceptable to Railway.
- (d) Railroad Protective Liability insurance naming only the Railway as the Insured with coverage of at least \$5,000,000 per occurrence and \$10,000,000 in the aggregate. The policy Must be issued on a standard ISO form CG 00 35 10 93 and include the following:
- Endorsed to include the Pollution Exclusion Amendment (ISO form CG 28 31 10 93)
 - Endorsed to include the Limited Seepage and Pollution Endorsement.
 - Endorsed to remove any exclusion for punitive damages.
 - No other endorsements restricting coverage may be added.
 - The original policy must be provided to the Railway prior to performing any work or services under this Agreement

In lieu of providing a Railroad Protective Liability Policy, Licensee may participate in Licensor's Blanket Railroad Protective Liability Insurance Policy available to contractor.

13.2 Other Requirements:

13.2.1 All policies (applying to coverage listed above) must not contain an exclusion for punitive damages and certificates of insurance must reflect that no exclusion exists.

13.2.2 Contractor agrees to waive its right of recovery against Railway for all claims and suits against Railway. In addition, its insurers, through the terms of the policy or policy endorsement, waive their right of subrogation against Railway for all claims and suits. The certificate of insurance must reflect the waiver of subrogation endorsement. Contractor further waives its right of recovery, and its insurers also waive their right of subrogation against Railway for loss of its owned or leased property or property under contractor's care, custody or control.

13.2.3 Contractor is not allowed to self-insure without the prior written consent of Railway. If granted by Railway, any deductible, self-insured retention or other financial responsibility for claims must be covered directly by contractor in lieu of insurance. Any and all Railway liabilities that would otherwise, in accordance with the provisions of this Agreement, be covered by contractor's insurance will be covered as if contractor elected not to include a deductible, self-insured retention or other financial responsibility for claims.

13.2.4 Prior to commencing the Work, contractor must furnish to Railway an acceptable certificate(s) of insurance including an original signature of the authorized representative evidencing the required coverage, endorsements, and amendments and referencing the contract audit/folder number if available. Contractor shall notify Railway in writing at least 30 days prior to any cancellation, non-renewal, substitution or material alteration. Upon request from Railway, a certified duplicate original of any required policy must be furnished. Contractor should send the certificate(s) to the following address:

<u>Railroad:</u>	<u>Commission:</u>			
BNSF Railway Company	Ms.	Brandi		Baldwin
P.O. Box 140528	State	Construction	and	Materials
Kansas City, MO 64114	MoDOT			Engineer
Toll Free: 877-576-2378	P.O.		Box	270
Fax number: 817-840-7487	Jefferson	City,	MO	65102
Email:				BNSF@certfocus.com
www.certfocus.com				

13.2.5 Any insurance policy must be written by a reputable insurance company acceptable to Railway or with a current Best's Guide Rating of A- and Class VII or better, and authorized to do business in the state(s) in which the service is to be provide.

13.2.6 Contractor represents that this Agreement has been thoroughly reviewed by contractor's insurance agent(s)/broker(s), who have been instructed by contractor to procure the insurance coverage required by this Agreement. Allocated Loss Expense must be in addition to all policy limits for coverages referenced above. Not more frequently than once every five years, Railway may reasonably modify the required insurance coverage to reflect then-current risk management practices in the railroad industry and underwriting practices in the insurance industry.

13.2.7 If any portion of the operation is to be subcontracted by contractor, contractor must require that the subcontractor provide and maintain the insurance coverages set forth herein, naming Railway as an additional insured, and requiring that the subcontractor release, defend and indemnify Railway to the same extent and under the same terms and conditions as contractor is required to release, defend and indemnify Railway herein.

13.2.8 Failure to provide evidence as required by this section will entitle, but not require, Railway to terminate this Agreement immediately. Acceptance of a certificate that does not comply with this section will not operate as a waiver of contractor's obligations hereunder.

13.2.9 The fact that insurance (including, without limitation, self-insurance) is obtained by contractor will not be deemed to release or diminish the liability of contractor including, without limitation, liability under the indemnity provisions of this Agreement. Damages recoverable by Railway will not be limited by the amount of the required insurance coverage.

13.2.10 For purposes of this section, Railway means "Burlington Northern Santa Fe LLC", "BNSF RAILWAY COMPANY" and the subsidiaries, successors, assigns and affiliates of each.

13.2.11 Railroad will not accept binders as evidence of insurance, the original policy shall be provided. The named insured, description of the work and designation of the job site to be shown on the Policy are as follows:

- (a) Named Insured: BNSF Railway Company
- (b) Description and Designation:
Roadway improvements under BNSF bridge.
St. Louis County Route 366/Watson Road
Job No. J6S3582
US DOT# 663828H MP 8.84 BNSF River Sub in Shrewsbury, MO.

13.2.12 The contractor must notify BNSF Manager of Public Projects at Kara.brockamp@bnsf.com when applying for railroad insurance coverage.

13.3 If any part of the work is sublet, similar insurance and evidence thereof in the same amounts as required of the prime contractor, shall be provided by or in behalf of the subcontractor to cover the subcontractor's operations. Endorsements to the prime contractor's policies specifically naming subcontractors and describing their operations will be acceptable for this purpose.

13.4 All Insurance hereinbefore specified shall be carried until all work required to be performed under the terms of the contract has been satisfactorily completed within the limits of the Railroad's right of way as evidenced by the formal acceptance by the Commission. Insuring Companies may cancel insurance by permission of the Commission and Railroad or on 30 days written notice to the Railroad and Commission.

14.0 Hazardous Materials Compliance and Reporting. Contractor shall be responsible for complying with all applicable federal, state and local governmental laws and regulations, including, but not limited to environmental laws and regulations (including but not limited to the Resource Conservation and Recovery Act, as amended; the Clean Water Act, as amended; the Oil Pollution Act, as amended; the Hazardous Materials Transportation Act, as amended; and the Comprehensive Environmental Response, Compensation and Liability Act, as amended), and health and safety laws and regulations. In addition to the liability provisions contained elsewhere in this job special provision, the contractor hereby indemnifies, defends and holds harmless the Railroad for, from and against all fines or penalties imposed or assessed by federal, state and local governmental agencies against the Railroad which arise out of contractor's work under this special provision. Notwithstanding the preceding sentence, the contractor will not be liable for pre-existing hazardous materials or hazardous substances discovered on Railroad's property or right of way so long as such hazardous materials or hazardous substances were not caused by (in whole or in part) contractor's work, acts or omissions. If contractor discovers any hazardous waste, hazardous substance, petroleum or other deleterious material, including but not limited to any non-containerized commodity or material, on or adjacent to Railroad's property, in or near any surface water, swamp, wetlands or waterways, while performing any work under this special provision, the contractor shall immediately:

- (a) Notify the Railroad's Resource Operations Center at (800) 832-5452, of such discovery.
- (b) Take safeguards necessary to protect employees, subcontractors, agents and/or third parties.

(c) Exercise due care with respect to the release, including the taking of any appropriate measure to minimize the impact of such release

15.0 Personal Injury Reporting. The Railroad is required to report certain injuries as a part of compliance with Federal Railroad Administration (“FRA”) reporting requirements. Any personal injury sustained by any employee of the contractor, subcontractor or contractor’s invitees while on the Railroad’s property shall be reported immediately, by phone or mail if unable to contact in person, to the Railroad’s representative in charge of the project. The Non-Employee Personal Injury Data Collection Form is to be completed and sent by Fax to the Railroad at (817) 352-7595 and to the Railroad’s Project Representative no later than the close of shift on the date of the injury.

16.0 Failure to Comply. In the event the contractor violates or fails to comply with any of the requirements of this special provision, the below orders will be applied. Any such orders shall remain in effect until the contractor has remedied the situation to the satisfaction of the Railroad Engineer and the Engineer.

(a) The Railroad Engineer may require that the contractor to vacate the Railroad’s property.

(b) The Engineer may withhold all monies due to the contractor until contractor has remedied the situation to the satisfaction of the Railroad Engineer and the Engineer.

17.0 Payment for Cost of Compliance. No separate payment will be made for any extra cost incurred on account of compliance with this special provision. All such cost shall be included in the contract unit price for other items included in the contract. Railroad will not be responsible for paying the contractor for any work performed under this special provision.

Y. Crestwood and Webster Groves Coordination

1.0 Description. The cities of Crestwood and Webster Groves are including bus stop improvements in their city limits along the corridor.

2.0 Contact Requirements. The J6S3582 contractor shall coordinate with MoDOT and the public works directors of both cities at least 14 days in advance of any work on bus stop pads and bus stop locations to assist in allowing the two city’s improvements to take place. The two contacts are:

James Swingle
Director of Public Works
One Detjen Dr
Crestwood, MO 63126
Telephone Number: (314) 729-4722
Email: jswingle@cityofcrestwood.org

Vera Cavato
Acting Director of Public Works

4 E Lockwood
Webster Groves, MO 63119
Telephone Number: (314) 963-5339
Email: cavatov@webstergrovesmo.gov

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

Z. Bus Service

1.0 The contractor shall be aware Metro Bus Service operates several different routes along various portions of Route 366 with bus stops located along the entire corridor. The contractor shall always maintain pedestrian access to each bus stop, unless approved by the Engineer and Metro. All active bus stop signs shall always remain visible during construction. Should any of the existing bus stop signs or posts be damaged by the contractor's negligence, they shall be replaced at the contractor's expense. The contractor shall contact Roderick Thomas of Metro at 314-923-3000 (office), 314-280-3622 (mobile), or rthomas@metrostlouis.org regarding the requirements of this section.

2.0 Various school districts may have bus stops located along Route 366 and/or side streets within the project limits. The contractor shall contact the school districts two weeks prior to beginning work so temporary bus stop locations can be identified.

Lindbergh School District
Laura Warren – Location Manager
Office: 314-638-4500
Email: transportation@lindberghschools.ws

Webster Groves School District
Derek Duncan – Director of Communications
Office: 314-918-4006
Email: Duncan.Derek@wgmail.org

Affton School District
Paula Hudson – Transportation Coordinator
Office: 314-633-5919
Email: PHudson@afftonschools.net

3.0 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.

AA. Parked Vehicles During Construction

1.0 Description. Along certain portions of the project, on-street parking may be allowed if the Engineer allows for staging purposes.

In addition to the potential for on-street parking during construction, there are numerous parking lots and car dealerships along the project with parked vehicles. If any of these vehicles interferes with the work, the Contractor shall notify, in writing, the owners of such vehicles, advising them of the nature of the interference and shall arrange and cooperate with them for the protection or disposition of such vehicles. The Contractor shall furnish the Engineer with copies of such notifications and with copies of any agreement between the Contractor and the property owners concerning such protection or disposition.

1.1 The Contractor shall take all necessary precautions for the protection of the parked vehicles contiguous to the work.

1.2 The Contractor shall be responsible for the damage or destruction of the parked cars of any character resulting from neglect, misconduct, or omission in his/her manner or method of execution or nonexecution of the work, or caused by defective work or the use of unsatisfactory materials or equipment, and such responsibility shall not be released until the work has been completed and accepted and the requirements of the Specifications complied with.

1.3 Whenever parked vehicles are so damaged or destroyed, the Contractor shall, at no additional cost to the Commission, restore such vehicle to a condition equal to that existing before such damage or injury was done by repairing, rebuilding, or replacing it as may be directed, or the Contractor shall otherwise make good such damage or destruction in an acceptable manner. If the Contractor fails to do so, the Engineer may, after the expiration of a period of 48 hours after giving the Contractor notice in writing, proceed to repair, rebuild, or otherwise restore such vehicle as may be deemed necessary, and the cost thereof will be deducted from any compensation due, or which may become due, the Contractor under this or any other contract between the Commission and the Contractor.

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

BB. Site Restoration

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

2.0 If the contractor elects and receives approval from the engineer for alternate trench and/or pull box locations, any areas of concrete slope protection, sidewalk, pavement, shoulders, islands and medians – as well as any similar improvements consisting of asphaltic concrete materials – removed in conjunction with their construction shall be replaced with improvements of similar composition and thickness. Removals shall be achieved by means of full depth saw cuts, the

resulting subgrade compacted to minimum density requirements and topped with 4 inches of compacted aggregate base course prior to replacement of surface materials. Concrete materials used in replacement shall be approved by the engineer. A commercial asphalt mix may be used for replacement of asphaltic surfacing upon approval of the engineer.

2.1 Unless quantities and pay items for removal and subsequent replacement of improvements are contained in the plans for a specific location of removal work, no direct payment will be made for full depth saw cutting and the removal and subsequent replacement of asphalt or concrete slope protection, sidewalk, pavement, shoulders, islands, medians, sod and the required dowel and tie bars removed and replaced by the contractor as a result of his election to vary the location of conduit runs and pull boxes. This work will be considered as included in the various unit bid prices for conduit and pull boxes established in the contract, and no additional payment will be made.

2.2 Sidewalks and sidewalk ramps that are disturbed as described in this provision shall be replaced to meet current ADA standards at the contractor's expense.

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

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

CC. Balanced Mix Design Requirements for Section 403 Asphaltic Concrete Pavement JSP-24-01

1.0 Description. Balanced Mix Design (BMD) and Paver-Mounted Thermal Profiles (PMTP), as specified herein, are required on this project for all Sec 403 asphaltic concrete pavement surface and base course mixes. BMD shall be in accordance with section 2.0. PMTP shall be in accordance with section 3.0. No additional payment will be made for compliance with these provisions.

1.1 Rapid Penetrating Emulsion. Should use of Rapid Penetrating Emulsion (RPE) be necessary for corrective action of longitudinal joint density, as specified elsewhere in section 2.0, RPE shall be in accordance with MoDOT JSP2303 Rapid Penetrating Emulsion (available at: https://epg.modot.org/index.php/Job_Special_Provisions), except that no payment will be made for use of RPE.

2.0 *Delete Sec 403 in its entirety and substitute the following:*

403 ASPHALTIC CONCRETE PAVEMENT with Balanced Mix Design

403.1 Description. This work shall consist of providing a bituminous mixture to be placed in one or more courses on a prepared base or underlying course as shown on the plans or as directed

by the engineer. The contractor shall be responsible for QC of the bituminous mixture, including the design, and control of the quality of the material incorporated into the project. The engineer will be responsible for QA, including testing, to assure the quality of the material incorporated into the project.

403.1.1 Naming Convention. The nomenclature of Superpave bituminous mixture names, such as SP125CLP, will be as follows. When only the aggregate size is shown, such as SP125, the specifications shall apply to all variations of that size, such as SP125B, SP125C, SP125CLP, etc. When "x" is indicated, such as SP125xLP, specifications shall apply to all variations of mixture designs. Stone Matrix Asphalt will be generally referred to as SMA and designated by SM or SMR.

Superpave Nomenclature	
SP	Superpave
048	4.75mm (No. 4) nominal aggregate size
095	9.5 mm (3/8 inch) nominal aggregate size
125	12.5 mm (1/2 inch) nominal aggregate size
190	19.0 mm (3/4 inch) nominal aggregate size
250	25.0 mm (1 inch) nominal aggregate size
x	Mixture design: B, C, E or F (as described below)
LP	Limestone porphyry (when designated)
SM	Stone Matrix Asphalt (when designated)
SMR	Stone Matrix Asphalt limestone/non-carbonate (when designated)

403.1.2 Design Levels. The following cumulative equivalent single axle loads (ESALs) shall be used for the specified mix design. The same size aggregate mix design at a higher design traffic may be substituted at the contractor's expense for the contract specified mixture design with the approval from the engineer. Substitutions shall be done uniformly and project mixing of various designs for the same work will not be permitted. For example, an SP125B mixture may be substituted for an SP125C mixture, or SP190C for SP190E, etc. Mixture design substitution will be limited to one design level higher than that specified in the contract.

Design Traffic (ESALs)	Design
< 300,000	F
300,000 to < 3,000,000	E
3,000,000 to < 30,000,000	C
≥ 30,000,000	B

403.2 Material. All material shall be in accordance with Division 1000, Material Details, and specifically as follows:

Item	Section
Aggregate	1002
Asphalt Binder, Performance Graded (PG)*	1015
Fiber Additive	1071
Anti-Strip Additive	1071

*The grade of asphalt binder will be specified in the contract.

403.2.1 Stone Matrix Asphalt. In addition to other requirements, material for SMA mixtures shall meet the following. Coarse aggregate shall consist of crushed limestone and either porphyry or steel slag in accordance with the quality requirements of [Sec 1002](#), except as follows. The Los Angeles (LA) abrasion, when tested in accordance with AASHTO T 96, shall not exceed 40 percent based on initial ledge approval and source approval. The percent absorption, when tested in accordance with AASHTO T 85, shall not exceed 3.5 percent based on the individual fractions. The amount of flat and elongated particles, measured on material retained on a No. 4 sieve, of the blended aggregate shall not exceed 20 percent based on a 3:1 ratio or 5 percent based on a 5:1 ratio.

403.2.2 Filler Restriction. Rigden void content determined in accordance with MoDOT Test Method TM-73 shall be no greater than 50 percent.

403.2.3 Fibers. A fiber additive shall be used as a stabilizer in SMA Mixtures. Fibers shall be uniformly distributed by the end of the plant mixing process. The dosage rate for fibers shall be no less than 0.3 percent by weight of the total mixture for cellulose and no less than 0.4 percent by weight for mineral fibers.

403.2.4 Reclaimed Asphalt. A maximum of 30 percent virgin effective binder replacement may be used in mixtures without changing the grade of binder. The asphalt binder content of recycled asphalt materials shall be determined in accordance with AASHTO T 164, ASTM D 2172 or other approved method of solvent extraction. A correction factor for use during production may be determined for binder ignition by burning a sample in accordance with AASHTO T 308 and subtracting from the binder content determined by extraction. The aggregate specific gravity shall be determined by performing AASHTO T 209 in accordance with [Sec 403.19.3.1.2](#) and calculating the G_{se} to which a 0.98 correction factor will be applied to obtain the G_{sb} as follows:

$$G_{se} = \frac{100 - P_b}{\frac{100}{G_{mm}} - \frac{P_b}{G_b}} \qquad \text{RAP } G_{sb} = \text{RAP } G_{se} \times 0.98$$

403.2.5 Reclaimed Asphalt Pavement. Reclaimed Asphalt Pavement (RAP) may be used in any mixture, except SMA mixtures. Mixtures may be used with more than 30 percent virgin effective binder replacement provided testing according to AASHTO M 323 is included with the job mix formula that ensures the combined binder meets the grade specified in the contract. All

RAP material, except as noted below, shall be tested in accordance with AASHTO T 327, *Method of Resistance of Coarse Aggregate Degradation by Abrasion in the Micro-Deval Apparatus*. Aggregate shall have the asphalt coating removed either by extraction or binder ignition during production. The material shall be tested in the Micro-Deval apparatus at a frequency of once per 1500 tons. The percent loss shall not exceed the Micro-Deval loss of the combined virgin material by more than five percent. Micro-Deval testing will be waived for RAP material obtained from MoDOT roadways. All RAP material shall be in accordance with [Sec 1002](#) for deleterious and other foreign material.

403.2.6 Reclaimed Asphalt Shingles. Reclaimed Asphalt Shingles (RAS) may be used in any mixture specified to use PG 64-22 in accordance with AASHTO PP 53 except as follows: When the ratio of virgin effective binder to total binder in the mixture is between 60 and 70 percent, the grade of the virgin binder shall be PG 52-28 or PG 58-28. Shingles shall be ground to 3/8-inch minus. Waste, manufacturer or new, shingles shall be essential free of deleterious materials. Post-consumer RAS shall not contain more than 1.5 percent wood by weight or more than 3.0 percent total deleterious by weight. Post-consumer RAS shall be certified to contain less than the maximum allowable amount of asbestos as defined by national or local standards. The gradation of the aggregate may be determined by solvent extraction of the binder or using the following as a standard gradation:

Shingle Aggregate Gradation	
Sieve Size	Percent Passing by Weight
3/8 in.	100
No. 4	95
No. 8	85
No. 16	70
No. 30	50
No. 50	45
No. 100	35
No. 200	25

403.3 Composition of Mixtures.

403.3.1 Gradation. Prior to mixing with asphalt binder, the combined aggregate gradation, including filler if needed, shall meet the following gradation for the type of mixture specified in the contract. A job mix formula may be approved which permits the combined aggregate gradation during mixture production to be outside the limits of the master range when the full tolerances specified in [Sec 403.5](#) are applied.

Percent Passing by Weight							
Sieve Size	SP250	SP190	SP125	SP095	SP048	SP125xSM(R)	SP095xSM(R)
1 1/2 in.	100	---	---	---	---	---	---
1 in.	90 - 100	100	---	---	---	---	---
3/4 in.	90 max.	90 - 100	100	---	---	100	---
1/2 in.	---	90 max.	90 - 100	100	---	90-100	100
3/8 in.	---	---	90 max.	90-100	100	50-80	70-95
No. 4	---	---	---	90 max.	90-100	20 - 35	30-50
No. 8	19 - 45	23 - 49	28 - 58	32-67	---	16 - 24	20-30
No. 16	---	---	---	---	30-60	---	21 max.
No. 30	---	---	---	---	---	---	18 max.
No. 50	---	---	---	---	---	---	15 max.
No. 100	---	---	---	---	---	---	---
No. 200	1 - 7	2 - 8	2 - 10	2-10	7-12	8.0-11.0	8.0-12.0

403.3.2 Anti-Strip Agent. An anti-strip will be allowed by the engineer to improve resistance to stripping. Anti-strip agents and application rates shall be from a list approved in accordance with [Sec 1071](#).

403.3.3 Porphyry Mixtures. For LP and SMA mixtures, at least 50 percent by volume of the aggregate shall be crushed porphyry retained on the following sieves: No. 30 for SP048, No. 16 for SP095 and No. 8 for SP125. Depending on the actual gradation of porphyry aggregate furnished, the amount of crushed porphyry required may vary, however at least 40 percent by weight of crushed porphyry will be required. Steel slag may be substituted for porphyry in LP and SM mixtures, except at least 45 percent by weight of crushed porphyry and/or slag will be required. The engineer may approve the use of other hard, durable aggregate in addition to porphyry and steel slag. When an SMR mixture is designated, the mixture shall contain aggregate blends with at least 30 percent non-carbonate material in accordance with [Sec 403.3.5](#).

403.3.4 Minimum Stone Matrix Asphalt Binder. The percent asphalt binder for SMA mixtures shall not be less than 6.0 percent unless otherwise allowed by the engineer.

403.3.5 Surface Mixtures. Design level B surface mixtures and SP048NC, except as described in [Sec 403.15.3](#), containing limestone coarse aggregate shall contain a minimum amount of non-carbonate aggregate. The LA abrasion values, AASHTO T 96, of the limestone will determine the type and amount of non-carbonate aggregate required as shown in the table below. The LA abrasion value will be determined from the most recent source approval sample. In lieu of the above requirements, the aggregate blend shall have an acid insoluble residue (AIR), MoDOT Test Method TM 76, meeting the plus No. 4 criteria of crushed non-carbonate material. Non-carbonate aggregate shall have an AIR of at least 85 percent insoluble residue.

Coarse Aggregate (+ No. 4)	Minimum Non-Carbonate by Volume
Limestone, LA ≤ 30	30% Plus No. 4
Limestone, LA > 30	20% Minus No. 4*
Dolomite	No Requirement

*Use for all SP095 and SP048NC containing limestone.

403.4 Job Mix Formula. At least 30 days prior to placing any mixture on the project, the contractor shall submit a mix design for approval to Construction and Materials. The mixture shall be designed in accordance with AASHTO R 35 or R 46 and shall be tested in accordance with AASHTO T 312 except as noted herein. A detailed description of the mix design process shall be included with the job mix formula (JMF). Representative samples of each ingredient for the mixture shall be submitted with the mix design.

403.4.1 Proficiency Sample Program. Laboratories that participate in and achieve a score of three or greater in the AASHTO proficiency sample program for T 11, T 27, T 84, T 85, T 166, T 176, T 209, T 304 (ASTM C 1252), T 308 and T 312 will have the mixture verification process waived. The mix design shall be submitted to Construction and Materials for approval at least seven days prior to mixture production.

403.4.2 Required Information. The mix design shall include raw data from the design process and contain the following information:

- (a) All possible sources intended for use, and grade and specific gravity of asphalt binder.
- (b) Source, type (formation, etc.), ledge number if applicable, gradation, and deleterious content of each aggregate fraction.
- (c) Bulk and apparent specific gravities and absorption of each aggregate fraction in accordance with AASHTO T 85 for coarse aggregate and AASHTO T 84 for fine aggregate including all raw data.
- (d) Specific gravity of hydrated lime, mineral filler or baghouse fines, if used, in accordance with AASHTO T 100.
- (e) Percentage of each aggregate component.
- (f) Combined gradation of the job mix.
- (g) Percent asphalt binder, by weight, based on the total mixture and percent asphalt binder contributed by reclaimed asphalt materials.
- (h) Bulk specific gravity (G_{mb}) by AASHTO T 166 Method A of a laboratory compacted mixture compacted at N_{design} gyrations.
- (i) Percent air voids (V_a) of the laboratory compacted specimen compacted to N_{design} gyrations.

- (j) Voids in the mineral aggregate (VMA) and volume of Effective Asphalt (V_{be}) at N_{design} gyrations.
- (k) Theoretical maximum specific gravity (G_{mm}) as determined by AASHTO T 209, in accordance with [Sec 403.19.3](#), after the sample has been short term aged in accordance with AASHTO R 30.
- (l) The tensile strength ratio as determined by AASHTO T 283 including all raw data.
- (m) The gyratory sample weight to produce a 115 mm minimum height specimen.
- (n) Mixing temperature and gyratory molding temperature.
- (o) Number of gyrations at N_{design} .
- (p) Dust proportion ratio ($-200/P_{be}$).
- (q) Bulk specific gravity (G_{sb}) of the combined aggregate.
- (r) Percent chert contained in each aggregate fraction.
- (s) Percent of G_{mm} at $N_{initial}$ and $N_{maximum}$.
- (t) Voids in coarse aggregate (VCA) for both the mixture and dry-rodded condition for SMA mixtures.
- (u) Draindown for SMA mixtures.
- (v) Performance testing results for Cracking Tolerance Index (CT_{Index}), Critically aged Cracking Tolerance Index ($CT_{Index,CriticallyAged}$), Hamburg Wheel Tracking Test (HWTT), and Rutting Tolerance Index (RT_{Index}).
- (w) Baghouse fines added for design.
 - (i) Batch and continuous mix plants – Indicate which aggregate fraction to add baghouse percentage during production.
 - (ii) Drum mix plants – Provide cold feed settings with and without baghouse percentage.

403.4.3 Approval. No mixture will be accepted for use until the JMF for the project is approved by Construction and Materials.

403.4.4 Mix Formula Modification. The JMF approved for each mixture shall be in effect until modified in writing by the engineer. When unsatisfactory results occur or should a source of material be changed, a new JMF may be required.

403.4.4.1 Asphalt Binder Source Change. When an asphalt binder source change includes a binder grading that differs from the original grade on the JMF, new performance testing values (CT_{Index} and RT_{Index}) shall be provided prior to use.

403.4.4.2 Additive Source Change. When rejuvenators, warm mix additives, anti-strip additive, or other additives sources change; new performance testing values (CT_{Index} and RT_{Index}) shall be provided.

403.4.5 Design Gyration. The minimum number (N) of gyrations required for gyratory compaction shall be as follows:

Design	N_{design}^a
F	35
E	50
C	60
B	65

^a SMA mixtures shall have N_{design} equal to 100.

403.4.6 Mixture Characteristics. When compacted in accordance with AASHTO T 312, the mixture shall meet the following criteria.

403.4.6.1 Air Voids (V_a). Design air voids for SuperPave mixtures at all traffic levels shall be between 3.0 and 5.0 percent. SMA mixtures shall have a design air void of 4.0 percent.

403.4.6.2 Voids in the Mineral Aggregate (VMA). SuperPave mixtures shall have a minimum volume of effective asphalt, equal to the VMA minus the air voids, as shown in the chart below, with design air voids between 3.0% to 5.0% for SuperPave and shall be 4.0% for SMA. The minimum VMA shall be equal to the minimum volume of effective binder (V_{be}) plus design air voids.

Mixture	V_{be} Minimum (percent)
SP250	9.0
SP190	10.0
SP125 (except for SMA)	11.0
SP095 (except for SMA)	12.0
SP048	13.0
SMA	13.0

403.4.7 Dust to Binder Ratio. For all mixtures except SMA and SP048, the ratio of minus No. 200 material to effective asphalt binder (P_{be}) shall be between 0.8 and 1.6. For SP048, the ratio of minus No. 200 material to effective asphalt binder (P_{be}) shall be between 0.9 and 2.0.

403.4.8 Moisture Susceptibility. For all mixtures except SMA, the mixture shall have a tensile strength ratio (TSR) greater than 85 percent (80 percent if an approved anti-strip agent is used) when compacted to 3.7 inches with 7 ± 0.5 percent air voids and tested in accordance with AASHTO T 283. SMA mixtures shall have a TSR greater than 85 (80 percent if an approved anti-

strip agent is used) percent when compacted to 3.7 inches with 6 ± 0.5 percent air voids and tested in accordance with AASHTO T 283.

403.4.8.1 Minimum Tensile Strength. All mixtures shall have a minimum allowable conditioned tensile strength of 60 psi.

403.4.8.2 Liquid Anti-Stip Dosage. The liquid anti-strip dosage shall be in the range recommended by the manufacturer and provided on the JMF.

403.4.9 Draindown. AASHTO T 305, Draindown Test, shall be performed on all SMA mixtures prior to job mix approval. The mixture shall be stabilized in such a way that the draindown of the asphalt binder shall not exceed 0.3 percent by weight of mixture.

403.4.10 Voids in Coarse Aggregate. The percent VCA_{MIX} of SMA mixtures shall be less than or equal to the VCA_{DRC} as determined using AASHTO T 19. This may be calculated using the following equations:

$$VCA_{DRC} = 100 \times (G_{CA} \gamma_w - \gamma_s) / G_{CA} \gamma_w$$

$$VCA_{MIX} = 100 - (P_{bp} \times G_{mb} / G_{CA})$$

$$P_{bp} = P_s \times PA_{bp}$$

Where:

- G_{CA} = bulk specific gravity of the combined coarse aggregate (AASHTO T 85),
- γ_s = unit weight of coarse aggregate in the dry-rodded condition (DRC) (lb/ft³) (AASHTO T 19),
- γ_w = unit weight of water (62.34 lb/ft³),
- P_{bp} = percent aggregate by total mixture weight retained on No. 4 sieve and
- PA_{bp} = percent aggregate by total aggregate weight retained on No. 4 sieve*.

*Use No. 8 sieve for SP095xSM

403.4.11 Mix Design Performance Testing. Acceptable test results meeting the criteria for the following performance tests shall be submitted with the mix design for approval. Test specimens shall be compacted to an air void content of $7.0 \pm 0.5\%$ or $6.0 \pm 0.5\%$ for SMA mixtures.

403.4.11.1 Cracking Tolerance Index (CT_{Index}) Testing. The CT_{Index} testing shall be completed in accordance with ASTM D8225 and at a test temperature of 25 ± 0.5 °C.

Mix Type	Minimum CT _{Index}	CT _{Index,(Critically Aged)*}
Non-SMA	50	Informational Only
SMA	135	Informational Only

*Critically Aged defined as loose mix aging for 20 hours at 115° C.

403.4.11.2 Rutting Tolerance Index (RT_{Index}) Testing. The RT_{Index} testing shall be completed in accordance with ASTM D8360 and at a test temperature of 50 +/- 1°C.

PG Grade High Temperature*	Minimum RT _{Index}
58-28H / 64-22	50
64-22H / 70-22	65
64-22V / 76-22	80

*Determined by the binder grade specified in the contract.

403.4.11.3 Hamburg Wheel Track (HWT). HWT testing will be completed in accordance with AASHTO T324 at test temperature of 50 +/- 1°C and 2.44 in specimen height.

PG Grade High Temperature *	Minimum Wheel Passes	Maximum Rut Depth (in.)
58-28H / 64-22	7,500	0.38
64-22H / 70-22	15,000	0.38
64-22V / 76-22	20,000	0.38

*Determined by the binder grade specified in the contract.

403.5 Mixture Production Specification Limits.

403.5.1 Gradation and Deleterious Content Control. The gradation of the aggregate shall be determined from samples taken from the hot bins on batch-type or continuous mixing plants or from the composite cold feed belt on drum mix plants. The gradation may also be obtained by sampling the mixture and testing the residual aggregate. The deleterious content of the aggregate shall be determined from samples taken from the composite cold feed belt. The RAP shall be sampled from the RAP feeding system on the asphalt plant. Gradation and deleterious shall be taken when directed by the engineer.

403.5.1.1 Stone Matrix Asphalt Tolerances. In producing mixtures for the project, the plant shall be operated such that no intentional deviations from the job mix formula are made. The maximum deviation from the approved job mix formula shall be as follows for SMA mixtures:

Sieve	Max. Tolerance	
	SP095	SP125
3/4 in.	---	---
1/2 in.	---	±4
3/8 in.	±4	±4
No. 4	±3	±3
No. 8	±3	±3
No. 200	±2	±2

403.5.1.2 Mixture Tolerance. For all other SP mixtures, the percent passing the first sieve size smaller than the nominal maximum size shall not exceed 92.0 percent, a tolerance not to exceed 2.0 percent on the No. 8 sieve from the table in [Sec 403.3.1](#), and within the range listed in [Sec](#)

403.3.1 for the No. 200 sieve. The deleterious content of the material retained on the No. 4 sieve shall not exceed the limits specified in [Sec 1002.2](#).

403.5.2 Density. The final, in-place density of the mixture shall be 92.5 to 98.0 percent of the theoretical maximum specific gravity for all mixtures except SMA. SMA mixtures shall have a minimum density of 94.0 percent of the theoretical maximum specific gravity. The theoretical maximum specific gravity shall be determined from a sample representing the material being tested. Tests shall be taken not later than the day following placement of the mixture. The engineer will randomly determine test locations.

403.5.2.1 Shoulder Density. Density on non-integral shoulders shall be in accordance with [Sec 403.15.3](#).

403.5.2.2 Integral Shoulder. When shoulders are placed integrally with the traveled way, tests shall be taken on the traveled way.

403.5.2.3 Longitudinal Joint Density. Density along longitudinal joints shall be in accordance with [Sec 403.16.1](#). Pay shall be in accordance with [Sec 403.23.4.1](#).

403.5.3 Asphalt Content. The asphalt content (AC) shall be within ± 0.3 percent of the approved mix design.

403.5.4 Air Voids. Air voids shall be within ± 1.0 percent of the approved mix design at N_{des} gyrations.

403.5.5 Cracking Tolerance Index. Minimum CT_{Index} shall be 50 for all mixtures except SMA. SMA mixtures shall have a minimum CT_{Index} of 135.

403.5.6 Rutting Tolerance Index. Minimum RT_{Index} shall be based upon the high temperature asphalt binder grade in the contract in accordance with the following:

PG Grade High Temperature*	Minimum $RT_{Index}^{(a)}$
58-28H / 64-22	50
64-22H / 70-22	65
64-22V / 76-22	80

*Determined by the binder grade specified in the contract.

^(a)Mixtures not meeting the minimum RT_{Index} shall be tested by the Hamburg Wheel Track Test and meet a minimum of 1/2" rutting at the number of wheel passes required by the contract grade of the mixture.

403.5.7 Tensile Strength Ratio (TSR). The TSR shall be greater than or equal to 75 percent as determined from loose mixture taken from the plant and tested in accordance with AASHTO T 283. The minimum allowable conditioned tensile strength of the mixture shall be 60 psi. The liquid anti-strip dosage during production shall match the dosage listed on the JMF.

403.5.8 Fibers. The fiber proportioning and delivery system for SMA mixtures shall have an accuracy of 10 percent by weight of the material actually being measured in any given period of time.

403.5.9 Moisture Content. The asphaltic concrete mixture, when sampled and tested in accordance with AASHTO T 329, shall not contain more than 0.5 percent moisture by weight of the mixture.

403.5.10 Contamination. The asphaltic concrete mixture shall not be contaminated with deleterious agents such as unburned fuel, objectionable fuel residue or any other material not inherent to the job mix formula.

403.6 Field Laboratory. The contractor shall provide a Type 3 field laboratory in accordance with [Sec 601](#). The contractor shall furnish the bituminous mixture equipment to perform all required test methods for QC and QA work. The gyratory compactor shall be evaluated in accordance with AASHTO PP 35. An approved list will be maintained by Construction and Materials. All other equipment shall be capable of performing tests in accordance with the approved test methods.

403.7 Bituminous Mixing Plants. Bituminous mixing plants and preparation of material and mixtures shall be in accordance with [Sec 404](#).

403.8 Hauling Equipment. Trucks used for hauling bituminous mixtures shall be in accordance with [Sec 404](#).

403.9 Pavers. Bituminous pavers shall be self-contained units, provided with an activated screed or strike-off assembly, heated if necessary, and capable of spreading and finishing asphaltic concrete in lane widths applicable to the specified typical sections and thicknesses shown on the plans.

403.10 Construction Requirements.

403.10.1 Weather Limitations. No mixture shall be placed on any wet or frozen surface. No mixture shall be placed when either the air temperature or the temperature of the surface on which the mixture is to be placed is below 40 F. Temperatures shall be obtained in accordance with MoDOT Test Method TM 20.

403.10.2 Substitutions. With approval from the engineer, the contractor may substitute a smaller nominal maximum size mixture for a larger sized mixture. Specifications governing the substitute mixture shall apply. Except for a single surface layer, the total pavement thickness shall be maintained when the substitute mixture layer is reduced as allowed in [Sec 403.13](#) by increasing the thickness of other layers or courses. The contract unit price for the original mixture shall be used.

403.11 Field Adjustments of Job Mix Formulas. When test results indicate the mixture produced does not meet the specification requirements, the contractor may field adjust the job mix formula as noted herein. Field adjustments may consist of changing the percent binder as

listed on the original approved job mix by no more than 0.3 percent. Additional fractions of material or new material will not be permitted as field adjustments. The engineer shall be notified immediately when any change is made in the cold feed settings, the hot bin settings or the binder content. A new G_{sb} shall be calculated using the new aggregate percentages. The gradation of the adjusted mixture shall meet the requirements of the mixture type specified in the contract. When the binder content is adjusted more than 0.3 percent, the mixture will be considered out of specification, and a new mix design shall be established.

403.11.1 Field Mix Redesign. When a new mix design will be required, the contractor will be permitted to establish the new mix design in the field. The mixture shall be designed in accordance with AASHTO R 35 or AASHTO R 46 and shall meet the mix design requirements, including performance testing and TSR requirements. A representative sample of the mixture shall be submitted with the new mix design to the Central Laboratory for mixture verification. The amount of mixture submitted for verification shall weigh at least 50 pounds.

403.11.1.1 Approval. New mix designs established in the field shall be submitted for approval to Construction and Materials. Upon approval, Construction and Materials will assign a new mix number to the mixture.

403.11.1.2 Resume Production. No mixture shall be placed on the project until the new field mix design is approved.

403.12 Application of Prime or Tack. The prime coat, if specified, shall be applied in accordance with [Sec 408](#). A tack coat is required on all existing pavement and shoulder surfaces that will be overlaid with a bituminous mixture. A tack coat is also required between all lifts of bituminous pavements placed within the driving and turn lanes, unless otherwise specified in the contract. All construction requirements of a tacked surface shall be in accordance with [Sec 407](#), and specified herein. The tack coat shall be applied uniformly and shall completely cover the surface upon which the bituminous mixture is to be placed. Placement of a bituminous mixture shall not be placed upon a tacked surface that is not uniformly covered or surfaces that have experienced excessive loss of tack due to tracking. Re-application of tack due to excess tracking or non-uniform coverage shall be at the contractor's expense.

403.13 Spreading and Finishing. The base course, primed or tacked surface, or preceding course or layer shall be cleaned of all dirt, packed soil or any other foreign material prior to spreading the asphaltic mixture. If lumps are present or a crust of mixture has formed, the entire load will be rejected. The thickness and width of each course shall conform to the typical section in the contract. The contractor may elect to construct each course in multiple layers. The minimum compacted thickness shall be 0.75 inches for SP048, 1.25 inches for SP095, 1.75 inches for SP125, 2 inches for SP190, and 3 inches for SP250.

403.13.1 Paving Widths. The following shall apply for roadways constructed under traffic. For pavements having a width of 16 to 24 feet, inclusive, the asphaltic concrete pavement shall be laid in lanes approximately one half the full width of the completed pavement, and the full width shall be completed as soon as practical. Unless otherwise permitted, a single lane of any course shall not be constructed to a length that cannot be completed to full width of the pavement the succeeding operating day. For pavements greater than 24 feet wide, single lane width

construction shall be limited to one day's production and completion to full width shall be accomplished as soon as practical. Uneven pavement shall be left in place for no more than seven days, unless approved by the engineer. Removal of pavement to be in accordance with this specification shall be at the contractor's expense.

403.13.2 Segregation. No thermal or physical mix segregation will be permitted in handling the mixture at the plant, from the truck or during spreading operations on the roadbed.

Paaver Mounted Thermal Profiling (PMTP) shall be conducted in accordance with Sec 406.

All layers shall be feathered out, by hand raking, if necessary, in transitioning the depth of the surface to meet present grades at bridges or ends of projects, to provide a uniform, smooth riding surface free of irregularities. Where only the top layer of the surfacing continues across a bridge, the bottom layers shall be feathered out.

Any visual/physical segregation shall be tested in accordance with MoDOT Test Method TM 75. Mixture production shall immediately cease if either criteria of MoDOT Test Method TM 75 fail. Segregated mixture shall be removed and replaced to the limits determined by the engineer.

403.13.3 Release to Traffic. If the asphaltic concrete construction consists of more than a single layer, each layer shall be compacted as specified and allowed to cool to the ambient temperature before the next layer is placed. The contractor shall keep traffic off the asphaltic concrete until the surface of the asphaltic concrete is 140 F or below and the asphaltic concrete has cooled sufficiently to prevent flushing of the asphalt binder to the surface, marking or distorting the surface or breaking down the edges.

403.13.4 Draindown. Evidence of asphalt binder separation or draindown at delivery will be cause for rejection.

403.13.5 Shoulder Substitution. When a [Sec 403](#) mixture is specified for traffic lanes, the same mixture may be used for the adjacent shoulder, subject to the density requirements in [Sec 403.5.2](#).

403.14 Spot Wedging and Leveling Course. The engineer will specify the locations and thickness of spot wedging and the thickness of leveling course to obtain the smoothest possible riding surface. This procedure may result in spot wedging operations over small areas with feather-edging at high points and ends of wedge areas. Rigid control of the placement thickness of the leveling course shall be required. Leveling course, consisting of a layer of asphaltic concrete of variable thickness used to superelevate curves and eliminate irregularities in the existing base, shall be spread uniformly to the specified profile grade and cross section. The mixture shall be uniformly spread and compacted, with only minor segregation as accepted by the engineer. Type SP125 or finer mixtures, as applicable, shall be used for the spot wedging and for the leveling course. Mixtures used as spot wedging and leveling courses shall be accepted in accordance with [Sec 403.23.8.3](#).

403.15 Compaction. After the asphaltic mixture has been spread, struck off and surface irregularities adjusted, the asphaltic mixture shall be compacted thoroughly and uniformly by rolling to obtain the required compaction while the mixture is in a workable condition. Excessive

rolling, to the extent of aggregate degradation, will not be permitted. Rollers shall not be used in the vibratory mode when the mixture temperature is below 225 F. When warm mix technology is used, as approved by the engineer, rollers shall not be used in the vibratory mode when the mixture temperature is below 200 F .

403.15.1 Rolling. Any displacement occurring as a result of starting, stopping or changing direction of a roller, or from other causes, shall be avoided. Excess liquid, to prevent adhesion of the mixture to the rollers, will not be permitted. Diesel fuel, fuel oil or other detrimental products shall not be used as wetting agents. Along forms, curbs, headers, walls, and other places not accessible to the roller, the mixture shall be thoroughly compacted with hot hand tampers, smoothing irons or with mechanical tampers.

403.15.2 Defective Mixture. Any mixture that becomes loose and broken, mixed with dirt or is in any way defective shall be removed and replaced with fresh, hot mixture, which shall be compacted to conform with the surrounding area. Any area showing an excess or deficiency of asphalt binder shall be removed and replaced.

403.15.3 Non-Traffic Areas. [Sec 403](#) mixtures used for surfacing medians and similar areas, shoulders adjacent to rigid or flexible pavement and shoulders adjacent to resurfaced pavement shall be compacted to the specified densities for the mixture. Once an established rolling pattern has been demonstrated to provide the required density for shoulders, at the engineer's discretion, the pattern may be used in lieu of density tests provided no changes in the material, typical location or temperatures are made. Regardless of the method, density will still be required and subject to testing as deemed necessary by the engineer. In lieu of roller and density requirements, temporary bypasses to be maintained at the expense of the contractor shall be thoroughly compacted. The rolling shall be performed at proper time intervals and shall be continued until there is no visible evidence of further consolidation.

403.15.4 Density Measurement. Measurements for determining the in-place density of the mixture shall be taken no later than the day following placement. Measurements not obtained within the prescribed time limits shall be subject to the requirements of [Sec 403.22](#).

403.15.4.1 Density Cores. If a core is taken, material from underlying layers that remain adhered to the core shall be removed in a manner that does not harm the integrity of the specimen. If the contractor elects to place a lift of mixture greater than six times the nominal maximum aggregate size, cores shall be cut in half and the density of each half determined separately.

403.15.4.2 Nuclear/Alternative Methods. In-place asphalt density may be obtained by nuclear or alternative methods in accordance with MoDOT TM-41. The nuclear/alternative calibration locations shall be conducted within a trial section in accordance with [Sec 405.4.8](#).

403.15.5 Intelligent Compaction. Intelligent Compaction requirements in accordance with Section 405 shall not apply unless required by job special provision. Intelligent compaction shall be conducted on the traveled way to monitor the optimum roller passes at a mean temperature above 180 F in accordance with [Sec 405](#). Passing Segments shall have a minimum of 85% coverage at or above the optimum number of passes. Segments with between 85% and 70% coverage will be called moderate segments. Any segment with less than 70% coverage at the

optimum number of passes shall be a Deficient Segment. If 70% of the target IC-MV is not obtained, the segment shall be flagged accordingly in the Veta project file. All segments with a mean temperature of less than 180 F at the optimum pass shall be considered deficient.

403.15.6 Surface Smoothness. The finish of the pavement surface shall be substantially free from waves or irregularities and shall be true to the established crown and grade. The pavement surface shall be thoroughly tested for smoothness by profiling or straight edging in accordance with [Sec 610](#).

403.16 Joints. Transverse joints shall be formed by any method that will produce a dense, vertical section for use when laying is resumed. When a transverse vertical edge is to be left and opened to traffic, a temporary depth transition shall be built as approved by the engineer. The joint formed when the fresh mixture is placed shall be dense, well sealed, and the grade, line and surface texture of the succeeding surface shall conform to that of the joined surface. If directed by the engineer, the transverse joint shall be painted with a light coating of liquid asphalt. Hand manipulation of the mixture shall be minimized to avoid unsightly surface texture.

403.16.1 Joint Composition. Longitudinal joints shall be formed by the use of an edging plate fixed on both sides of the finishing machine. Care shall be taken to obtain a well bonded and sealed longitudinal joint by placing the hot mixture in a manner ensuring maximum compaction at this point. If directed by the engineer for properly sealing the longitudinal joint, a light coating of bituminous material shall be applied to the exposed edge before the joint is made. Each side of the joint shall be flush and along true lines.

403.16.2 Joint Offset. The longitudinal joint in any layer shall offset that in the layer immediately below by a minimum of 6 inches; except, the joints in the completed surfacing shall be at the lane lines of the traveled way or other required placement width outside the travel lane. The placement width shall be adjusted such that pavement marking shall not fall on a longitudinal joint.

403.17 Quality Control.

403.17.1 Quality Control Operations. The contractor shall maintain equipment and qualified personnel to perform all QC field inspection, sampling and testing as required by this specification. All contractor personnel included in the QC operation shall be qualified by the MoDOT Technician Certification Program. Under no circumstances will unqualified personnel be allowed to perform QC sampling or testing. Personnel will be disqualified if acceptable methods and procedures are not followed.

403.17.1.1 Asphalt Test Results. The contractor shall record all test results and furnish a copy, including all raw data, to the engineer no later than the beginning of the day following the test. The contractor shall maintain all test results in an organized format and shall be available to the QA inspector at all times. Scale readings and other measurements not directly recorded by electronic media shall be recorded in an organized format. Printouts from gyratory compactors and asphalt content devices shall be retained as part of the testing records.

403.17.2 Bituminous Quality Control Plan. Prior to approval of the trial mix design by the engineer, the contractor shall submit a QC Plan to Construction and Materials for approval. The QC Plan shall include:

- (a) The contractor representative in charge of QC and the project level representative if different from the contractor representative. Contact information should be recorded for these individuals.
- (b) Lot and subplot sizes and how they will be designated.
- (c) Performance testing, volumetrics, and asphalt content sampling, fabrication, and testing plan.
- (d) The test method for determining asphalt content and density determination. If cores are to be cut, the number of cores shall be specified.
- (e) Intelligent Compaction (if included in contract) and Paver Mounted Thermal Profiler base station and cellular reception plan.
- (f) A proposed independent third party name, contact, address, and phone number for dispute resolution.

403.17.2.1 Third Party. The third party shall be independent of the contractor, MoDOT consultants and all project subcontractors or suppliers on each specific project. All testing of material for dispute resolution shall be performed by an approved laboratory. Approved laboratories shall be AASHTO Accreditation Program certified in the areas of the material being tested.

403.17.2.2 Plant Calibration. Plant calibration shall be performed by the contractor in accordance with [Sec 404](#), and records shall be made available to the engineer.

403.17.2.3 Retained Samples. All samples taken by the contractor, including but not limited to tested aggregate, volumetric and density samples, shall be retained for the engineer until the contractor's and engineer's tests are complete and accepted unless otherwise instructed. This includes CT_{Index} and RT_{Index} results. These samples shall be maintained in clean covered containers, without contamination, readily accessible to the engineer. The retained sample's identification shall consist of, but is not limited to:

- (a) Time and date sampled.
- (b) Product specification number.
- (c) Type of sample, i.e. belt, bin, stockpile.
- (d) Lot and subplot designation.
- (e) Sampler/Tester.

(f) Project Job Number.

403.17.2.3.1 Retained Loose Mix Material. All loose mix samples for determination of volumetrics, performance tests, asphalt binder content and TSR shall be taken from the plant at random as designated by the engineer. Loose mix material shall be taken, identified, and retained for the engineer.

403.17.2.4 Performance Test Specimens and Loose Mix Sample. All loose mix samples for determination of performance tests, volumetrics, asphalt binder content and TSR shall be taken at the plant at random intervals as designated by the engineer. All QC/QA loose mix samples shall be taken by the contractor. Non-TSR performance test specimens shall be fabricated by the contractor. The engineer shall be present when taking loose mix samples and fabricating specimens for QA testing. Companion samples shall be identified and retained for the engineer.

403.17.3 Quality Control Laboratory. All QC mixture testing shall be performed in an approved laboratory.

403.17.3.1 Calibration Schedule. The contractor shall calibrate or verify all significant test equipment associated with tests covered in this specification. Intervals as set by the contractor shall not exceed the following limits:

Equipment - Test Method (AASHTO)	Requirement	Interval (Month)
Performance Testing Load Frames – R 18	Calibrate	12
Hamburg Wheel Track Test - R 18	Calibrate	12
Gyratory Compactor - T 312	Calibrate – 1.16 ± .02° internal angle	12 ^a
Gyratory Compactor - T 312	Verify	Daily
Gyratory Molds - T 312	Check Critical Dimensions	12
Thermometers - T 209, T 166, T 312	Calibrate	6
Vacuum System - T 209	Check Pressure	12
Pycnometer (Flask) - T 209	Calibrate	Daily
Binder Ignition Oven - T 308	Verify	12 ^b
Nuclear Content Gauge – T 287 or MoDOT TM 54	Drift & Stability – Manuf. Recommendation	1
Mechanical Shakers - T 27	Check Sieving Thoroughness	12
Sieves	Check Physical Condition	6
Weighted Foot Assembly - T 176	Check Weight	12
Mechanical Shaker - T 176	Check Rate & Length of Throw	12
Liquid Limit Device - T 89	Check Wear & Critical Dimensions	12
Grooving Tool - T 89	Check Critical Dimensions	12
Ovens	Verify Temp. Settings	4
Balances	Verify	12 ^b
Timers	Check Accuracy	6

^aCalibrate and/or verify after each move.

^bVerify after each move.

403.17.3.1.1 Inventory. An inventory of all major sampling, testing, calibration, and verification equipment, including the serial number or other identifying number shall be maintained.

403.17.3.1.2 Calibration Records. Calibration and verification records shall include but are not limited to:

- (a) Detailed results of the work performed (dimensions, mass, force, temperature, etc.)
- (b) Description of the equipment calibrated including identifying number.
- (c) Date the work was performed.
- (d) Identification of the individual performing the work.
- (e) Identification of the calibration or verification procedure used.
- (f) The previous calibration or verification date and next due date.
- (g) Identification of any in-house calibration or verification device used (including identification to establish traceability of items such as standard masses, proving rings, standard thermometers, balances, etc.).

403.17.3.2 Record Retention. Test records shall be maintained to permit verification of any test report. Records pertaining to testing, equipment calibration and verification, test reports, internal quality systems review, proficiency sample testing, test technician training and evaluation and personnel shall be retained in a secure location for a minimum of three years.

403.17.3.3 Test Method Availability. A current copy of all test methods and procedures shall be maintained in the QC laboratory at all times for reference by the technicians. Examples of report formats and procedures may be found in AASHTO R 18.

403.18 Quality Assurance. All QA field inspection, sampling and testing will be performed by a qualified MoDOT technician. The QA inspector shall have free access to any and all testing equipment used by the mixture producer and any workbooks, records or control charts maintained by the mixture producer for the QC process. The QA inspector shall also have sufficient access to the plant grounds to assure compliance with the approved QC Plan.

403.18.1 Assurance Testing. At the plant, the contractor shall sample, condition, fabricate, and provide the CT_{Index} and RT_{Index} test specimens and provide loose mix material for all QA testing at the provided random tonnage in the presence of the engineer. The engineer will independently test the specimens and/or mixture at the frequency listed in Sec 403.19.3. The independent samples shall be of sufficient size to retain half for possible disputes.

The engineer's test results, including all raw data, will be made available to the contractor when completed and no later than the next working day.

403.18.2 Core Chain of Custody. QA density cores shall be sealed in approved tamper-evident containers immediately after extraction in the presence of the engineer.

403.18.3 Federal Highway Administration Requirements. Performance and acceptance of QC/QA testing under these specifications shall not eliminate any FHWA requirements for acceptance of the material.

403.19 Acceptance of Material. Acceptance of bituminous mixture will be based on lots. With the exception of density, asphalt material will be sampled at the asphalt plant in lots or sublots on a random basis through the use of a random number system and evaluated using a Quality Level Analysis (QLA). A QLA will determine payment based on a combination of the total PWL (PWL_t) determined for each pay factor item for each lot of material produced.

403.19.1 Random Numbers. The engineer will generate random numbers. Random numbers will be based upon tonnage.

403.19.2 A lot shall consist of a maximum of 6,000 tons. The maximum subplot size shall be 1500 tons and each lot shall contain no less than 4 sublots. Sublots from incomplete lots shall be combined with the previous complete lot for determination of pay factors. When no previous lot exists, the mixture shall be treated in accordance with Sec 403.23.8.1. A new lot shall begin when the asphalt content of a mixture is adjusted in accordance with Sec 403.11 or if there is an asphalt binder grade change or an additive source change.

403.19.3 Test and Pay Factor Items. As a minimum, the contractor and engineer shall test in accordance with the following table. The number of random tests per subplot may be increased per the contractor's QC plan. The QC plan shall state the test and testing frequency. All random tests shall be used in the pay factor determination. Where multiple test methods are allowed, the contractor shall designate the test method to be used in the QC Plan. Final payment will be based on the indicated pay factor items.

Tested Property	Test Method	Contractor Frequency	Engineer Frequency
Pay Factors			
Mat Density (% of theoretical maximum density) ^(a)	MoDOT TM 41, AASHTO T 166 or AASHTO T 331	1 Sample / Sublot	1 Sample / Lot
Asphalt content	AASHTO T 164, or MoDOT Test Method TM-54, or AASHTO T 287, or AASHTO T 308	1 / Sublot	1 / Lot
V _a , N _{des}	AASHTO T 312 and R 35	1 / Sublot	1 / Lot
CT _{Index}	ASTM D 8225	1 / 3000 tons	1 / 12,000 tons
Pay Factor Adjustments			

Unconfined Longitudinal Joint Density ^(a)	MoDOT TM 41, AASHTO T 166 or AASHTO T 331	1 Sample / Sublot	1 Sample / Lot
Intelligent Compaction	Sec 405	Continuous	10% of travelway of one roller
RT _{Index}	ASTM D 8360	1 / 3000 tons	1 / 12000 tons
Tensile Strength and TSR	AASHTO T 283	1 / 12000 tons (maximum)	1 / Project
Temperatures			
Mix Temperature at Plant	----	1 / Sublot	1 / Day
Temperature of Base and Air	----	As Needed	As Needed

(a) Core samples shall consist of one core. Up to two additional cores, as stated in the QC Plan, may be obtained at the same offset within one foot of the randomly selected location. If more than one core is obtained, all cores shall be combined into one sample.

403.19.3.1 Test Method Modification.

403.19.3.1.1 Binder Ignition Modification. Asphalt content determination in accordance with AASHTO T 308, Section 6.9.1 shall be modified by adding the following: If the calibration factor exceeds 1.0 percent, lower the test temperature to 800 ± 8 F and repeat test. Use the calibration factor obtained at 800 F even if it exceeds 1.0 percent. If RAP is used, the binder ignition oven shall be calibrated in accordance with MoDOT Test Method TM 77. At the engineer’s discretion, testing may be waived when production does not exceed 200 tons per day. The contractor shall certify the proper proportions of a previously proven mixture were used.

403.19.3.1.2 Rice Test. When the water absorption of any aggregate fraction is greater than 2.0 percent, the test method for determining theoretical maximum specific gravity, AASHTO T 209, shall be modified as follows: After completing the procedure in accordance with Section 9.5.1 or 9.5.2, drain water from the sample. To prevent loss of fine particles, decant the water through a paper towel held over the top of the container. Spread the sample before an electric fan to remove surface moisture. Weigh at 15-minute intervals, and when the loss in mass is less than 0.05 percent for this interval, the sample may be considered to be surface dry. This procedure requires about 2 hours and shall be accompanied by intermittent stirring of the sample. Break conglomerations of mixture by hand. Take care to prevent loss of particles of mixture. Calculate the specific gravity of the sample by substituting the final surface-dry mass for A in denominator of Equations 2 or 3.

403.19.3.1.3 Mixture Bulk Specific Gravity. Determining bulk specific gravity using paraffin-coated specimens, AASHTO T 275, shall not be used when required by AASHTO T 166. Alternate methods are AASHTO T 331 and ASTM D1188. The surface of specimens prepared for testing by these methods may have the surface texture removed by sawing a minimal amount. Specimens shall be securely held in a jig or other clamping device to eliminate distortion and retain a face parallel to the original surface. Measurements for lift thickness shall be made prior to sawing.

403.19.3.1.4 QC and QA Mix Sampling and Preparation. All loose mix shall be sampled at the plant by the contractor during production in accordance with AASHTO R 97 and split to the appropriate size in accordance with AASHTO R 47. After QC has been notified of the random sample, the first truck shall be sampled as directed by the engineer. If the random number for multiple tests overlap, the contractor shall complete the first testing requirements and then immediately proceed with the second testing requirements. The contractor shall wait 30 minutes after sampling loose mix before fabricating specimens for CT_{Index} and RT_{Index} testing. Loose mix temperatures shall not drop below the molding temperature. The 30 minutes shall start when all the material for the loose mix sample has been obtained and the time this occurs shall be recorded. All specimens shall be fabricated as soon as possible after the 30 minute delay. QC and QA samples shall be taken and fabricated by the contractor at separate random times.

The following table details the minimum number of specimens required for QC or QA testing:

Test Method	Minimum Number of Specimens	Molded Specimen Height (mm)
Required Fabrication for CT_{Index} and RT_{Index} QC Frequency: 1 Set per 3000 tons QA Frequency 1 Set per 12000 tons		
Cracking Tolerance Index (CT_{Index})	5 Compacted Specimens	62 ^(b)
Rutting Tolerance Index (RT_{Index})	3 Compated Specimens	62 ^(b)
Retained Loose Mix ^(a) (QA sample only)	125 lbs	N/A
Required Fabrication for Volumetrics and % Asphalt Content QC Frequency: 1 Set per subplot QA Frequency 1 Set per Lot		
% Asphalt Content	1 Sample	N/A
Theo. Max SG of mixture, Gmm	1 Sample	N/A
% Air Voids	2 Compacted Specimens	N_{Design}
Retained Loose Mix ^(c)	30 lbs	N/A

Required Sampling for TSR QC Frequency: 1 Sample per 12,000 tons QA Frequency: 1 Sample per Project		
Tensile Strength Ratio (TSR)	250 lbs	N/A

- (a) Retained loose mix for Hamburg verification of mixture not meeting minimum RT_{index} thresholds
- (b) 95 mm specimen height for SP250 mixes
- (c) Retain at least 30 pounds of loose mix material for dispute resolution.

The CT_{index} test shall be based upon five compacted specimens tested, discard the single highest and lowest values, and average the three remaining values.

The RT_{index} test shall be based upon the average of three compacted specimens.

Volumetric testing shall be based upon the average of two compacted specimens.

403.19.3.1.5 Molding Performance Samples. The specimens shall be compacted to an air void content of 7.0 +/- 0.5% or 6.0 ± 0.5% for SMA mixtures. The compacted test specimens shall be allowed to cool to 77 +/- 5° F prior to determining the air void content.

403.19.3.1.6 Records. Compaction temperature, times in and out of the oven, gyratory specimen weights and times, and sample identification shall be recorded.

403.20 Miscellaneous Applications.

403.20.1 Small Quantities. Small quantities are less than 6000 tons for the pay item quantities of each separate mixture and the following shall apply:

- (a) A field laboratory will not be required for monitoring mixtures. All required QC and QA testing shall be performed in an approved laboratory.
- (b) No Performance Testing is required and acceptance shall be in accordance with Sec 403.23.8.1. Density, % AC, and % Air Voids shall be performed at a frequency of no less than one per day if production does not exceed 1000 tons and at a frequency of no less than two per day if production exceeds 1000 tons. Independent or retained sample QA tests shall be performed at least once per project, as indicated.

403.20.2 Base Widening and Entrances. For base widening mixture and entrance work, the following will apply:

- (a) All base widening shall be constructed in accordance with [Sec 401.7](#) and subsections.
- (b) The minimum density of these mixtures shall be attained as specified herein, except, compaction may be performed in accordance with [Sec 403.15.3](#).

403.20.3 Dispute Resolution. When there are significant discrepancies between the engineer's and the contractor's test results, dispute resolution procedures will be used.

403.20.3.1 Cease Work. The contractor's operations may be required to cease until the dispute is resolved if the test results indicate the mixture is subject to failure.

403.20.3.2 Third Party Resolution. The first step in dispute resolution will be to identify differences in procedures and correcting inappropriate procedures before moving to third party resolution. If that does not resolve the dispute, either the contractor or the engineer may request the approved QC Plan third party involvement. The recommendations of the approved third party shall be binding on both the engineer and contractor.

403.20.3.3 Third Party Payment. The contractor shall be responsible for the cost associated with the third party testing and resolution if the final result indicates the engineer's test results were correct. Likewise the Commission will be responsible for the cost associated with the third party testing and resolution when the final result indicates the contractor's results were correct.

403.20.3.4 Other Adjustments. The contractor shall not be entitled to any additional payment for costs incurred due to use of the dispute resolution procedures such as, but not limited to, those for delay, cessation of operations, costs to subcontractors, etc. The engineer may give consideration to adjustment of working days if warranted.

403.20.3.5 Dispute with CT_{Index} and RT_{Index} Results. If QA and QC results for CT_{Index} or RT_{Index} do not compare favorably, the first step will be to identify differences in procedures, including specimen aging. If that does not resolve the dispute, the QA CT_{Index} result shall be averaged with the QC CT_{Index} result to determine pay. If RT_{Index} results are in dispute, QC shall fabricate specimens for Hamburg testing in the presence of the Engineer using the retained loose mix material. Retained loose mix material from the QC sample shall be used to fabricate specimens unless otherwise directed by the Engineer. Specimens shall be sent to the Engineer for Hamburg testing to determine specification compliance.

403.21 General Requirements.

403.21.1 Sequence of Operations. To reduce inconvenience to the traveling public during widening or surfacing, the contractor will not be permitted to place any final surface course until the base widening, the leveling course and the binder course have been completed throughout the entire combination of sections, unless otherwise authorized by the engineer. The proper condition of the base widening, the leveling course, and the binder course, at the time of placing the surface course, shall be the contractor's responsibility.

403.21.2 Pavement Marking. If the contractor's work has obliterated the existing pavement marking on resurfacing projects open to through traffic, the pavement marking shall be replaced in accordance with [Sec 620](#).

403.21.3 Surfaced Approaches. At locations designated in the contract or as specified by the engineer, approaches shall be primed in accordance with [Sec 408](#) and surfaced with Type SP125 asphaltic concrete. The asphaltic concrete surface shall be placed in accordance with the details

shown on the plans or as specified by the engineer. Approaches shall not be surfaced until after the surface course adjacent to the entrance is completed. Any work required to condition and prepare the subgrade on the approaches will be at the contractor's expense.

403.21.4 Filling Drain Basins. If shown on the plans, existing drain basins shall be filled to the top of the lip with plant mix bituminous base course or asphaltic concrete from the pavement edge to the edge of the shoulder. Any difficulty or delay created by this requirement will be at the contractor's expense.

403.21.5 Pavement Repairs (Blow-Ups). A blow-up will be considered that area where excessive expansion has resulted in distress to the existing pavement. Blow-ups occurring prior to the application of the tack coat on the existing surface will normally be repaired by the Commission. Blow-ups occurring after the application of the tack coat shall be repaired by the contractor by removing the distressed concrete and replacing the pavement in accordance with [Sec 613](#).

403.22 Method of Measurement.

403.22.1 Weight Determination. The weight of the mixture will be determined from the batch weights if a batch-type plant is used, and will be determined by weighing each truck load on scales in accordance with [Sec 310](#) if other types of plants are used. Measurement will be made to the nearest 0.1 ton for the total tonnage of material accepted.

403.22.2 Full Depth.

403.22.2.1 The final driving surface area, for the full depth of the pavement, will be used as the area for all underlying bituminous lifts and will not include the additional quantity needed to construct the 1:1 slope.

403.22.2.2 Final measurement of the completed pavement will not be made except for authorized changes during construction, or where appreciable errors are found in the contract quantity. Where required, measurement of the pavement complete in place will be made to the nearest 0.1 square yard. The revision or correction will be computed and added to or deducted from the contract quantity.

403.22.3 Alternate Overlay.

403.22.3.1 Field Established Quantity. When bid as an alternate to a Portland cement concrete overlay, the contractor shall establish the existing roadway profile and set the final overlay profile. The engineer may adjust the final profile as needed. The tons of hot mix asphalt required will be determined by the engineer from the set or adjusted profile. This quantity will be the field established plan quantity.

403.22.3.2 Overlay Measurement. Final measurement of the completed pavement will be based on the field established plan quantity except for authorized changes during construction. The revision or correction will be computed and added to or deducted from the contract quantity. Measurement of the pavement complete in place will be made to the nearest 0.1 ton.

403.22.4 Pavement Testing. The finished courses shall have the nominal thickness shown on the plans. Tests will be conducted to ensure that each course is being constructed to proper thickness, composition, and density. The contractor shall cut samples from any layer of the compacted mixture at locations designated by the engineer. QA samples shall be cut and delivered to the engineer no later than the end of the next day following the laydown operation. If the samples are not cut and delivered as stated, the asphaltic laydown operation may be suspended and a deduction of 5 percent per day of the contract unit price of the representative material may be applied, until samples are cut and delivered to the engineer. Samples may be obtained by either sawing or drilling 4-inch minimum diameter cores. Each sawed sample shall consist of a single piece of the pavement of the size designated by the engineer, but no larger than 12 inches square.

403.22.4.1 Pavement Thickness. Lift thickness may be determined by the average thickness of cores taken for density measurements for each lot. Total thickness samples for new full depth asphalt pavements shall be obtained after all bituminous construction is completed on the project and shall be taken at locations specified by the engineer. For the purpose of determining the constructed thickness of full depth pavement, cores shall be taken at random intervals in each traffic lane at the rate of one core per 1000 feet or increment thereof, or at any other locations as may be determined by the engineer and measured in accordance with AASHTO T 148. Sections of any asphaltic concrete determined to be 0.5 inches or more, less than the thickness shown on the plans, shall be corrected by the contractor. No payment will be made for any costs incurred by the contractor in correcting pavement deficient in thickness. Each core is representative of the pavement thickness for a distance extending one-half the distance to the next core, measured along centerline, or in the case of a beginning or ending core, the distance will extend to the end of the pavement.

403.22.4.2 Surface Restoration. The surface from which samples have been taken, including those for density measurements, shall be restored by the contractor with the mixture then being produced no later than the next day of plant operation, if construction is still active. If bituminous construction has been completed, the surface from which samples have been taken shall be restored within 48 hours with an approved commercial mixture or with cold patch mixtures acceptable to the engineer.

403.23 Basis of Payment.

403.23.1 Percent Within Limits. PWL will be based on the mean, standard deviation and quality index of each lot's test results. The upper PWL (PWL_u) and lower PWL (PWL_l) is determined from the table in [Sec 502.15.8](#). For Upper or Lower Quality Index values less than zero, the value in the Table shall be subtracted from 100. Total percent within limits, PWL_t , is: $PWL_t = (PWL_u + PWL_l) - 100$. For Density of SMA mixes the PWL_u shall be 100.

The mean is: $\bar{x}_a = (\sum x_j)/n$

Where: \bar{x}_a = Average of the individual values being considered

$\sum x_j$ = The summation of all the individual values being considered

n = The number of individual values under consideration

The Standard Deviation is: $s = (\sum(x_i - x_a)^2 / (n - 1))^{1/2}$

The Upper Quality Index is: $Q_u = (USL - x_a) / s$

The Lower Quality Index is: $Q_1 = (x_a - LSL) / s$

Where: Q_u = Upper Quality Index

Q_1 = Lower Quality Index

USL = Pay Factor Item Upper Spec Limit

LSL = Pay Factor Item Lower Spec Limit

403.23.1.1 Quality Level Analysis. The engineer will make the QLA no more than 24 hours after receipt of the contractor's test results, by determining the PWL_i for each designated pay factor item.

403.23.1.1.1 Acceptance. The contractor's test results will be used when applicable to determine the PWL , provided the contractor's QC tests and the engineer's QA tests compare favorably, and provided the engineer's inspection and monitoring activities indicate the contractor is following the approved QC Plan.

403.23.1.1.2 Comparison. Favorable comparison will be obtained when the engineer's QA test results on a production sample are within two standard deviations or the comparison limit, whichever is greater, of the mean of the contractor's test results for that particular lot. Comparison limits for QC average results are as follows: air voids within ± 0.5 percent, asphalt content within ± 0.2 percent, and density within $\pm 1.3\%$. QA CT_{index} results shall be within ± 30 of the QC testing that falls nearest result for SuperPave and ± 60 for SMA. For the CT_{index} test, if all QC and QA are greater than 80 for SuperPave mixes and greater than 190 for SMA mixes, then results are considered comparable. QA RT_{index} results shall be within ± 15 percent of the QC testing that falls nearest. Further comparisons may be made by using F & t testing at a significance level of 1 percent as directed by the engineer.

403.23.1.1.3 Outliers. No test result shall be discarded, except individual test results on a lot basis may be checked for an outlier in accordance with the statistic T in ASTM E 178, at a significance level of 5 percent. If an outlier is found, material from the retained QA sample may be tested, in the presence of the engineer, to determine a replacement test value. The replacement test value shall be used in the PWL determination.

403.23.1.1.4 Roadway/Shoulder Lots. For the purpose of QLA, mixture placed on the traveled way and placed on the traveled way and shoulders integrally, shall be accounted for in a regular lot/sublot routine. Mixture placed on shoulders only shall be accounted for in a shoulder lot/sublot routine.

403.23.1.1.5 Random Sampling. For the purpose of QLA, all mixture produced at the plant and placed on the roadway shall be subject to random testing. Mainline density measurements at the roadway shall not be taken within 6 inches of an unconfined longitudinal joint. Random samples taken in the same day may be separated by 200 tons.

403.23.2 Pay Factors. The total pay factor (PF_T) for each lot will be equal to the weighted sum of the pay factors (PF) for each pay factor item for each lot, and is determined as follows:

$$PF_T = + (0.5) PF_{\text{Density}} + (0.25) PF_{\text{Va}} + (0.25) PF_{\text{AC}}$$

The PF_T for each lot, on the shoulder or otherwise when the density pay factor is not directly included, will be equal to the weighted sum of the PF for each pay factor item for each lot, and will be determined as follows:

$$PF_T = (0.5) PF_{\text{Va}} + (0.5) PF_{\text{AC}}$$

The PF for each pay factor item for each lot will be based on the PWL_t of each pay factor item of each lot and will be determined as follows:

When PWL_t is greater than or equal to 90: $PF = 0.3 PWL_t + 73$;

When PWL_t is greater than or equal to 70 and PWL_t is less than 90: $PF = 0.5 PWL_t + 55$;

When PWL_t is less than 70: $PF = 2 PWL_t - 50$;

403.23.2.1 Density Pay Factor. The theoretical maximum specific gravity of the mixture, as determined for each subplot and the bulk specific gravity of no less than one core from each subplot, will be used to perform the QLA for the percent of theoretical maximum density. Thick cores required to be cut in half in accordance with [Sec 403.15.4](#) shall effectively double the number of sublots for cores. When density is not used as a pay factor, additional adjustment of the contract unit price will be based on the table in [Sec 403.23.8.1](#).

403.23.2.2 Asphalt Content Pay Factor. The QLA will be performed using the asphalt content test results from each lot.

403.23.2.3 Air Voids Pay Factor. Two gyratory specimens shall be compacted for each subplot and the average of the two specimens will be used to calculate the volumetrics of the subplot. The air voids shall be determined from the gyratory compacted specimens. The air voids for the QLA shall be those calculated using the average bulk specific gravity of the gyratory compacted specimens and the theoretical maximum specific gravity of the mixture determined for the subplot of material.

403.23.2.4 CT_{Index} and TSR Pay Factor. The contract unit price for each 3,000 tons or fraction thereof for all mixtures shall be adjusted based on the average CT_{Index} results for the tonnage according to the following table provided that acceptable RT_{Index} or Hamburg and TSR results are obtained. The lower adjusted contract unit price from the CT_{Index} and TSR results shall apply.

SuperPave Mixtures		
Cracking Tolerance Index (CT_{Index})	Tensile Strength Ratio (TSR)^(a)	Percent of Contract Price
40 – 49	70 – 74 %	97%
50 – 99	75 – 84 %	100%
100 or Greater	85 % or Greater	103%
SMA Mixtures		
Cracking Tolerance Index (CT_{Index})	Tensile Strength Ratio (TSR)^(a)	Percent of Contract Price
80 – 134	70 – 74 %	97%
135 – 239	75 – 84 %	100%
240 or Greater	85 % or Greater	103%

(a) If an approved liquid anti-strip is used, the TSR limit to receive full incentive is 80 %.

The QLA shall be performed using each Density, % Air Void, and % Asphalt Content result within the lot.

403.23.3 Removal of Material. All lots of material with a PF_T less than 50.0 shall be removed and replaced with acceptable material by the contractor.

Any subplot of material with a percent of theoretical maximum density of less than 90.5 percent or greater than 98.5 percent shall be removed and replaced with acceptable material by the contractor. For SMA mixtures, any subplot of material with a percent of theoretical maximum density of less than 92.0 percent shall be removed and replaced with acceptable material by the contractor.

Any material with a CT_{Index} less than 40 shall be removed and replaced with acceptable material by the contractor. For SMA mixtures, any material with a CT_{Index} less than 80 shall be removed and replaced with acceptable material by the contractor.

Any subplot of material with air voids in the compacted specimens less than 1.5 percent or tonnage of material not meeting the minimum RT_{Index} shall be evaluated with Hamburg testing and removed and replaced with acceptable material by the contractor if the rut depth is greater than 1/2-inch at the designated number of wheel passes.

Any material with TSR results below 70% or minimum conditioned tensile strength below 60 psi are considered unacceptable and will be subject to removal, production shall cease, the mixture reverified, and other payfactors incentives shall not be applied.

No additional payment will be made for such removal and replacement. The replaced material will be tested at the frequencies listed in [Sec 403.19](#). Pay for the material will be determined in accordance with the applicable portions of [Sec 403.23](#) based on the replacement material.

403.23.4 Pay Factor Adjustments. If any payment reductions are necessary, the lower adjusted contract unit price of the total payfactor (PF_T) and unconfined longitudinal joint density adjustment will apply. Intelligent Compaction (IC) adjustment (if required by contract) may affect PF_{Density}. Pay factor adjustments are as follows:

403.23.4.1 Unconfined Longitudinal Joint Density Adjustment. The minimum density of all traveled way pavement within 6 inches of a longitudinal joint, including the pavement on the traveled way side of the shoulder joint, shall not be less than 90.5 percent of the theoretical maximum specific gravity for SuperPave mixtures and above 92.0 percent of the theoretical maximum specific gravity for SMA mixtures. The density of the longitudinal joint when confined will be included in the evaluation of the remainder of the mat. Pay adjustments will be in accordance with the following table and will be applied to the corresponding tonnage represented by the core(s).

Pay adjustments due to longitudinal joint density will apply to the full width of the lane paved. The average of joint cores from each subplot will determine specification compliance. If payment reductions are necessary, the lowest PF_{Total} shall apply. Adjustments due to joint density will apply to the subplot from which the cores are obtained.

Longitudinal Joint Density	
Field Density (Percent of Laboratory Max. Theoretical Specific Gravity)	Percent of Contract Unit Price
SuperPave Mixtures	
≥ 90.5	PF _{Total} not changed by longitudinal joint density
89.5 – 90.4	Maximum PF _{Total} = 100%; Correction Required ^(a)
< 89.5	Remove and Replace
SMA Mixtures	
≥ 92.0	PF _{Total} not changed by longitudinal joint density
90.0 – 91.9	Maximum PF _{Total} = 100%; Correction Required ^(a)
< 90.0	Remove and Replace

(a) Correction requires spraying rapid penetrating emulsion on deficient density areas in accordance with JSP2303. All costs associated with correction shall be at the contractor's expense with no additional payment.

403.23.4.2 Intelligent Compaction Adjustment. When Intelligent Compaction is included as a pay item in the contract, sublots shall have a minimum of 85 % roller coverage and a mean temperature above 180 °F at the optimum number of roller passes of the traveled way. Pay adjustments will be in accordance with the following table and will be applied to the corresponding subplot that falls within the corresponding IC segment:

Intelligent Compaction	
Percent Roller Coverage at Optimum Pass Count	Percent of Contract Unit Price
≥ 85 %	Payment adjustment due to intelligent compaction does not apply
< 85	Verify core density in accordance with Sec 405

If roller coverage is less than 85%, the lower adjusted contract unit price of the PWL or unconfined joint density adjustment will apply. Adjustments due to roller coverage will apply to the corresponding sublots. The roller coverage per subplot shall be the average roller coverage for the days the subplot was paved weighted by the tons paved per day.

Any subplot with roller coverage less than 70 percent shall be subject to the core density verification as directed by the engineer. Pay adjustments shall be in accordance with Sec 405.

403.23.4.3 Smoothness Adjustment. The contract unit price for all mixes, except wedge or level course, will be adjusted in accordance with [Sec 610.5](#). The contract unit prices for asphaltic concrete pavement will be considered full compensation for all materials entering into the construction of the pavement and for the cost of the smoothness testing and correction.

403.23.4.4 Paver Mounted Thermal Profiler. The contract unit price for all mixes, except wedge or level course, will be adjusted in accordance with Sec 406. The contract unit prices for asphaltic concrete pavement will be considered full compensation for all materials entering into the construction of the pavement and for the cost of the PMTP testing and correction.

403.23.4.5 Intelligent Compaction. If Intelligent compaction is not included as a pay item in the contract, then all specification requirements and pay adjustments pertaining to Intelligent Compaction will not apply. If pay items for Intelligent Compaction are included in the contract, then all specification requirements and pay adjustments pertaining to Intelligent Compaction shall apply.

403.23.5 Aggregate Variation. Due to possible variations in the specific gravity of the aggregates, the tonnage of mixture used may vary from the proposal quantities. No adjustment in contract unit price will be made because of such variation.

403.23.6 Compacted Samples. Payment for obtaining and delivering samples of compacted mixture from the pavement and replacing the surface will be made per sample at the fixed price specified in [Sec 109](#). No direct payment will be made for samples taken for QC and QA testing.

403.23.7 Payment for Pavement Repairs (Blow-ups). Payment for repairing blow-ups will be made in accordance with [Sec 104](#).

403.23.8 Miscellaneous Applications.

403.23.8.1 Small Quantities. Small quantities are defined in [Sec 403.20.1](#). Unless the contractor has elected to use the normal evaluation in the Bituminous QC Plan for small quantities, the following shall apply for each separate mixture qualifying as a small quantity

(a) QLA and PWL shall not apply.

(b) Mixtures shall be within the specified limits for % Air Voids, % AC, and density. In addition to any adjustments in pay due to profile, the contract unit price for the mixture represented by each set of cores will be adjusted based on actual field density above or below the specified density using the following schedule:

Field Density (Percent of Laboratory Max. Theoretical Density)	Pay Factor (Percent of Contract Unit Price)
For all SP mixtures other than SMA:	
92.5 to 98.0 inclusive	100
90.5 to 92.4 inclusive	Correction ^(a)
Above 98.0 or Below 90.5	Remove and Replace
For SMA mixtures:	
>94.0	100
92.0 to 93.9 inclusive	Correction ^(a)
Above 98.0 or Below 92.0	Remove and Replace

(a) Correction requires spraying rapid penetrating emulsion on deficient density areas in accordance with JSP2303. All costs associated with correction shall be at the contractor's expense with no additional payment.

403.23.8.2 Base Widening and Entrances. For base widening mixtures and entrance work, QLA and PWL will not be required. Payment for these mixtures will be made at 100 percent of contract unit price for material that otherwise meets the specifications.

403.23.8.3 Single Lift on Unmilled Surface or Leveling Course Work. For resurfacing projects specifying a single lift on an unmilled surface, surface mixture of 3,000 tons or more, or for leveling course work, the following shall apply to the traveled way mixture. All bituminous mixture QC/QA requirements shall apply, except the density pay factor designated in [Sec 403.23.2](#) will not be directly included in the total pay factor. In lieu of that, one density sample shall be taken per subplot and the pay adjustment for density will be made using the table in [Sec 403.23.8.1](#).

3.0 *Insert Sec 406 Paver-Mounted Thermal Profiles:*

406 Paver-Mounted Thermal Profiles

406.1 Description. This work shall consist of continuous thermal profiling of the asphalt mat temperature behind the trailing edge of the paver screed plate during placement operations using a Paver-Mounted Thermal Profile System (PMTPS). This work shall be completed in accordance

with the general principles set forth in AASHTO R 110 "Standard Practice for Continuous Thermal Profile of Asphalt Mixture Construction", and specifically as stated in the following sections.

406.2 Required Measurements. PMTPS measurements are required on the full width of paving of each asphalt lift. Collection of data shall include shoulder pavement when placed simultaneously with the mainline. The shoulder paving data will be filtered out using Veta during data processing. PMTPS data collection is not required in the following exceptions:

- (1) PMTPS measurements are not required on auxiliary lane tapers, ramps, shoulders (not paved simultaneously with mainline), cross-overs, non-continuous turn lanes, loops, bypass lanes, acceleration/deceleration lanes, intersecting streets, roundabouts, and partial lane width widenings.
- (2) PMTPS measurements are not required for a total net paving length less than 2 lane miles.
- (3) PMTPS measurements are not required on asphalt lift thicknesses less than 1-inch.

406.3 Equipment Requirements. The PMTPS shall consist of the following components listed.

- (1) Temperature sensor to continuously monitor surface temperature of mat.
 - a. Longitudinal and lateral surface temperature readings shall be collected at 12-inch or less intervals at all paving speeds with an X-Y accuracy of plus or minus 1-inch.
 - b. Surface temperatures shall be collected for the full width paved in one pass (including any shoulders paved simultaneously with mainline).
 - c. Surface temperature sensors(s) shall have a temperature range of at least 140 °F to 480 °F. Sensory accuracy shall be plus or minus 3.6 °F, or plus or minus 2.0 percent of sensor reading, whichever is greater.
- (2) Global Navigation Satellite System (GNSS) receiver to capture coordinates of the surface temperature readings. GNSS accuracy shall be plus or minus 2 inches or less in X and Y directions when intelligent compaction is being used. A base station shall be required at any locations having poor cellular reception to obtain required accuracy. When intelligent compaction is not being used GNSS accuracy shall be plus or minus 4 ft or less in the X and Y directions and ground distance sensor shall be within plus or minus 1/1000 ft.
- (3) Onboard data acquisition with a minimum of the following capabilities:
 - a. Displays (in real-time) map of the surface temperature readings.
 - b. Displays total distance, paver speed and location.
 - c. Reports surface temperature readings and GNSS status.

- d. Provides real-time statistical summaries of surface temperature readings.
- e. Allows operator to define data lot currently being placed per AASHTO PP 114.
- f. Stores data internally until data transfer.
- g. Automatically transfers data to cloud storage or other approved methods.

406.3.1 System Setup on Pavers. Pavers shall be instrumented with the PMTP system for the full paving width and shall collect measurements no less than 3-feet and no greater than 12-feet from the trailing edge of the screed plate. Other objects shall not obstruct surface temperature measurements and GNSS accuracy.

406.4 Construction Requirements.

406.4.1 Temperature Verification. Temperature verification shall follow AASHTO R110-22, Section 6 Calibration. A record of each verification shall be submitted to the SharePoint prior to the start of the project.

406.4.2 Data Management. PMTP data files shall be compatible with the Veta software. The contractor shall supply the engineer with the manufacturer's PMTPS Computer Software 14 days prior to beginning work and until ninety days after completion of all work. If Cloud Storage or Cloud Computing is used, the engineer shall be supplied one user ID with full access for the same time-period specified. If cloud storage is not used Raw PMTP data files shall be downloaded once per day and uploaded to the appropriate MoDOT IC-PMTP SharePoint site before the start of the next day's production. The following data management requirements shall apply:

- (1) The PMTP data files should be directly transferred from cloud storage to Veta. Other methods shall be approved by the engineer.
- (2) The PMTP Veta files shall be appropriately formatted and filtered in accordance with MoDOT IC-PMTP protocol.
- (3) Date and time stamp of PMTP shall be checked and verified to reflect the local time zone for both mapped and exported data.

406.4.3 Quality Control. The following shall apply to the Contractor's Quality Control for PMTP.

- (1) The contractor shall have a properly trained person listed in the QC Plan that has completed a Veta training course within the last 2 years to perform the PMTP data collection and file management for the project.
- (2) The PMTP system shall have a documented annual calibration before beginning construction.
- (3) For each run, the thermal profile shall be divided into 150-foot sublots at the full paving width and partial data sublots as follows:

- (a) Combine partial data sublots less than 75-feet with the previous data subplot.
 - (b) Treat partial sublots greater than 75-feet as one data subplot.
 - (c) Sublots shall not extend over multiple days, different lifts, or paving directions.
- (4) Veta files shall be completed and uploaded with the appropriate naming convention in accordance with MoDOT IC-PMTPS Protocol. Appropriate naming convention can be found in the IC-PMTP Document Helper located in the [Intelligent Compaction SharePoint site](#). The completed Veta files shall have the appropriate filters applied with the summary data transferred to the Summary Report. An up-to-date Summary Report shall be provided to the engineer two days prior to the 1st and 15th of each month.
- (5) **PMTP Quality Control Plan.** A pre-activity meeting shall be required prior to mainline paving. The PMTP Quality Control Plan shall be submitted to the engineer at least 2 weeks prior to the mainline paving pre-activity meeting. The plan at minimum shall include the following:
- (a) A list of personnel previously trained
 - (b) Detailed daily verification procedure for checking the RTK-GNSS of PMTP
 - (c) Procedure for downloading PMTP data from the instrument
 - (c) The procedure for training operators or other project staff
 - (e) Detailed daily verification procedure for checking the temperature sensor on the PMTP
 - (f) The name of the designated PMTP Quality Control Technician
 - (g) Procedure for submitting data
 - (h) Contact information for technical support staff
 - (i) Anticipated cellular service and GNSS coverage throughout entire project
 - (j) A list of the control points with either UTM or State Plane Coordinates established by the contractor if a base station is required.

406.4.4 Quality Assurance (QA) Testing. The Engineer will use a Forward Looking InfraRed (FLIR) camera to verify the contractor's PMTP system. QA tests shall be taken at random locations twice per day. The contractor shall assist the engineer with the placement of the event marker.

The QA tests using the FLIR data QA tool shall compare favorably, according to the instructions found in the IC-PMTP Document Helper located in the [Intelligent Compaction SharePoint site](#). If results do not compare favorably, the contractor's PMTPS shall be verified by the manufacturer. In the case that the PMTPS is required to be sent off to the manufacturer and the contractor is not able to provide a replacement, the contractor will be allowed to continue paving with the verification by the engineer using a FLIR camera for acceptance only.

406.4.5 Thermal Segregation. Thermal segregation will be calculated by using the Differential Range Statistics (DRS) under the parameters of AASHTO R110 in each 150-foot subplot.

The Veta analysis with the appropriate filters applied shall exclude the following surface temperature readings from each subplot:

- (1) Surface temperature readings less than 180°F.
- (2) Surface temperature readings within 2 ft. prior to and 8 ft. after paver stops that are greater than 1 minute in length.

The thermal segregation categories are based on the Differential Range Statistics (DRS), as shown in the table below.

Differential Range Statistics (DRS)	Thermal Segregation Category
DRS ≤ 25.0°F	Low
25°F < DRS ≤ 35°F	Moderate
35°F < DRS ≤ 50°F	Moderate-High
DRS ≥ 50°F	Severe

406.4.6.1 Incentive/Disincentive. Incentive/disincentive adjustments shall be made for each subplot in accordance with the following:

Thermal Segregation Category	Adjustment per 150 ft. Sublot
Low	\$40 Incentive
Moderate	\$40 to \$0 Incentive (Linear)
Moderate-High	\$0 to -\$40 Disincentive (Linear)
Severe	-\$40 Disincentive and Reviewed by Engineer

406.5 Loss of Data. If data collection ceases as a result of circumstances reasonably beyond the control of the contractor, the contractor will be allowed to continue the days paving, but the paved sublots will not be eligible for 406 PMTP Incentive. The engineer must be notified immediately of the issue and shall determine if the contractor has made a reasonable effort to resolve the issue. A meeting with the engineer shall be held to determine how to proceed if the issue is expected to extend into the next day’s paving. Failure to notify the engineer of the issue at hand will result in the paved sublots to receive a minus \$40 deduct.

406.5.1 GNSS Obstructions. A base station shall be used at any locations having poor cellular reception. Isolated areas influenced by a GNSS obstruction may be excluded from DRS computation provided that the following conditions are satisfied:

- (1) The position data is present
- (2) The GNSS Reception Mode as recorded by the onsite equipment indicates that an obstruction is present

(3) The location is properly flagged in the Veta project file and the location is identified in the bi-weekly report

(4) The total of these areas is no more than 5% of any single day's production.

406.5.2 QA Acceptance. When PMTP data is not available, paved sublots will be accepted by verification using the FLIR camera. Temperature differentials greater than 50°F are subject to removal.

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

DD. Polymer Modified Emulsion Tack

1.0 Description. This work shall consist of preparing and treating an existing bituminous or concrete surface with a low-tracking or non-tracking tack coat material prior to an asphalt overlay in accordance with Section 407, except as revised by this specification.

2.0 Material. The tack coat shall be a hard penetration asphalt emulsion (SS-1vh) with the material properties in accordance with Sec 1015.20.5.4.

3.0 Method of Measurement. Measurement of asphalt emulsion to the nearest gallon shall be made as specified in Sec 1015. The measurement of asphalt emulsion shall be based upon undiluted material.

4.0 Basis of Payment. The accepted quantity of low-tracking or non-tracking tack coat or polymer modified emulsion tack will be made at the contract unit price for:

Item Number	Description	Unit
407-99.12	Misc. Tack Coat – Low-Tracking or Non-Tracking	Gallon

EE. Linear Grading Class 2 – Modified

1.0 Description. Modified Linear Grading Class 2 shall consist of any necessary clearing and grubbing in accordance with Sec 201, preparing subgrade for shoulder, pavement widening, sidewalk, paved approaches, curb and gutter, roadside retaining wall, or other roadside appurtenances by excavating, compacting, fin-grading, and shaping existing shoulder and ditch for-slope, conforming to the typical section shown on the plans. It may be necessary to haul material.

2.0 Construction Requirements. The shoulder, pavement widening, sidewalk, curb and gutter, paved approaches, roadside retaining wall, or other roadside appurtenances shall be excavated and graded as shown on the typical section with minimal disturbance of the existing sub-grade and fore slope. Density shall be obtained from reasonable compactive efforts consisting of no less than three passes with a roller until no further visible compaction can be achieved, or by other

methods approved by the Engineer. Subgrade preparation and compaction shall also be in accordance with Sections 203, 209 and 210.

2.1 All ditches shall be graded to drain and maintain existing flow capacity, unless approved by the engineer. If fill material for the shoulder widening work impacts the ditch capacity, the contractor shall re-grade the backslope to maintain the flow capacity of the ditch. Fore slopes and back slopes shall be constructed at a 3:1, except as noted on the plans or approved otherwise by the engineer.

2.2 It may be necessary to go outside the limits of the right of way to obtain additional material or to dispose of excess material. All costs for providing additional material or disposing of excess material shall be included at the contract unit price for pay item 207-99.09, Modified Linear Grading, Class 2. All contractor furnished material shall be approved by the Engineer prior to being incorporated into the project. Quarry screenings will not be considered an approved contractor furnished material.

2.3 Included in this work is any pavement edge treatment that might be necessary to stay in compliance with the Standard Plans. The need for edge treatment is determined by the contractor's method of operations.

3.0 Method of Measurement. Measurement will be made to the nearest 1/10 station separately for the length of pavement edge along each side of the roadway, measured along centerline of the traveled way and totaled to the nearest Station for the sum of all segments in accordance with Section 207.

4.0 Basis of Payment. Payment for Modified Linear Grading, Class 2 as described in this provision will be made at the contract unit price for:

Item Number	Unit	Description
207-99.09	Station	Linear Grading Class 2, Modified

FF. Shaping Slopes, Class III (Modified Material Requirements) NJSP-20-03B

Delete Sec 215.1.3 and 215.1.3.1 and substitute the following:

215.1.3 Shaping Slopes, Class III, shall consist of providing rock fill material and shaping slopes to construct additional shoulder width for the installation of guardrail and Type A crashworthy end terminals in accordance with Missouri Standard Plans for Highway Construction. The rock fill material used shall meet the requirements specified in Sec 215.1.3.1. The shoulder surface shall be finished smooth such that it is traversable and without significant voids or depressions.

215.1.3.1 Material Requirements. Rock fill material used for Shaping Slopes, Class III, shall consist of a durable crushed stone, shot rock or broken concrete, with a predominant size of 3 inches and a maximum size of 6 inches. Acceptance by the engineer will be made by visual inspection.

215.4 Basis of Payment. The accepted quantity will be paid at the contract unit bid price for:

Item Number	Unit	Description
215-99.10	100 FT	Misc. Shaping Slopes Class III – Modified Material Requirement

GG. Guardrail Requirements

1.0 Safety Devices. Before any guardrail, bridge approach transition sections, crashworthy end terminals or end anchors are installed, the contractor shall layout the proposed alignment in the field to check that each of these items can be installed properly based upon the standard plans and the manufacturer’s recommendations. The contractor shall notify the engineer when that field inspection of the guardrail review takes place to allow the engineer to be present at that time. In addition, the meeting shall take place before the contractor selects and orders any crashworthy end terminals or crash cushions.

1.1 The length of the Type A crashworthy end terminals are estimated in the plans to be 50 feet in length. The two Type C crashworthy end terminals are estimated to be 22 feet and 13 feet. See plans for details. If the length of crashworthy end terminals selected by the contractor have lengths that vary from the plans, then the contractor shall inform the Engineer, as it may require the length of guardrail to be extended a short distance to meet design requirements.

2.0 Basis of Payment. The accepted guardrail, bridge approach transition sections, crashworthy end terminals and end anchors, complete in place, will be paid for by the contract unit bid price for the following items and will be full compensation for all labor, equipment and material to complete the above-described work:

Item Number	Description	Unit
606-10.60	MGS Guardrail	Linear Foot
606-10.80	MGS End Anchor	Each
606-30.14	Type A Crashworthy End Terminal (MASH)	Each
606-30.20	Type C Crashworthy End Terminal (MASH)	Each

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

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

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

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

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

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

3.0 Coordination of Construction.

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

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

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

4.0 Final Acceptance of Work. The contractor shall provide the completed ADA Checklist to the engineer at the semi-final inspection. ADA improvements require final inspection and compliance with the ADA requirements and the ADA Checklist. Each item listed in the checklist must receive either a "YES" or an "N/A" score. Any item receiving a "NO" will be deemed non-compliant and shall be corrected at the contractor's expense unless deemed otherwise by the engineer. Documentation must be provided about the location of any non-compliant items that are allowed to remain at the end of the construction project. Specific details of the non-compliant

items, the ADA requirement that the work was not able to comply with, and the specific reasons that justify the exception are to be included with the completed ADA Checklist provided to the engineer.

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

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

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

II. ADA Material Testing Frequency Modifications JSP-23-01

1.0 Description. This provision revises the Inspection and Testing Plan (ITP) for the construction of ADA compliant features to better match the nature of the work. The Quality Control (QC) testing frequency for the Sections identified below are to be revised as specified.

2.0 Compaction Test on Base Rock Under Sidewalk, Curb Ramps and Paved Approaches. (Revises ITP Sec 304.3.4) The required test frequency will be one per 600 tons.

3.0 Gradation Test on Base Rock Under Sidewalk, Curb Ramps and Paved Approaches. (Revises ITP Sec 304.4.1) The required frequency will be one per 500 tons.

4.0 Concrete Plant Checklists. (Revises ITP Sec 501) Submittal of the 501 Concrete Plant Checklist will be once per week when the contractor is only pouring curb, sidewalk, paved approaches, and curb ramps.

5.0 Concrete Median, Median Strip, Sidewalk, Curb Ramps, and Curb. (Revises ITP Sec 608) The required frequency will be the first truckload for the project and each 100 CUYDs for air and slump thereafter. Strength will be verified by use of cylinders or maturity meters at a minimum rate of one per 100 CUYD.

6.0 Paved Approaches. (ITP Sec 608) The required testing of one test from the first truckload per day and each 100 CUYDs for air and slump will remain per ITP. Strength will be verified by use of cylinders or maturity meters at a minimum rate of one per 100 CUYD.

7.0 Curb Concrete. (Revises ITP Sec 609) The required frequency will be the same as Sec 5.0 above.

8.0 Basis of Payment. No direct payment will be made to the contractor to fulfill the above requirements.

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

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

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

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

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

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

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

Pay Item Number	Description	Unit
202-20.10	Removal of Improvements	Lump Sum
304-05.04	Type 5 Aggregate for Base (4 In. Thick)	S.Y.
608-60.07	Concrete Sidewalk, 7 In.	S.Y.
608-30.06	6" Concrete Median Strip	S.Y.
608-10.12	Truncated Domes	S.F.

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

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

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

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

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

- Excavation and preparing of the subgrade prior to placement of the aggregate base
- 4" Type 5 Aggregate Base underneath the new ramp
- Everything shown in the various figures of ADA ramp curb types on Standard Plan 608.50 shall be poured as 7" concrete. This includes all area of ramp, level landing pads and any flares included in the per each ADA Ramp.
- Variable height curb along the roadway within the limits of the new ADA ramp
- Variable height curb along the backside of the new ADA ramp
- Concrete median used to separate direction of travel within a dual perpendicular ramp
- Furnishing and installing any reinforcement needed as shown in the plans for curbs taller than 8"
- Tinting of concrete surface as required in the plans
- Saw Cuts needed for the removal of the existing concrete area where the new ADA ramp is being constructed
- Removal of the existing concrete area where the new ADA ramp is being constructed

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

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

- Truncated Domes

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

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

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

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

2.4 Design Plans

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

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

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

As shown on this special sheet, 10 feet beyond the landing is considered part of the ADA ramp. Payment for the ramp will be 10 feet beyond the landing and no adjustment in sidewalk length/quantity will be made if this 10-foot ramp length is adjusted by the contractor in the field.

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

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

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

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

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

Pay Item Number	Description	Unit
608-10.12	Truncated Domes	S.F.
608-99.02	ADA Curb Ramp	Each

LL. Paved Approach, High Early Strength

1.0 Description. This work shall consist of providing a concrete mix design with 24-48 Hour high early strength to be placed as specified in the contract documents or as directed by the Engineer. The high early strength properties shall be in accordance with this provision.

2.0 Mix Design. In addition to the requirements under section 501 of the Standard Specifications:

The Contractor shall submit a 24-48 Hour High Early opening concrete pavement mix design to the Engineer, at least 14 calendar days prior to use, for review and approval. The concrete mix design shall be capable of obtaining a minimum compressive strength of 3500 psi in 48 hours.

The Contractor shall provide the Engineer documentation as follows:

- That an American Concrete Institute (ACI) Certified Concrete Field Testing Technician, Grade I, or approved equal, has been used to:
 - Measure temperature, slump, self-consolidating concrete properties (slump flow, visual stability index, and J-ring values), air content and wet unit weight of the trial batch.
- That an American Concrete Institute (ACI) Certified Concrete Strength Testing Technician, or approved equal, has been used to:
 - Perform compression testing and report the required compressive strengths.

High early opening strength concrete shall be effectively protected from freezing for a period of at least three (3) equivalent curing days after it has been placed or until the minimum specified compressive strength has been attained by field cured concrete test or by maturity testing.

3.0 Payment. The contract unit price shall be considered as full compensation for all the labor, equipment, materials, and other construction involved to complete the work. The following is the Pay Item Number:

Pay Item Number	Description	Unit
608-99.05	Paved Approach, 7 In., High Early Strength	S.Y.
608-99.05	Paved Approach, 8 In., High Early Strength	S.Y.

MM. Concrete Sidewalk and Curb Jointing at Utility Poles

1.0 Description. Contractor shall provide longitudinal and transverse jointing for concrete sidewalk and concrete curbing to direct pedestrians around utility poles. The longitudinal and transverse jointing shall be completed to provide separation from the pedestrian access route on the sidewalk from utility poles.

2.0 Construction Requirements. At each utility pole located within the sidewalk or curbing adjacent to sidewalk, concrete jointing/edging shall be provided to a depth of ¾-inch. The jointing shall be as per direction of Engineer.

2.1 Jointing to be completed to guide sidewalk users around utility poles. The length of longitudinal joints shall be a length of 10-feet (maximum length of 15-feet) at each utility pole. Transverse short jointing shall be completed within the longitudinal joint at 12-inch intervals.

2.2 Jointing pattern shall be approved by Engineer as part of the pre-concrete placement conference.

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

NN. Ground Improvement

1.0 Description. The work shall consist of replacing the insitu soil from below the bottom of the Mechanically Stabilized Earth Retaining Wall as detailed in the plans. The soil shall be removed and replaced with compacted, MoDOT Type 1 or Type 5 Aggregate. Separation geotextile shall be placed between the existing ground and the MoDOT Type 1 or Type 5 Aggregate as detailed in the plans.

2.0 Materials.

2.1 Aggregate used for ground improvement shall be Type 1 or Type 5 in accordance with Sec 1007 and compacted in accordance with Sec 203.

2.2 Separation geotextile shall be provided in accordance with Sec 624.

3.0 Construction Requirements.

3.1 Ground improvement shall be required where wall height (measured from top of leveling pad to top of wall) exceeds 7.5'. The station limits provided in the plans for ground improvement are estimated and shall be finalized by the contractor.

3.2 The layer of lean clay shall be removed in totality for all locations requiring ground improvement based on the dimensions provided in the contract plans. The approximate bottom elevation of the lean clay layer is provided in the plans but shall be field verified and approved by engineer.

4.0 Method of Measurement. This work will not be measured for payment but will be considered a lump sum unit.

5.0 Basis of Payment. All costs for furnishing material, material placement, and all excavation to bottom of lean clay layer will be considered completely covered in the contract unit price per Lump Sum for "Ground Improvement". No payment or adjustments will be made for deviation from provided dimensions or assumed lean clay layer bottom elevation. The following is the Pay Item Number:

Pay Item Number	Description	Unit
203-99.01	Ground Improvement	Lump Sum

OO. Moment Slab Sidewalk

1.0 Description. This work shall consist of providing a moment slab to work in conjunction with Type D Traffic Barrier as shown per contract plans.

2.0 Material.

2.1 Sidewalk to be in accordance with Sec 608.

2.2 Base aggregate to be in accordance with Sec 1007 and compacted in accordance with Sec 203.

3.0 Construction Requirements. Moment slab shall be built in accordance with the minimum dimensions shown on the contract plans and have ADA-compliant slopes.

4.0 Method of Measurement. This work will be measured to the nearest tenth of a square yard. The quantity to be paid will be measured from the moment slab's outline as shown on the contract

plans based on a width from back of curb to back of Type D Concrete Barrier. No payment will be made for deviation from provided moment slab limits.

5.0 Basis of Payment.

5.1 The contract unit price shall be considered as full compensation for material, labor, equipment, and other construction involved to complete the work as specified in the contract plans for Moment Slab Sidewalk. No payment or adjustments will be made for deviation from provided dimensions.

5.2 No direct payment will be made for the following:

- (a) Furnishing or installing reinforcement.
- (b) Any incidental work required for furnishing and installing tie bars.
- (c) Excavating or preparing the subgrade for any item contained in this specification.

The following is the Pay Item Number:

Pay Item Number	Description	Unit
608-99.05	Moment Slab Sidewalk	S.Y.

PP. Drainage Maintenance During Construction

1.0 Description. The contractor’s attention is called to the drainage construction. The Contractor is required to maintain drainage during construction and to ensure that the existing drainage system continues to convey all storm water until the new structures and pipes are in place.

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

QQ. Metropolitan Sewer District of St. Louis Permit (Job No. 23MSD-00395)

1.0 Description. Metropolitan St. Louis Sewer District (MSD) issued permit 23MSD-00395 for improvements associated with project J6S3582. A copy of the approved plans and permit requirements are available for download at <https://aca3.accela.com/STLMSD/>.

2.0 Permit Requirements. The Contractor shall comply with all General Construction Permitting Requirements indicated in the approved permit to include payment of all permit fees.

3.0 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 documents.

RR. Metropolitan Sewer District of St. Louis As-Built Submittals (Job No. 23MSD-00395)

1.0 Description. Metropolitan St. Louis Sewer District (MSD) requires as-built drawings of the constructed drainage facilities to be submitted for their records. The contractor shall perform all work necessary to produce and submit the final as-built drainage plans to MSD, per MSD's as-built submittal requirements. The contractor shall submit the MSD as-built drawings for MSD Job No. 23MSD-00395 (Pending) and subsequent revisions after all drainage structures related to the project have been constructed or adjusted.

2.0 MSD Electronic Plans Submittal Process. MSD requires that permits be submitted electronically using their new online paperless system Accela. The contractor will be required to login on to this system and upload as-builts and/or shop drawings as necessary. Additional information can be found here:

<https://msdprojectclear.org/doing-business/development-review/>

A direct link to the new online system can be found here:

<https://aca3.accela.com/STLMSD/Login.aspx>

In order to access the permit, the contractor will first need to call MSD in order to obtain access for the particular job mentioned above.

2.1 The contractor shall provide a copy of the as-built drainage plans to the MoDOT engineer at the time of the MSD submittal.

2.2 The Contractor shall comply with all General Construction Permitting Requirements indicated in the approved permit, which includes payment of all permit fees.

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

SS. Sidewalk Trench Drain

1.0 Description. This work shall consist of installing a sidewalk trench drain across the width of the sidewalk (and curb when present) to drain water from the curb line under the sidewalk. Details of this work are shown in the Sidewalk Trench Drain Special Sheet and plan sheet.

2.0 Materials. The sidewalk trench drain shall be a heavy duty bolted trench drain and frame and the lid shall be ADA compliant. The thickened sidewalk and reinforcement is incidental to the cost of the drain.

3.0 Basis of Payment. All costs for materials, equipment, labor, and installation shall be included in the cost for "Sidewalk Trench Drain" and be paid at the contract unit price per each. All grading necessary in this area is incidental to the cost of the Sidewalk Trench Drain. The associated rock ditch liner, bedding material, and erosion control geotextile as shown in the plans are paid for at their contract unit prices.

Pay Item Number	Description	Unit
614-99.02	Sidewalk Trench Drain	Each

TT. Convert Inlet To Manhole

1.0 Description. This work shall consist of converting an existing inlet to a manhole at the locations shown in the plans.

2.0 Material. Material shall be as specified in Sec. 604.10.2.

3.0 Construction Requirements. Work to convert existing inlets to manholes shall be done in accordance with Sec 604.10.3 and as specified herein.

3.1 Contractor shall remove approximately 2.5 feet of the existing inlet, including the existing inlet stone, sill and adjustment rings. Contractor shall rebuild the structure to grade as a manhole in accordance with MoDOT standard details and specifications.

3.2 New manhole steps, adjusting rings and new manhole frames and covers (Type 1-A) shall be provided as necessary.

4.0 Method of Measurement. Measurement of converting inlet to manhole will be made per each.

5.0 Basis of Payment. The accepted quantity of converting inlet to manhole, complete in place, will be paid for at the contract unit price:

Pay Item Number	Description	Unit
614-99.02	Convert Inlet to Manhole	Each

5.1 No direct payment will be made for reinforcement, removals, steps, adjusting rings, frame and covers, backfilling or other incidental items required to complete the work.

UU. Convert Grate Inlet to Curb Inlet

1.0 Description. This work shall consist of converting an existing grate inlet to a curb inlet at the locations shown in the plans.

2.0 Material. Material shall be as specified in Sec. 604.10.2.

3.0 Construction Requirements. Work to convert existing grate inlets to curb inlets shall be done in accordance with Sec 604.10.3 and as specified herein.

3.1 Contractor shall remove approximately 2.5 feet of the existing inlet, including the existing grate and bearing plate, frame and adjustment rings. Contractor shall rebuild the structure to grade as a curb inlet in accordance with MoDOT standard details and specifications.

4.0 Method of Measurement. Measurement of converting grate inlet to curb inlet will be made per each.

5.0 Basis of Payment. The accepted quantity of converting grate inlet to curb inlet, complete in place, will be paid for at the contract unit price:

Pay Item Number	Description	Unit
614-99.02	Convert Grate Inlet to Curb Inlet	Each

5.1 No direct payment will be made for reinforcement, removals, steps, adjusting rings, frame and covers, backfilling or other incidental items required to complete the work.

VV. Special Drainage Structures

1.0 Description. This work covers the furnishing and installation of special drainage structures as shown in the plans and details.

2.0 Construction Requirements. Construction shall be in accordance with the Missouri Department of Transportation Standard Specifications and Plans, latest edition.

3.0 Method of Measurement.

3.1 Measurement of Special Inlet No. 1 shall be the depth for payment, as per the Special Sheets and as shown in the Culvert Section Plan Sheets.

3.2 Excavation for Special Inlets is paid for separately as Class 3 Excavation. See plans for quantities.

4.0 Basis of Payment. The contract unit price shall be considered as full compensation for all labor, equipment, materials, or other construction involved to complete the work. The following is the Pay Item No. for each type of structure listed above:

Pay Item Number	Description	Unit
731-99.13	Special Structure	Vertical Linear Foot

WW. Single Inlets

1.0 Description. This work covers the furnishing and installation of MSD standard single street inlets as shown in the plans and details.

2.0 Material. Material for the single street inlets shall be as specified in the Metropolitan St. Louis Sewer District Standard Construction Specifications for Sewers and Drainage Facilities, latest edition.

3.0 Construction Requirements. The single street inlets are MSD standard drainage structures and shall be constructed in accordance with the latest Missouri Standard Specifications, Section 731 and as detailed in the Metropolitan St. Louis District Standard Detail Sheets, latest edition.

4.0 Method of Measurement.

4.1 Measurement of Single Street Inlets shall be the difference in feet from the top of the inlet stone to the low flowline of the inlet, as shown in the Culvert Section Plan Sheets and shall also include the inlet sill, stone and cover and pipe joints as required by MSD's Standard Construction Specifications Section H.

4.2 Excavation for all structures is paid for separately as Class 3 Excavation. See plans for quantities.

5.0 Basis of Payment. The contract unit price shall be considered as full compensation for all labor, equipment, materials, or other construction involved to complete the work. No direct pay for reinforcement, steps, inlet sill, stone, mortar, dowels, pipe joint material, granular backfill, cover or other incidental items necessary to complete this work. The following is the Pay Item No. for the single street inlet.

Pay Item Number	Description	Unit
731-99.13	Single Street Inlet	Vertical Linear Foot

XX. Clean Water Act Requirements

1.0 Description. The Contractor shall be aware that any work within streams, wetlands, or special aquatic sites requires a Section 404 permit from the Corps of Engineers.

2.0 The project meets the conditions of the following listed permits with no pre-construction notification to the Corps of Engineers:

Section 404 Nationwide Permit 14 (Linear Transportation Projects)

3.0 The Contractor shall abide by all general conditions of Section 404 and 401 Permits, and specific conditions of the following listed Nationwide Permit found in the General Provisions and Supplemental Specifications to the current Missouri Standard Specifications for Highway Construction referenced in this contract.

Section 404 Nationwide Permit 14 (Linear Transportation Projects)

3.1 If there are any changes to the scope or limits to the project, the Contractor must notify the Engineer who will then notify the MoDOT Environmental Section to verify that the project still meets permit conditions.

3.2 No additional time will be added to the contract for the contractor to obtain any permits.

4.0 Basis of Payment. There will be no direct payment for compliance with this provision.

YY. Adjust To Grade Items

1.0 Description. This work shall consist of adjusting water valves, water meters, basins/inlets, and manholes that are within areas where either new sidewalks, curb ramps, approaches or pavements are to be constructed as shown on the plans. The contractor shall verify the type of frame and cover in the field before performing the work. The adjustments shall be made to match the final proposed grade.

2.0 See Adjust to Grade MoDOT Pull Box for additional information.

2.0 Construction Requirements. Adjusting manholes and adjusting basins or inlets shall be done in accordance with Sec 604 except as modified herein.

2.1 Adjustments, extensions, and/or lowering of utility and any related excavation and backfill shall be constructed as approved by the Engineer. For MoDOT owned facilities, adjustments shall conform to current Missouri Standard Specifications for Highway Construction. For MSD owned facilities, adjustments shall conform to current MSD Standards and Specifications. Adjustments for inlets require the top lid slopes to be adjusted to less than 2% slope in all directions and some of these inlets need to be raised to the final sidewalk grade. These are called out in the plans as "adjust inlet top". Adjustments shall be completed so that the finished sidewalk, ramp, approach, or pavement meets current ADA standards.

3.0 Basis of Payment.

3.1 All costs for materials, equipment, labor and installation shall be included in the cost for adjusting the water valves, water meters, basins/inlets, manholes, and pull boxes.

Pay Item Number	Description	Unit
603-99.02	Adjust to Grade Water Meter	Each
603-99.02	Adjust to Grade Water Valve	Each
604-20.10	Adjusting Manhole	Each
604-20.20	Adjusting Basin or Inlet	Each

Refer to ITS/signal job special provisions for adjust to grade items related to ITS and signal items.

3.2 No direct payment will be made for any required hauling, cutting, joining, backfilling, or adjusting rings, or any other requirements necessary to fulfill this provision. No direct payment

will be made to recover the cost of equipment, labor, materials, or time required to fulfill the above provision.

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

1.0 Delete Sec 616.11 and insert the following:

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

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

2.0 Delete Sec 616.12 and insert the following:

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

- (a) Incidental items necessary to complete the work, unless specifically provided as a pay item in the contract.
- (b) Installing, operating, maintaining, cleaning, repairing, removing, or replacing traffic control devices.
- (c) Covering and uncovering existing signs and other traffic control devices.
- (d) Relocating temporary traffic control devices, including permanent traffic control devices temporarily relocated, unless specifically included as a pay item in the contract.
- (e) Worker apparel.
- (f) Flaggers, AFADs, PFDs, pilot vehicles, and appurtenances at flagging stations.
- (g) Furnishing, installing, operating, maintaining, and removing construction-related vehicle and equipment lighting.

(h) Construction and removal of temporary equipment crossovers, including restoring pre-existing crossovers.

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

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

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

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

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

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

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

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

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

AAA. Contractor Designed, Furnished and Installed Steel Plates

1.0 Description. The Contractor may elect to utilize steel plating to cover open trenches on Route 366, on crossroads or in adjacent paved areas to mitigate overnight roadside hazards. Steel plates shall be secured from lateral movement while in use. Steel plates shall withstand H-20 traffic loading.

2.0 Materials. All materials shall be in accordance with Division 1000, Material Details, as specified in the Missouri Highway and Transportation Commission's current edition of Missouri Standard Specifications for Highway Construction.

3.0 Construction Requirements.

3.1 Contractor shall provide asphalt wedging transitions for traffic and pedestrians at plate edges as detailed in the plans. Asphalt wedging transition for pedestrians shall comply with ADA pedestrian access routes as identified by Engineer. No direct pay for asphalt wedging or tack coat.

3.2 Contractor shall document by evidence of registered professional engineer's seal, signature, and date in accordance with appropriate state licensing requirements showing the design and placement of the steel plating meets loading requirements.

3.3 The Contractor shall conduct a pre-installation conference with the Engineer to review methods and procedures related to excavation support and protection. The pre-installation conference will address:

- Existing utilities and subsurface conditions.
- Proposed excavations.
- Proposed equipment.
- Monitoring of excavation support and protection system.
- Working area location and stability.
- Coordination with traffic control movements of general public.
- Removal of plating systems.

4.0 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. Utilization of steel plating, asphalt wedging and tack cost is considered **incidental to the Temporary Traffic Control lump sum pay item.**

BBB. Contractor Designed, Furnished and Installed Shoring for Excavation

1.0 Description. This Section addresses sheeting, bracing, and all operations necessary for the preparation of trenches for constructing retaining walls and bridges, bedding of pipes and pipe appurtenances, conduit, and buried cable.

2.0 Materials. All materials shall be in accordance with Division 1000.

3.0 Execution. Where selecting an option for excavation, trenching, and shoring in compliance with local, state, or federal safety regulations such as "OSHA Part 1926" or successor regulations, which require design by a registered professional engineer, submit (for information only and not for Engineer approval) the following:

- A. Copies of design calculations and notes for sloping, benching, support systems, shield systems, and other protective systems prepared by or under the supervision of a professional engineer legally authorized to practice in the jurisdiction where the Project is located.
- B. Documents provided with evidence of registered professional engineer's seal, signature, and date in accordance with appropriate state licensing requirements.
- C. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards that could develop during excavation support and protection system operations.
- D. Shore, support, and protect utilities encountered.
- E. Install excavation support and protection systems to ensure minimum interference with roads, streets, walks, and other adjacent occupied and used facilities.
- F. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Engineer and authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways if required by authorities having jurisdiction.
- G. Locate excavation support and protection systems clear of permanent construction so that forming and finishing of concrete surfaces are not impeded.
- H. Monitor excavation support and protection systems daily during excavation progress and for as long as excavation remains open. Promptly correct bulges, breakage, or other evidence of movement to ensure that excavation support and protection systems remain stable.
- I. Promptly repair damages to adjacent facilities caused by installing excavation support and protection systems.

4.0 Quality Assurance. The contractor shall conduct a pre-installation meeting at the project site to review methods and procedures related to excavation support and protection systems including, but not limited to:

- a. Existing utilities and subsurface conditions.
- b. Proposed excavations.
- c. Proposed equipment.
- d. Monitoring of excavation support and protection system.
- e. Working area location and stability.
- f. Coordination with traffic control movements of general public.

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.

CCC. Asphalt Coldmilling / Paving Requirement

1.0 Description. Asphalt coldmilling / paving requirement for the project.

2.0 Construction Requirements. Asphalt coldmilled pavement areas shall be filled with the 1 ½ inch lower lift of the corresponding asphaltic concrete mixture during the same work shift.

2.1 The contractor shall provide a material transfer vehicle during asphalt paving operations to ensure a consistent temperature of the asphalt throughout paving and to prevent segregation of the mix that produces a uniform final product.

3.0 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.

DDD. Pavement Marking

1.0 Description. Before beginning striping the contractor shall contact the sign shop at least 24 hours in advance. No additional pay shall be made to comply with this provision. Contact information is provided below.

Michael Love
Signing / Striping Supervisor
Office: (314) 205-7310
Cell: (314) 624-3318

EEE. Optional Temporary Pavement Marking Paint NJSP-18-07F

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 2026, as allowed herein. PPMP is defined as Standard Waterborne Paint and High Build Waterborne Paint and does not include Sec 620.20.3 Durable Pavement Markings.

1.1 No application of PPMP shall occur between October 1, 2025 and March 1, 2026, both dates inclusive, except as stated herein. When the contractor has begun application of PPMP prior to October 1, 2025, 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, 2025, 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, 2026. All PPMP shall be completed prior to June 1, 2026. 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, 2025, even when there is sufficient time to complete the PPMP prior to October 1, 2025. 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 2026, 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, 2026, 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, 2026.

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.

Item Number	Description	Unit
620-99.01	TEMPORARY PAVEMENT MARKING PAINT	LS

FFF. Island Tubular Marker

1.0 Description. Tubular markers shall be mounted on raised islands at the locations indicated in the plans.

2.0 Requirements. Island tubular markers shall have a height 18-inches as noted on plans, 2 reflective bands with super high intensity prismatic sheeting in accordance to Section 1042 and be constructed from thermoplastic polyurethane. Color of the island tubular marker and reflective bands shall match the pavement marking in which it is placed. Post shall be in the shape of a “T” with a width of 3 inches and depth of 2 inches. Post shall be capable of recovering from repeated vehicle impacts. Post shall insert and be secured into the plastic base with horizontal locking pins. When the post is no longer serviceable, it shall be able to be removed and a new post can be manually inserted and locked into the existing base.

3.0 Construction Requirements. Shall be surface mounted on the radius points of the island noses. The roadway shall be cleaned of dirt and gravel before installation. Island tubular markers shall be mounted using proper sized anchor bolts according to manufacturer’s instructions.

4.0 Method of Measurement. Measurement for installation of tubular marker with base will be made per each.

5.0 Basis of Payment. All labor, equipment and materials necessary to install these markers will be paid for under:

Item Number	Description	Unit
620-99.02	18 IN. White Island Tubular Marker	Each
620-99.02	18 IN. Yellow Island Tubular Marker	Each

GGG. Landscaping Restoration

1.0 Description. This work shall consist of restoring existing landscaped areas that are disturbed by construction activities as shown on the plans or as directed by the Engineer.

In “cut” areas, the existing landscape material (decorative rock, mulch, etc.), fabric and vegetation shall be removed within the grading limits and then the existing ground shall be cut to grade. After the existing ground is cut to grade, the existing fabric, vegetation, and landscape material shall be placed back in their original locations as directed by the Engineer.

In “fill” areas, additional “in-kind” landscape material shall be added to the existing landscape material to bring it up to the proposed grade as directed by the Engineer. Existing vegetation may need to be removed and replanted to bring it up to proposed grade as directed by the Engineer.

Any existing landscape material, fabric or vegetation damaged by the Contractor during construction shall be replaced "in-kind" at his/her expense as directed by the Engineer.

2.0 Method of Measurement and Basis of Payment. Landscaping restoration will be measured and paid for at the unit bid price per square yard. Payment will be considered full compensation for all labor, equipment and material to complete the described work. All expense incurred by the contractor in compliance with the above requirements shall be considered as completely covered by unit prices for:

Item Number	Description	Unit
803-99.05A	Landscaping Restoration	S.Y.

HHH. 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.

2.0 Signal Equipment. All equipment other than network communication devices noted in 3.0 are to be transported to the Commission's maintenance lot located at 2309a Barrett Station Road, Ballwin, Missouri 63021. The contractor shall notify the Commission's representative 24 hours prior to each delivery by calling:

Mr. Dennis Hixson, Traffic Supervisor, Preventative Maintenance/ITS
Cell: (314) 565-6726

Mr. Ron Mize, Traffic Supervisor, Emergency Signal Maintenance
Cell: (314) 565-6727

Brian Ducote, Interim Lighting and Locate Supervisor
Cell: (314) 681-8395

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 Commission's TMC in Chesterfield. The contractor shall notify the Commission's representative 24 hours prior to each delivery by calling 314-275-1526 and providing details for the delivery.

4.0 The contractor shall exercise reasonable care in the handling of the equipment during 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 "Removal of Improvements" per lump sum.

III. Maintenance of Roadway Lighting

1.0 Description. This work shall consist of maintaining the operation of the existing roadway lighting during the construction of the project.

2.0 Construction Requirements. Contractor shall schedule/stage work such as to minimize the duration that any roadway lighting will not be operational. Contractor shall provide a schedule of when the roadway lighting will not be operational to the Engineer for review and approval.

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

JJJ. Top Mount Luminaire

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

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

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

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

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

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

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

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

KKK. Top Mount Light Pole

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

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

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

Item Number	Item Name	Units
901-99.02	30 Ft. Top Mount Light Pole	Each
901-99.02	45 Ft. Top Mount Light Pole	Each

LLL. Temporary Traffic Signals and Lighting

1.0 Description. This work shall include furnishing, installing, relocating, maintaining and removing temporary traffic signals and lighting at the intersections of MO-366 at Watson Industrial Park and MO-336 at Pardee Lane. The contractor will be required to modify as well as furnish and install additional equipment in accordance with the traffic control plan. This work shall conform to Sec 902 except as herein modified.

2.0 Construction Requirements. Temporary traffic signals and lighting shall be furnished, installed, modified, and maintained to properly handle traffic at the intersections of MO-366 at Watson Industrial Park and MO-366 at Pardee Lane, until such time as the permanent traffic signal is installed at this intersection. The temporary signal shall remain connected to MoDOT's Intelligent Transportation System (ITS) network at all times, unless otherwise approved by the Engineer and MoDOT's ITS personnel.

2.1 The existing traffic signal and lighting equipment, including controller, can be utilized for this installation but will require relocation as shown on the traffic control plan. The contractor will be required to install additional equipment, such as new signal heads, poles, control cable, video detection equipment, and span wire assembly as required by the signal layout and staging.

2.2 The contractor shall relocate and modify the temporary traffic signals and lighting as shown on the plans. No additional payment will be made for this work

2.3 The temporary traffic signal installation shall be completely maintained by the contractor. MoDOT personnel shall not be directly involved in the installation, maintenance or timing of the signal or preempt system. Signal timing and phasing revisions shall be approved by the Engineer, but programmed by the Contractor. See also the Job Special Provision herein for TRAFFIC SIGNAL MAINTENANCE AND PROGRAMMING.

2.4 During periods of shutdown for required maintenance or when relocating equipment between stages, the contractor shall provide adequate traffic control, including flaggers. Sign W020-7b, Flagger (symbol), shall be displayed in advance of the flaggers. The contractor shall submit traffic control plans to the Engineer for approval.

2.5 The temporary traffic signal shall be removed by the Contractor after the permanent traffic signal is operational. All other signal and lighting equipment shall become the property of MoDOT. See also the Job Special Provision herein for DISPOSITION OF EXISTING SIGNAL AND LIGHTING EQUIPMENT.

3.0 Method of Measurement. Measurement will be made per lump sum.

4.0 Basis of Payment. Payment for furnishing, installation, operation, modification, maintenance, relocation and removal of the temporary traffic signal and lighting, will be completely covered by:

Item Number	Description	Unit
902-94.01	Temporary Traffic Signals and Lighting	L.S.

MMM. Install MoDOT Furnished Traffic Signal Controller

1.0 Description. The contractor shall install the Commission furnished traffic signal controller in the signal cabinets as shown in the plans.

2.0 Installation Requirements. The contractor shall contact the Commission's Traffic Operations Engineers 24 hours prior to picking up the controllers to determine the pickup point.

The contractor's traffic Engineer is responsible for programming the traffic signal controller. The traffic signal controller shall be programmed prior to installation in the cabinet and per plan in accordance with the Job Special Provision "Traffic Signal Maintenance and Programming."

The contractor is responsible for removing the old traffic signal controller and for returning it to the Commission in accordance with the Job Special Provision "Disposition of Existing Signal/Lighting and Network Equipment."

The contractor shall install the Commission furnished traffic signal controller utilizing the appropriate connections in the traffic signal cabinet. The contractor is responsible for getting the controller onto the MoDOT network unless directed otherwise by the Engineer.

Controllers to be installed in TS1 cabinets shall connect the “D” plug. “D” plug adapters are to be provided by the Commission.

3.0 Acceptance Testing. The Contractor shall contact MoDOT St. Louis ITS staff to verify remote communication to the traffic signal controller upon installation and while still on-site. Final acceptance of the traffic signal controller will not be made until the controller’s program passes its 15-day test period.

4.0 Basis of Payment. Measurement and payment for Install MoDOT furnished traffic signal controller includes the removal of the old traffic signal controller and the installation of the new traffic signal controller with the appropriate programming. Payment will be made as follows:

Item Number	Unit	Description
902.99-02	Each	Install MoDOT Furnished Traffic Signal Controller

NNN. SL District Traffic Signal Detection System

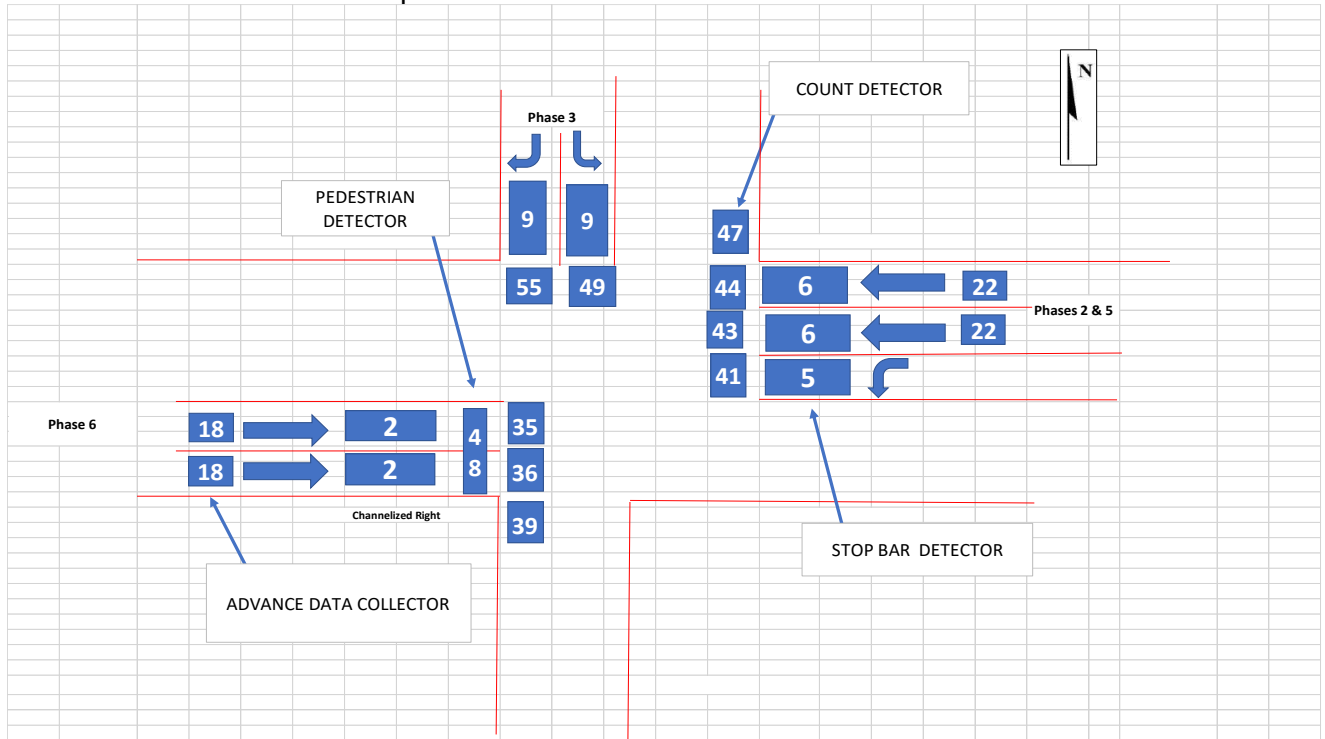
1.0 Description. This work shall consist of providing detectors for signalized installations that will support advance traffic signal performance measures (ATSPM) on the Commission’s St. Louis District roadways. Detectors shall be in accordance with the Missouri Standard Specifications for Highway Construction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

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

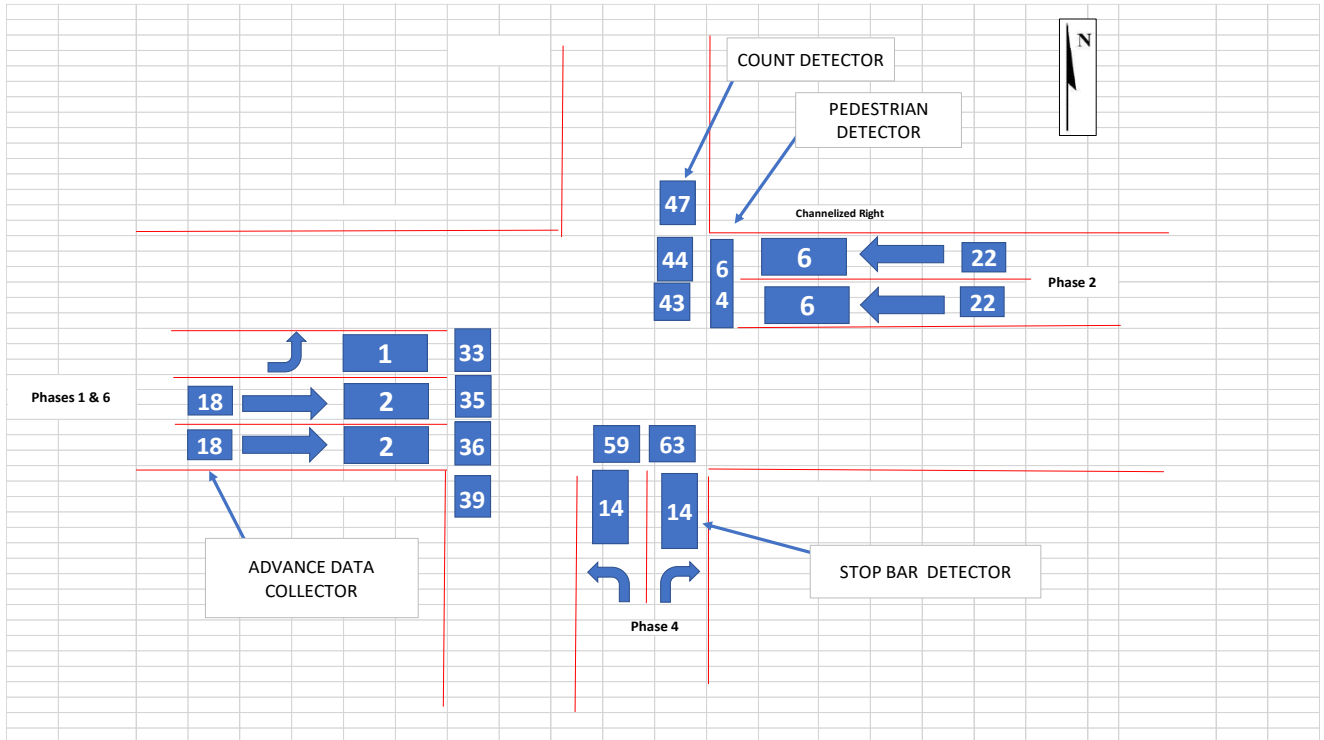
Description	Call	Extend	Data Collector
Stop Bar	Yes	Yes	No
Dilemma Zone (5 Second if applicable)	Yes	Yes	No
Dilemma Zone (8 second if applicable)	No	Yes	No
Count Detector	No	No	Yes
Advance Data Collector	No	No	Yes (Can double as dilemma zone detector)
Pedestrian Detector	No	No	Yes

MO-366 @ Geyer

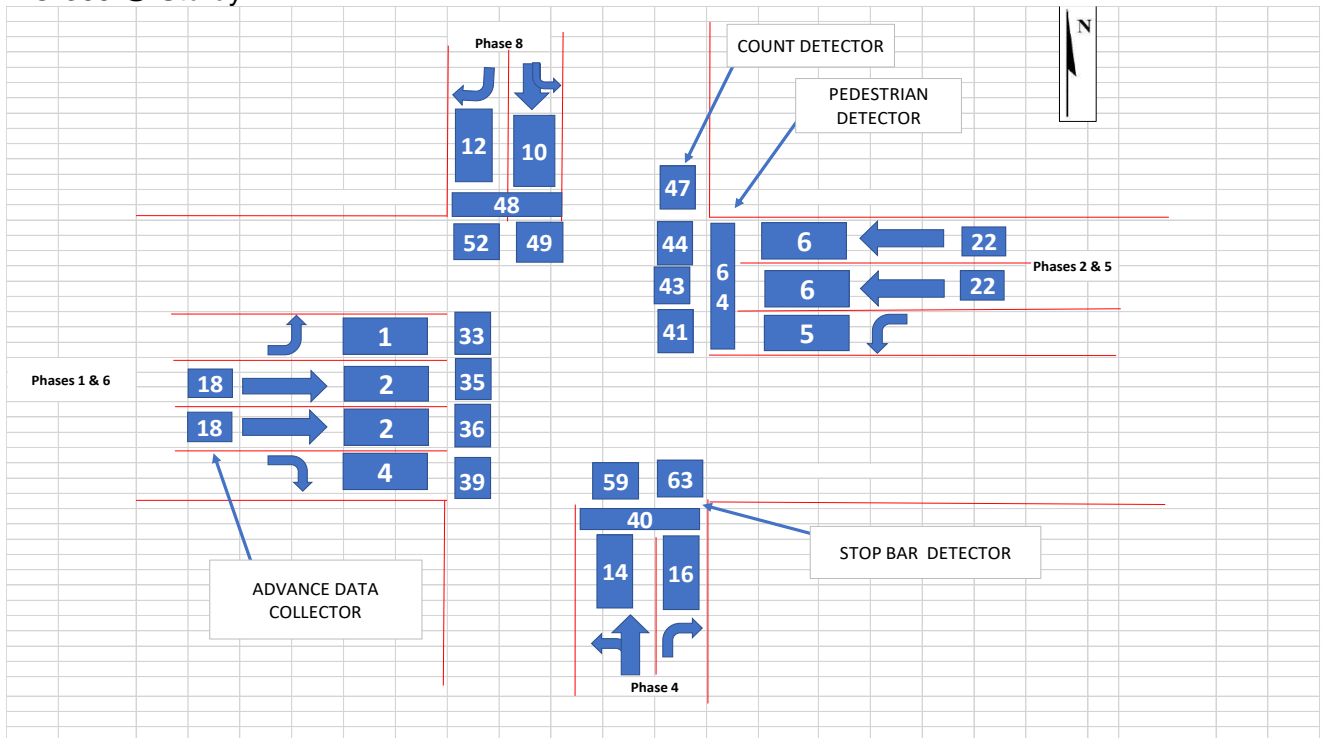
MO-366 @ US-67/50 SB Ramp



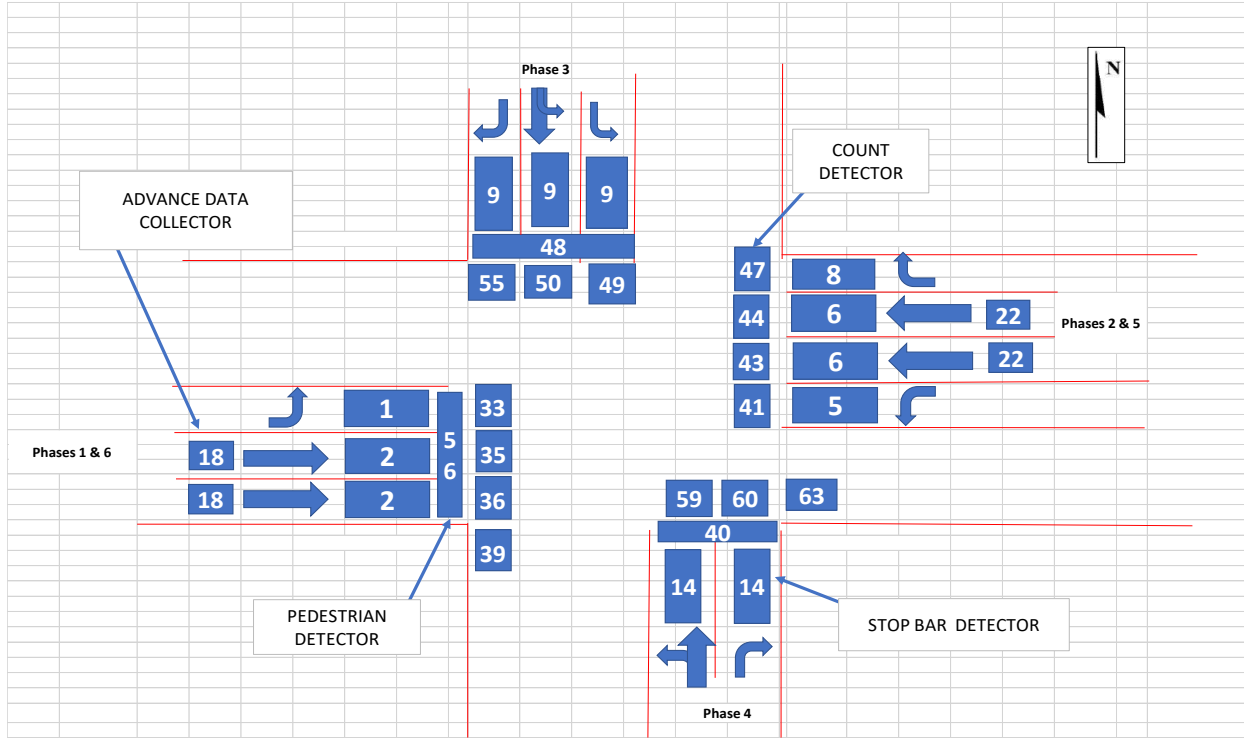
MO-366 @ US-67/50 NB Ramp



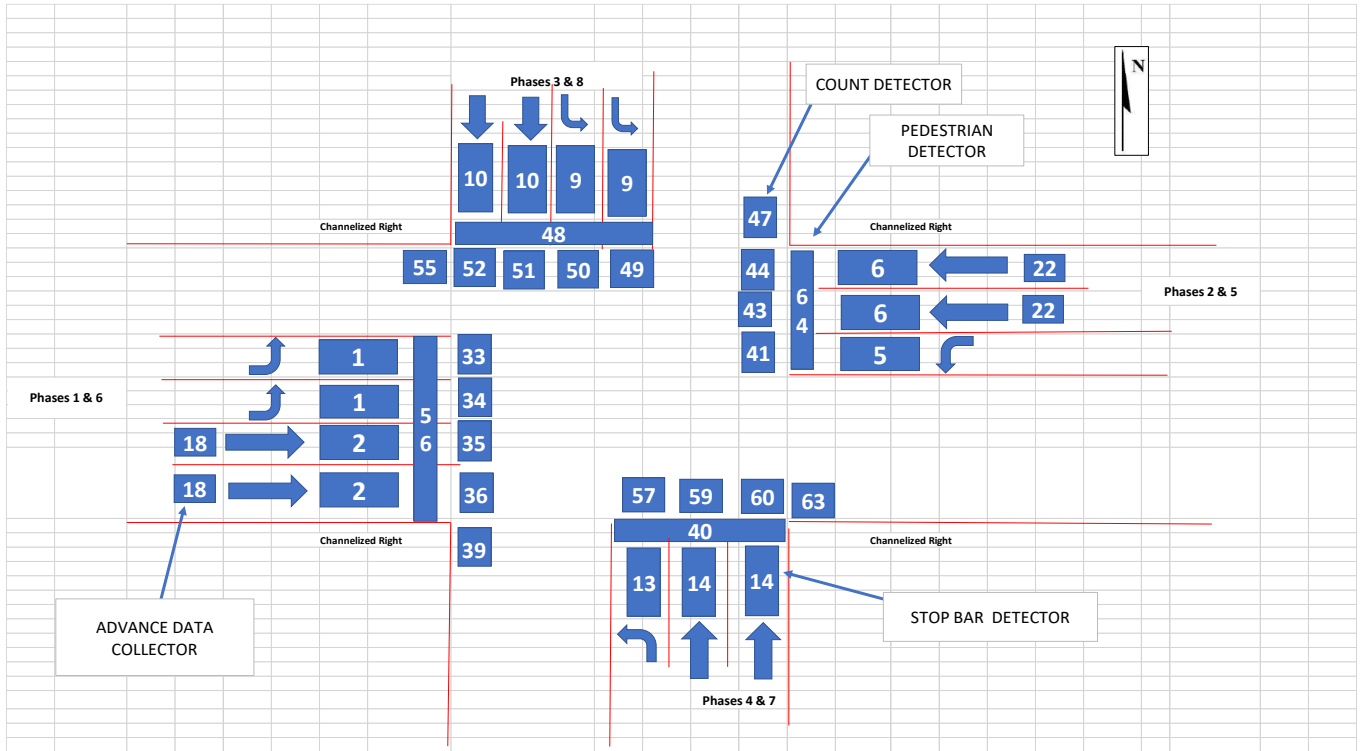
MO-366 @ Sturdy



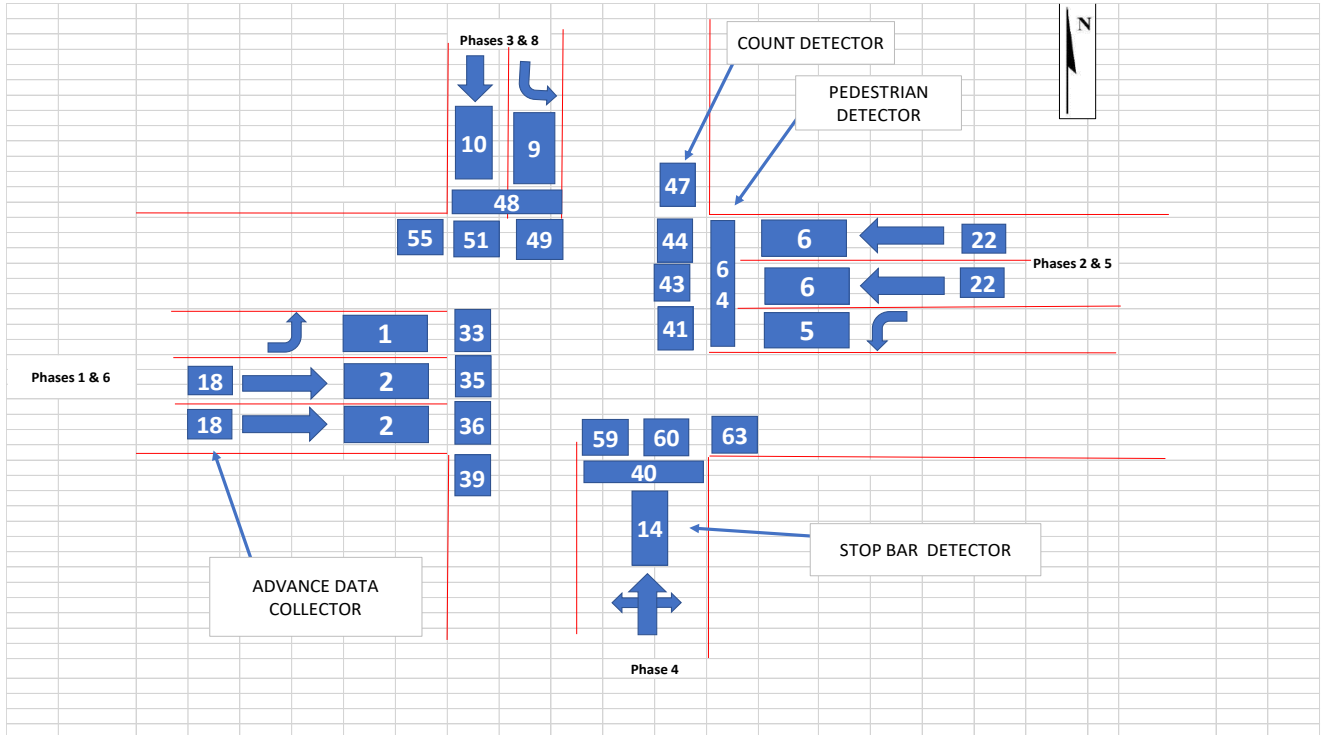
MO-366 @ Glenwood



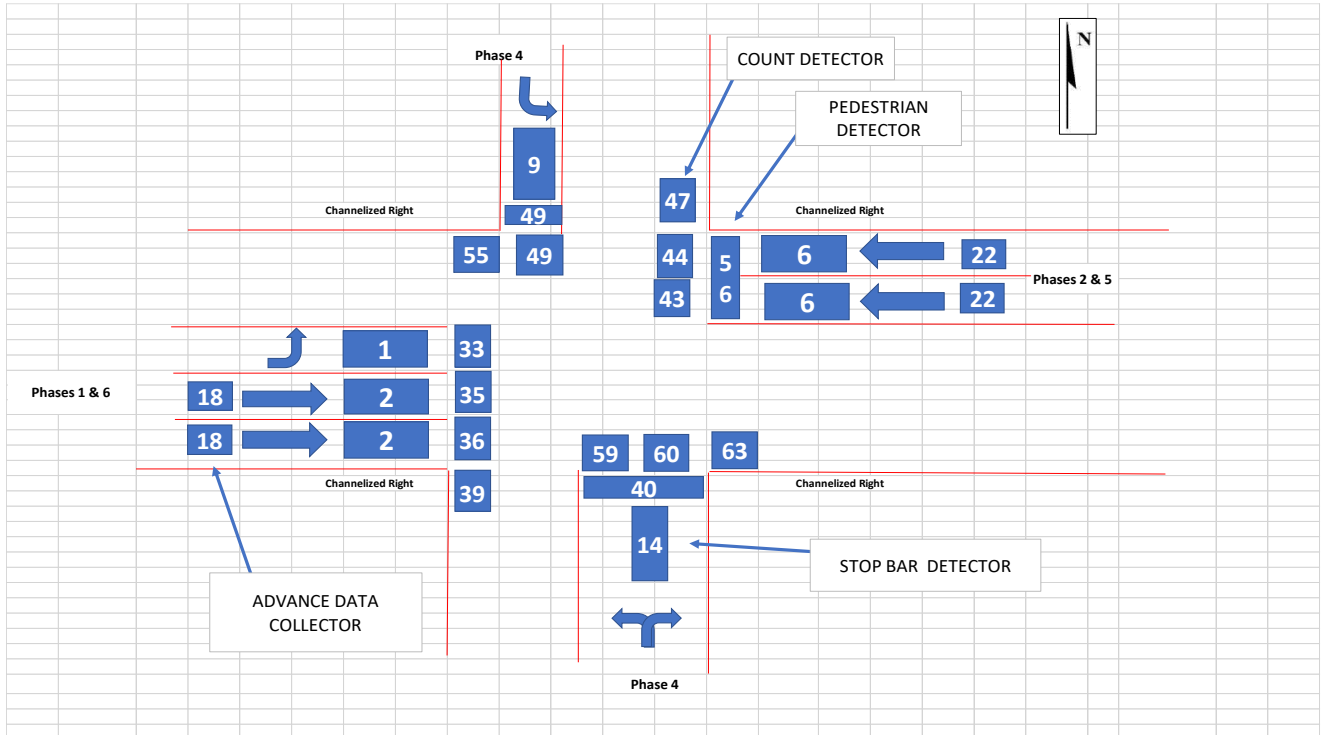
MO-366 @ New Sappington



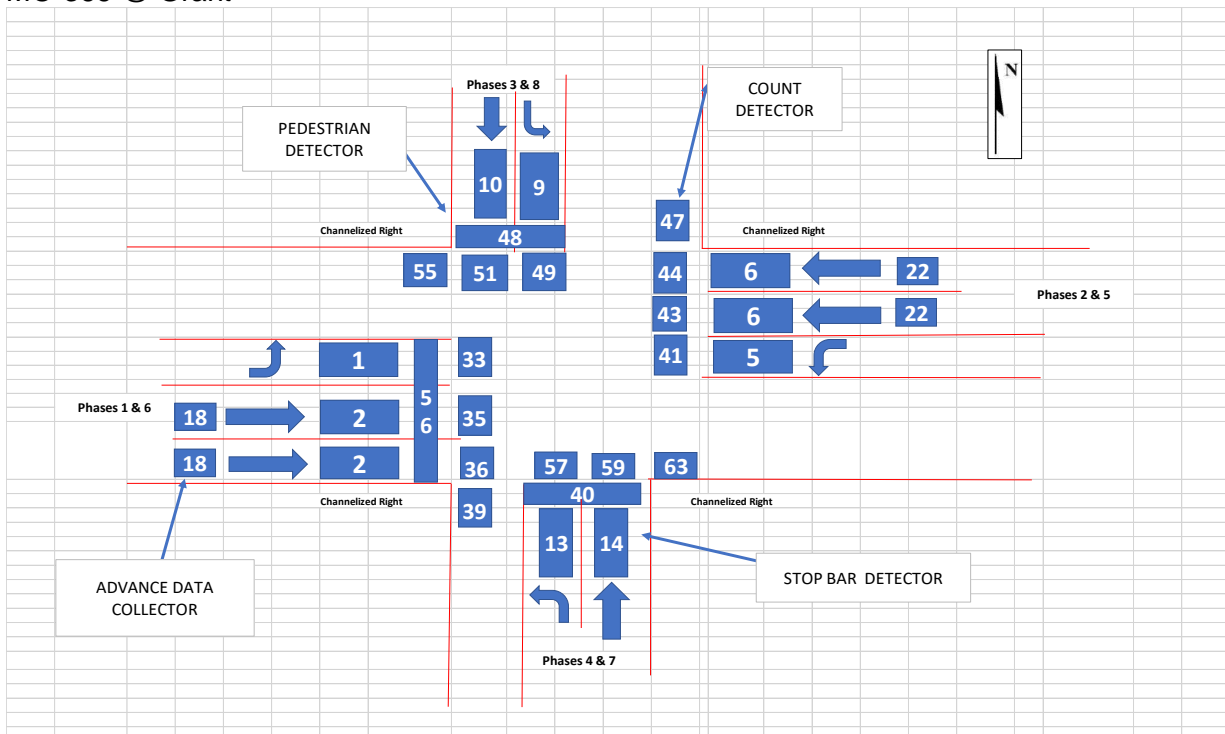
MO-366 @ Watson Industrial



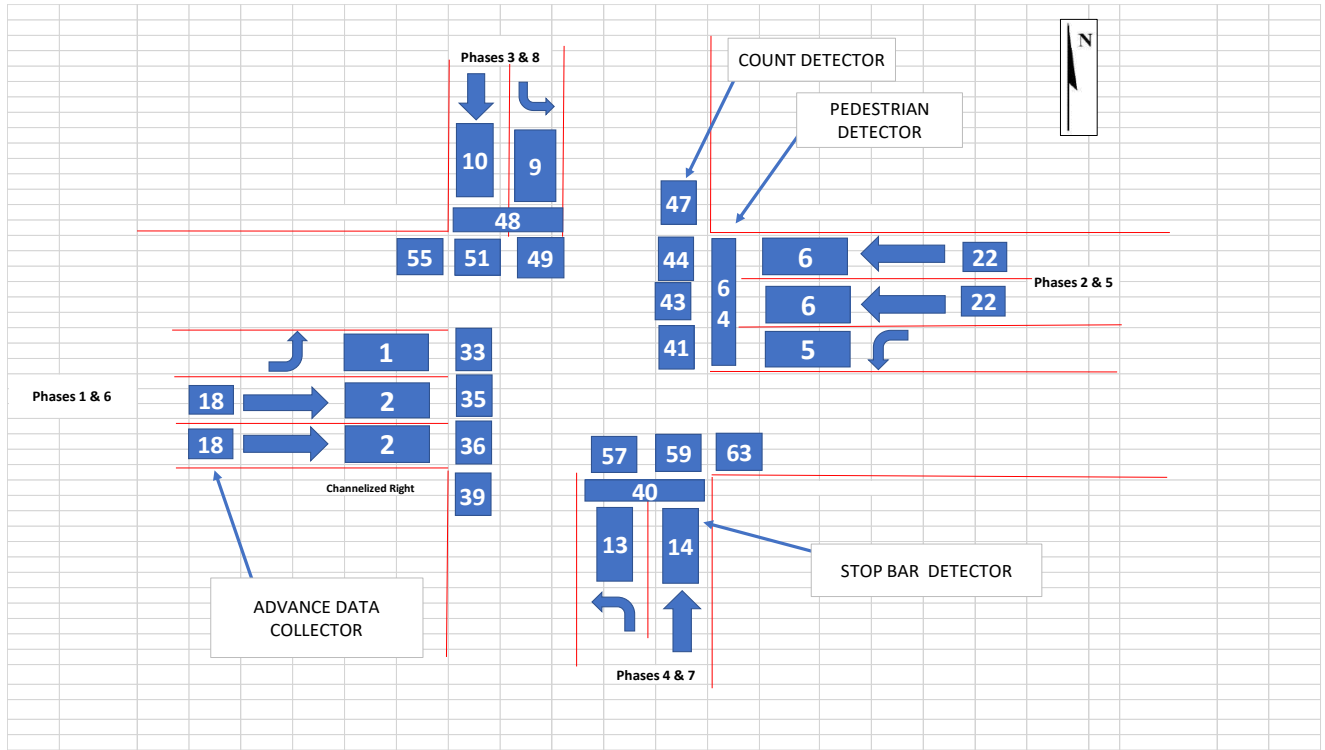
MO-366 @ Pardee



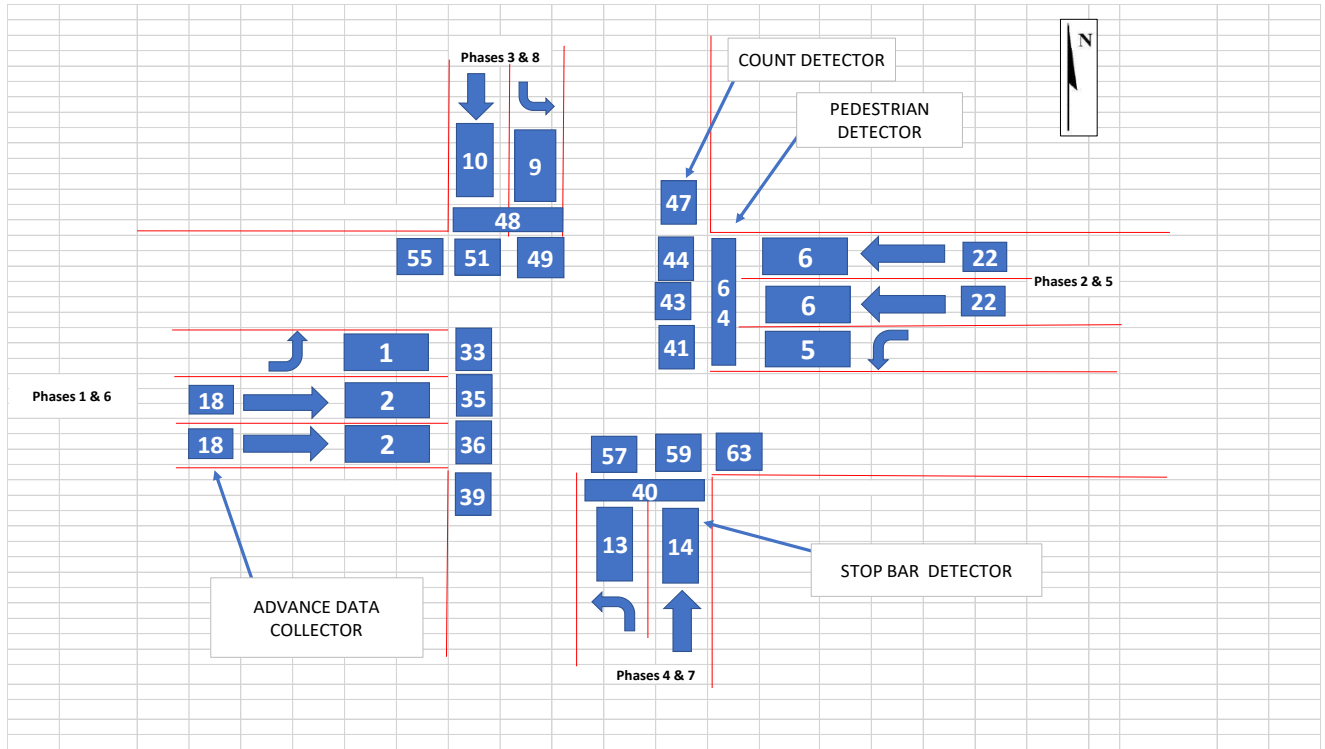
MO-366 @ Grant



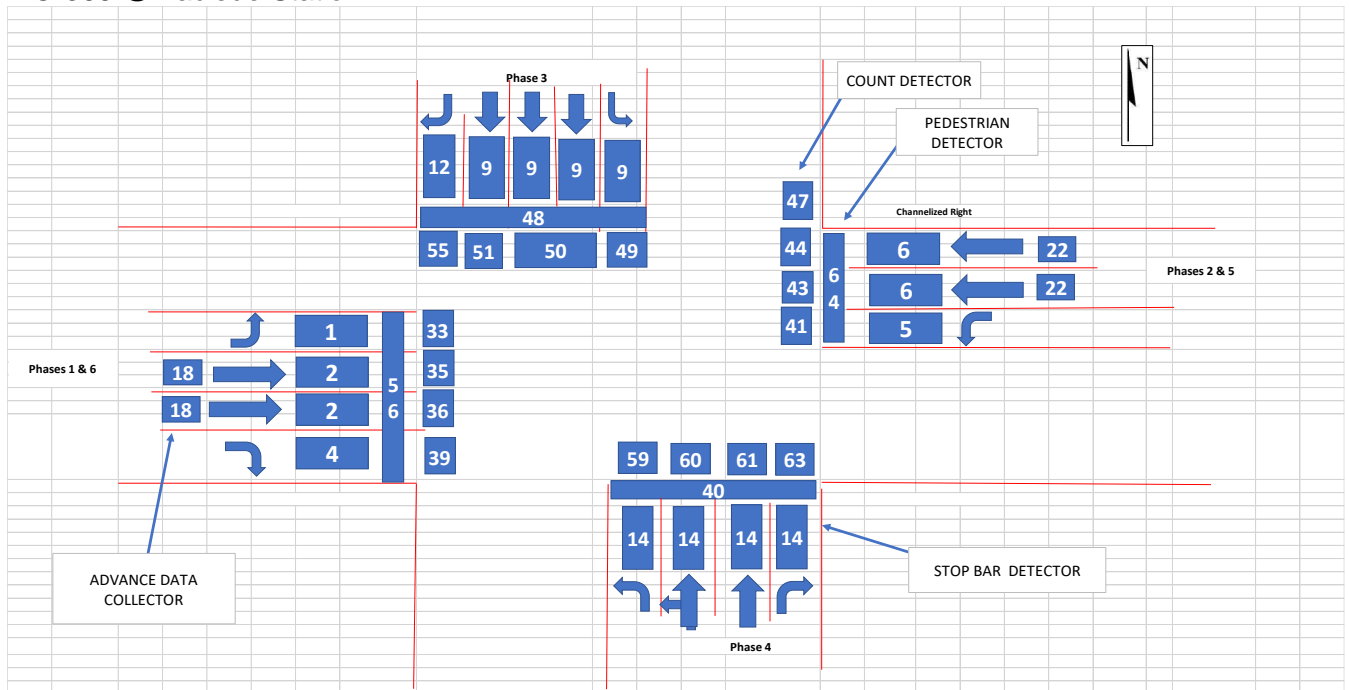
MO-366 @ Elm



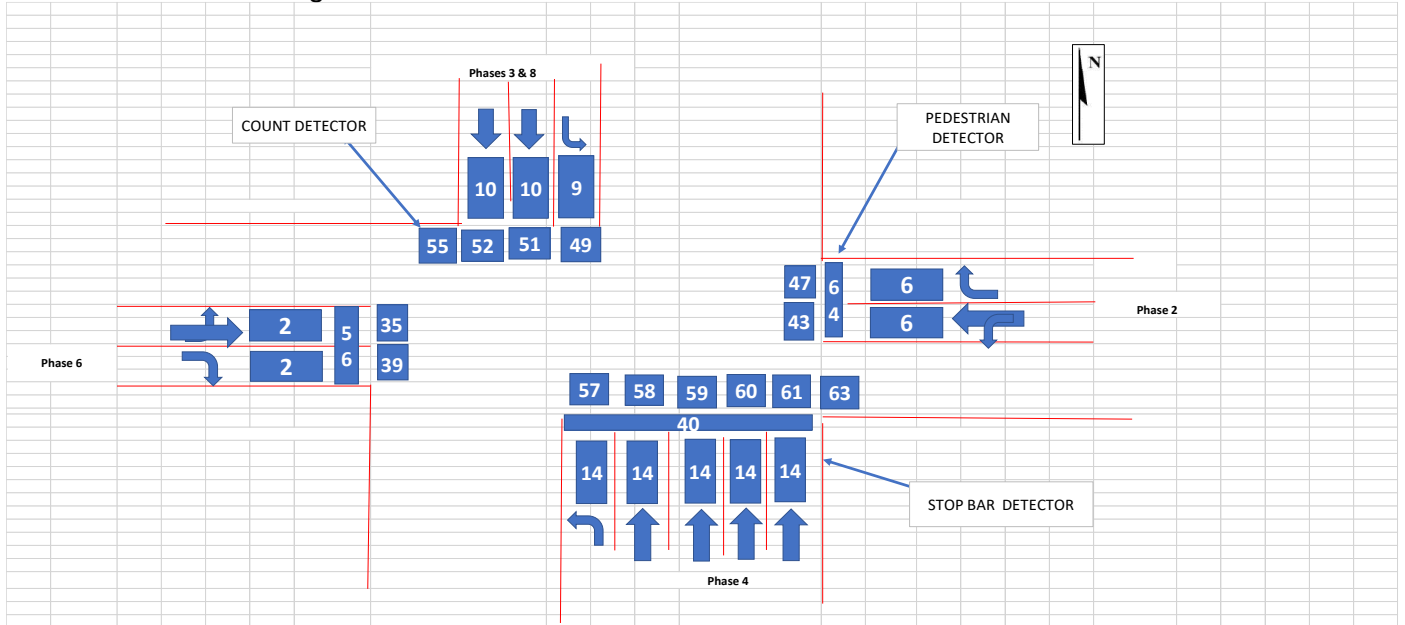
MO-366 @ Cheshire



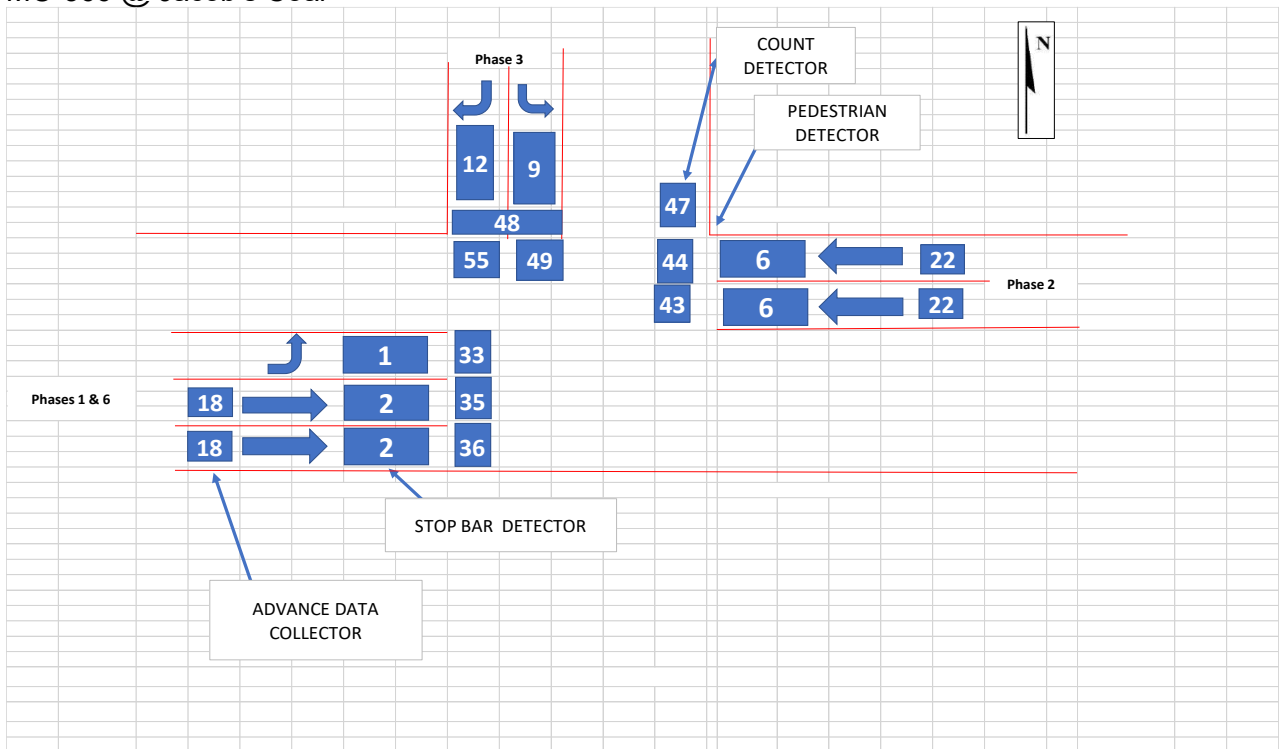
MO-366 @ Laclede Station



Laclede Station @ Heege



MO-366 @ Jacob's Coal



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

- MO-366 EB & WB @ Geyer

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

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

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

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

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

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

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

- Video Image
- Radar

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

4.2.1 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.

4.2.2 Material

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

- WAVETRONIX SmartSensor
 - Matrix

Provide a radar detection system with the following features.

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

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

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

4.2.2.3 Power and Communications.

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

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

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

4.2.3 Construction Requirements.

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

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

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

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

4.2.3.4 Acceptance Testing. The contractor shall develop a proposed test procedure for the CTAD and submit it to the Engineer for approval. It must include visual verification of vehicle

detections being received. Each detector shall be tested separately. Revise the proposed test procedure until it is acceptable to the Engineer. Provide all equipment and personnel needed to safely conduct the tests. Arrange for the Engineer's representative to witness the tests. Give the Engineer a report documenting the result of the tests.

4.2.4 Documentation and Software.

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

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

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

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

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

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

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

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

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

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

000. 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 the following pay item:

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

6.1 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.

PPP. Pedestrian Push Button Stanchion

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

2.0 Material Requirements.

2.1 Post. Posts shall be 48-inch long 4-inch diameter (4.5-inch O.D) schedule 40 aluminum pipe.

2.2 Foundation. Concrete and reinforcing shall comply with Sec 902.

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

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

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

4.0 Method of Measurement. Final measurement of pedestrian push button stanchion will be made per each. This shall include the dome cap, post, breakaway base, anchor rods, concrete forming tube, concrete, removal of existing concrete medians, median strips or concrete pavement, and all miscellaneous appurtenances to construct the post as shown on the plans.

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

Item No.	Description	Unit
902-99.02	Pedestrian Push Button Stanchion, 4 FT.	Each

QQQ. Pedestrian Push Button Extension

1.0 Description. This work shall consist of furnishing and installing a push button extension as indicated in the plans. The new push button shall be placed on an extension that is within a horizontal reach range of less than 10" and a vertical reach of 42". The Contractor shall submit shop drawings of the proposed push button extensions for approval, before installing.

2.0 Construction Requirements. Work shall be in accordance with Sec 902 and the manufacturer's recommendations.

3.0 Basis of Payment. Payment for furnishing and installing the push button extension shall include all excavation, materials, equipment, tools, labor, and work incidental thereto, and shall be considered to be completely covered by the contract unit price for:

Item No.	Description	Unit
902-99.02	Pedestrian Push Button Extension	Each

RRR. LED Blank Out Sign

1.0 Description. LED blank out sign shall be used as noted on the plans and conform to the following standards. The signs shall turn on only when the pedestrian phase is actuated by pressing the pedestrian push and remain on until the pedestrian phase ends.

2.0 Size and Message.

2.1 Size. Sign face shall be 30 inches wide and 30 inches high.

2.2 Message. Sign shall duplicate the graphics characteristics of MUTCD sign R3-1, "No Right Turn".

3.0 Functional Requirements

3.1 Visibility. The symbol shall be clearly legible, attracting attention under any lighting condition. At full intensity the sign must be completely visible anywhere within an approximate 15-degree cone centered about the optic axis. The LED Blank Out Sign shall be capable of displaying the symbol when energized and be completely blank out when not energized.. No phantom words or legend shall be seen under any ambient light conditions.

3.2 Components. The sign shall consist of:

- a. Weatherproof housing and door.
- b. LED's.
- c. Transformers.

3.3 LED's. All LED's should have an expected lifetime of 100,000 hours and be high in optical power.

3.4 Transformers. Transformers shall be used to reduce the incoming 120 volts AC to the design DC voltage. The transformers shall contain Class A insulation and weatherproofing.

3.5 Operation and Dimming. The sign shall be capable of continuous operation over a range in temperatures from -35F to +165F (-37C to +75C). 50% Pulse Width Modulation Dimming must be available for improved nighttime visibility.

4.0 Sign Housing

4.1 Construction. Housings shall be constructed of extruded aluminum. A flat aluminum panel shall be welded into the housing back. All corners and seams of one or two-way housings are to be heli-arc welded to provide a weatherproof seal around the entire case. Continuous full-length stainless steel hinges shall connect the housing and the extruded aluminum door. Sign shall have #3 stainless steel ¼ turn link-locks per door to tightly secure the door onto a gasket between it and the housing. Link-locks shall provide tool free access to the interior of the sign. Drainage shall be provided by at least four and no more than six drain holes at the corners of the housing.

4.2 Doors. Door gaskets should provide a weatherproof seal. The extruded aluminum doors shall have one side removable to gain access to the sign face. Each door shall be fitted with a sun hood. Standard length is 6".

4.3 Face. Sign face shall have the entire LED assembly mounted to it. The sign face will be protected by a polycarbonate, matte clear, lexan faceplate.

4.4 Finish. Finish on the sign housing shall be in powder coated matte black finish.

5.0 LED Message Modules

5.1 Components. The LED message module shall consist of the following components:

- a. A rigid aluminum message plate.
- b. High intensity LED's.
- c. LED drive electronics.

5.2 Mounting and Color. The LED's shall be mounted in panel via mounted fixing clips. Each LED shall be individually serviceable with spares included from the same batch to assure color uniformity upon replacement. Arrow shall be white and the circle with a diagonal line across it/slash symbol should be red unless approved by the engineer. Door panels shall be flat black to maximize legibility when activated.

5.3 Connections and Fasteners. The signs shall be able to operate using 3c#16 electrical cable and all electrical connections shall be made via barrier-type terminal strip. All fasteners and hardware shall be corrosion resistant stainless steel.

6.0 Warranty. Signs shall be warranted to be free of defects due to material and workmanship for a period of at least two (2) years.

7.0 Construction Requirements. Construction requirements shall conform to Sec 1092.

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

9.0 Basis of Payment. Payment will be for 1 unit per bid item "902-99.02 – LED Blank-Out Sign". Payment will be considered full compensation for all labor, equipment and material to complete the described work. It should be noted that the 3c#16 cable isn't included in this pay item.

Item No.	Type	Description
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902-99.02	Each	Powered R3-1 LED Blank-Out Sign
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SSS. Audible Pedestrian Pushbuttons and Signing (Revised 06.09.2023)

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

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

3.0 Equipment.

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

3.2 Vibrotactile. Vibrotactile walk indications shall be provided by a tactile arrow on the pushbutton that vibrates during the walk interval. Tactile arrow shall be located on the pushbutton that vibrates during the walk interval. Tactile arrow shall be located on the pushbutton, have high visual contrast (light on dark or dark on light), and shall be aligned parallel to the direction of travel on the associated crosswalk.

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

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

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

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

4.0 Performance.

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

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

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

4.4 Volume. Automatic volume adjustment in response to ambient traffic sound level will be provided up to a maximum volume of 100 dB. The units shall be responsive to ambient noise level changes up to no more than 5 dB louder than ambient sound. Tone or voice volume measured at 36 inches from the unit shall be 2dB minimum and 5dB maximum above ambient noise level. At installation, signal system is to be adjusted to be audible at no more than 5 to 12 feet from the system.

5.0 Documentation and Support.

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

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

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

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

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

Item Number	Description	Unit
902-99.02	Audible Pedestrian Pushbutton and Signing with Verbal Walk Message	Each

TTT. Countdown Pedestrian Signal Heads

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

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

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

- (a) Pedestrian signal head housings shall be constructed of a one-piece, 0.250-inch (6 mm) thick, polycarbonate material as shown on the plans. The housing shall include an integral mounting bracket designed for side-of-pole mounting on all makes of signal poles with a terminal compartment and minimum 5-position, double-row terminal block.
- (b) The door, lens and any openings in the housing shall have gaskets or seals to exclude dust and moisture from the inside of the compartment.
- (c) Lenses shall be constructed of polycarbonate material.
- (d) Pedestrian signal head units shall be provided with a manufactured preformed rectangular visor or screen-type louver.
- (e) All plastic material shall be ultraviolet stabilized.
- (f) Indications shall be ITE Class 3 symbol messages. The "Upraised Hand" symbol shall be illuminated with a filled, Portland orange LED module. The "Walking Person" symbol shall be illuminated with a filled, white LED module. The "Countdown" display numbers shall be illuminated with a Portland orange LED module. The LED modules shall be in accordance with applicable portions of Sec 1092.1.
- (g) Pedestrian traffic control signal faces shall be constructed such that all messages are displayed from the same message-bearing surface having a black opaque background. The "Countdown" display shall be located to the right of the "Upraised Hand" and "Walking Person" symbols, which will be overlaid.
- (h) Pedestrian signal heads require "Countdown" displays and shall have the following features:
 - (1) Display numbers must be two digits at least 9 inches in height.

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

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

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

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

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

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

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

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

UUU. 12-Position Backpanel Flashing Yellow Arrow

1.0 Definition. This work will include modifying the cabinets to provide new Special and Standard Overlaps to accommodate Flashing Yellow Arrow installation and programming as detailed on the plan sheets. The installation, cabinet modification, and programming of 3-section permissive only FYA and 4-section protected/permissive FYA signal heads and new FYA signs will vary by intersection. There are four categories for the cabinet modifications:

- One-approach modification
- Two-approach modification
- Three-approach modification
- Four-approach modification

The contractor shall refer to the plans for more details.

1.1 Default Load Switch Assignment – 12 position cabinets

1.1.1 Description. The contractor shall apply 12-compact Flashing Yellow Arrow installation method on all 12-position traffic signal cabinets. The NEMA Load Switch assignment for 12-compact FYA installation method is as follows:

12-Position Cabinet FYA NEMA Load Switch Assignments											
1	2	3	4	5	6	7	8	9	10	11	12
OLA FYA	PHASE 2	OLB FYA	PHASE 4	OLC FYA	PHASE 6	OLD FYA	PHASE 8	PHASE 2 PED	PHASE 4 PED	PHASE 6 PED	PHASE 8 PED
								PHASE 1 LEFT	PHASE 3 LEFT	PHASE 5 LEFT	PHASE 7 LEFT

1.2.2 Wiring. The contractor shall use following color code for the installation of Flashing Yellow Arrow:

If separate 7-conductor cable is present for the existing left turn signal head:

- Red Wire = Load Switch 1, 3, 5, or 7 Red output = 4-section Red Left Arrow
- Orange Wire = Load Switch 1, 3, 5, or 7 Yellow output = 4-section Steady Yellow Arrow
- Black/White Wire = Load Switch 1, 3, 5, or 7 Green output = 4-section Flashing Yellow Arrow
- Green Wire = Load Switch 9, 10, 11, or 12 Yellow output = 4-section Green Arrow

If no separate 7-conductor cable is present for the existing, permissive only, left turn signal head:

- Black Wire = Load Switch 1, 3, 5, or 7 Red output = 3-section Red Left Arrow
- Blue Wire = Load Switch 1, 3, 5, or 7 Yellow output = 3-section Steady Yellow Arrow
- Black/White Wire = Load Switch 1, 3, 5, or 7 Green Output = 3-section Flashing Yellow Arrow

If existing cabinet wiring does not allow the described color code to be met, the contractor shall tag all wires with assigned phases and direction used for the successful completion of the installation of Flashing Yellow Arrow.

1.2.3 Signal Monitor programming. The contractor shall use 12 channel programming mode for the signal monitor.

1.2.4 The contractor shall notify the engineer 24 hours after any successful modification to the load switch assignment, wiring, Controller and MMU programming described in this document.

2.0 Basis of Payment. No direct payment will be made for the cost of equipment, labor, materials or time required to fulfill this provision.

VVV. Network Connected Signal Monitor

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

2.0 Performance.

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

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

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

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

3.0 Construction Requirements.

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

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

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

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

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

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

WWW. Coordination with MoDOT Signal Shop for Cabinet Entry

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

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

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

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

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

XXX. Partial Acceptance of Signalized Intersections

1.0 Description. This work shall consist of maintaining operational signals and detection (both stopbar and advanced) throughout the construction staging, in accordance with Sec 902 and except as approved by the engineer. At the engineer's option, MoDOT may accept intersections for maintenance prior to final acceptance.

1.1 Once an intersection is complete, including but not limited to completion of construction, acceptance of all ADA facilities, and successful testing and operation of signal equipment, the engineer may partially accept that intersection for MoDOT's maintenance prior to Final Acceptance of the entire project.

2.0 Basis of Payment. No direct payment will be made for the cost of equipment, labor, materials or time required to fulfill this provision.

YYY. Traffic Signal Maintenance and Programming

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

2.0 Contractor Maintenance Responsibilities.

2.1 Traffic Signal Maintenance. Once any part of an existing traffic signal within the limits of this project has otherwise been modified and/or adjusted by the contractor or the contractor begins work at an intersection with traffic signals already in operation, then the contractor shall be solely responsible for that traffic signal's maintenance. All traffic signal maintenance shall be the responsibility of the contractor as specified in 902.2 and 902.3, until the Commission accepts the traffic signal for maintenance or as directed by the Engineer. Traffic signals to be accepted for maintenance by the contractor are listed in the below schedule:

Commission Traffic Signals to be Maintained by the Contractor:

- MO-366 @ Geyer
- MO-366 @ Sunset Office
- MO-366 @ US-61/67 Lindbergh
- MO-366 @ Sturdy
- MO-366 @ Glenwood
- MO-366 @ Sappington
- MO-366 @ Watson Industrial – Brookview
- MO-366 @ Pardee
- MO-366 @ Grant
- MO-366 @ Rock Hill-Elm
- MO-366 @ Cheshire
- MO-366 @ Laclede Station/Heege
- MO-366 @ Jacob's Coal-Mackenzie Point

2.2 Traffic Signal Controller Programming. If the contractor modifies and/or adjusts an existing traffic signal controller's programming or makes any roadway changes to reduce the traffic capacity through a signalized intersection within the limits of a project or utilizes a project defined detour that utilizes the traffic signals within the below schedule, the contractor shall be solely responsible for those traffic signal controller programs. All controller programming shall be the responsibility of the contractor as specified in 902.2 or until final acceptance of the project or until released from the responsibility by the Engineer. Traffic signal controller programs to be administered by the contractor are listed in the below schedule:

Traffic Signal Controller Programs to be Administered by the Contractor:

- MO-366 @ Geyer
- MO-366 @ Sunset Office
- MO-366 @ US-61/67 Lindbergh
- MO-366 @ Sturdy
- MO-366 @ Glenwood
- MO-366 @ Sappington
- MO-366 @ Old Sappington
- MO-366 @ Crestwood Plaza
- MO-366 @ Crestview
- MO-366 @ Watson Industrial – Brookview

- MO-366 @ Pardee
- MO-366 @ Grant
- MO-366 @ Rock Hill-Elm
- MO-366 @ Cheshire
- MO-366 @ Laclede Station/Heege
- MO-366 @ Kuda Ct-Trianon Pkwy
- MO-366 @ Jacob's Coal-Mackenzie Point
- MO-366 @ RT-P

2.3 Contractor's Traffic Engineer. If traffic signals are listed in the schedule outlined in section 2.2, the contractor shall have an experienced traffic Engineer with a Professional Engineer's (PE) license in Missouri as well as a Professional Traffic Operations Engineer (PTOE) certification (hereafter referred to as "contractor's traffic Engineer") with the noted experience outlined to section 3.0. MoDOT shall approve the traffic Engineer prior to them being hired.

2.4 Traffic Signal Complaints The contractor shall respond to malfunction complaints or traffic signal timing complaints for those locations detailed in section 2.1 and/or section 2.2 of this provision and as specified in Section 902.21.1. Response time shall be 1 hour for complaints received by the contractor between 6 AM and 6 PM on non-holiday weekdays, and 2 hours for all other times. For cases due to travel times or other extenuating circumstances additional time may be acceptable within reason but must be approved by a Commission Traffic Operations Engineers. These timeframes will replace the '24 hour' response time in Section 105.14 for any traffic signal-related incidents, where the entire cost of the work, if performed by MoDOT personnel or a third party, will be computed as described in Section 108.9 and deducted from the payments due the contractor.

2.5 Traffic Signal Contacts. The contractor must supply to the Engineer and to the Commission's Transportation Management Center (TMC) a contact name and phone number who will be responsible for receiving traffic signal timing complaints for the Engineer. These complaints may be forwarded directly to the contractor by someone other than the Engineer's representative and will not relieve the contractor from properly responding based on the response times of this provision. The contractor shall respond to the Engineer and its representative within 12 hours of the complaint and its remedy. The contractor shall submit to the Engineer's representative a weekly report of complaints received and remedies performed throughout the duration of the project.

2.6 Existing Traffic Signal Controller Programming. The contractor shall request an electronic report from the Engineer on the existing phasing and timing of each traffic signal, which may be the contractor's responsibility to program. The contractor shall give the Engineer 2 weeks' notice to supply the electronic report. The Engineer's representative shall be available to the contractor before any changes are made to a traffic signal or controller to answer any questions about the report. In lieu of the report, the contractor's traffic Engineer may obtain this information from the appropriate agency's central traffic signal control system.

2.7 Traffic Mitigation Plan. The contractor shall notify the Engineer 2 weeks prior to the date of any work impacting the Commission's traffic signals as described in Section 2.1 and/or 2.2. The

contractor shall meet with the Engineer's representatives to discuss their traffic mitigation plan at least 1 week before the date of the first impacts and as needed between construction stages. The traffic mitigation plan should at a minimum include:

- Proposed Timing Plan changes and any models
- Anticipated locations of concern
- A map in electronic format displaying the locations and names of the traffic signals and owning agency as detailed in sections 2.1 and/or section 2.2.
- Other traffic mitigation efforts

2.8 Notification of Changes to Traffic Signal System. The contractor shall notify the Engineer or representative of the changes no later than 1 working day after changes are programmed if unable to provide advance notice as specified in 902.2.

3.0 Contractor's Traffic Engineer Qualifications.

3.1 Credentials. The contractor shall have an experienced traffic Engineer with a Professional Engineer's (PE) license in Missouri as well as a Professional Traffic Operations Engineer (PTOE) certification.

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

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

3.2.2 Corridor Management. Time/space diagram manipulation to successfully adjust offsets and splits for rapidly changing traffic demands.

3.2.3 Controller Programming. Ability to program by hand and by software NTCIP-compatible controllers.

3.2.4 Intersection Programming. Implementation of adjusted and/or new timing plans because of changing traffic demand.

3.2.5 Traffic Signal Software. Use and understanding of all traffic signal controllers and central traffic signal control systems utilized by the Commission.

3.3 Proposed Traffic Engineers. The contractor shall submit the names(s) of proposed traffic engineer(s) and the name(s) of all other personnel on their proposed staff along with detailed experience in all tasks outlined in Paragraph 3.2 above. The Engineer reserves the right to reject any contractor traffic engineer, before the start of work, who does not have sufficient experience or, at any point during the project, which does not satisfy the requirements set forth within this Job Special Provision. A list of potential traffic engineers shall be submitted for review to the Project Manager and the Commission's Traffic Engineers prior to bid.

4.0 Contractor's Traffic Engineer Responsibilities.

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

4.2 Traffic Signal Timing Complaints. The contractor's traffic Engineer shall respond to any traffic signal timing complaints regarding signals outlined in section 2.2 of this provision.

4.3 Traffic Signal Coordination. The contractor's traffic Engineer shall be solely responsible for maintaining the coordination at any affected traffic signal to the satisfaction of the Commission's Traffic Operations Engineers or representative until completion of work as set forth in section 2.2 of this provision. Maintenance of coordination may include the synchronization of the affected controller's internal time clocks to the second using an atomic clock, or other means approved by the Commission's Traffic Operations Engineers. If time clock synchronization is used, the contractor shall verify all affected controllers are synchronized at least 1 time per week with a report to the Engineer or representative. This report will be in the form of a documentation record as spelled out in the Work Zone Traffic Management Plan.

4.4 Traffic Signal Controller Programming. The contractor's traffic Engineer shall be responsible for implementing traffic signal controller programming at each intersection listed in section 2.2 for any of the following scenarios:

- Intersection Impact
- Construction Stage Traffic Switch
- Response to Customer Concern
- New Intersection Turn-On (along with any subsequent revisions)
- Final completion of improvements
- As otherwise directed by the Engineer or the Commission's Traffic Operations Engineers

Proposed timing plans should be submitted to the Commission's Traffic Operations Engineers for review prior to field implementation.

4.5 Central Traffic Signal Control System Setup. If the signal controller type is changed, the contractor's traffic Engineer shall archive the existing controller programming and convert any new controllers to the proper controller interface type in the Commission's central traffic signal control system. If the same controller type is used, all previous databases shall be clearly labeled and saved separately from the default version, and the final timing program shall be uploaded into the Commission's central traffic signal control system and set as the default database. In addition, the contractor's traffic Engineer shall update any intersection diagrams (i.e., XPL) whose intersection controls were modified during construction.

4.6 Controller Program Test Period. The intersection program shall operate properly with no faults or malfunctions for a period of 15 consecutive days as a condition of being accepted for maintenance by the Commission. Any programming faults shall be corrected by the contractor's traffic Engineer per the response protocols of this provision and the 15 days will start over.

4.7 Cabinet Photos. The contractor's traffic Engineer shall obtain cabinet photos of any new or modified traffic signal cabinet affected by the project. The photos shall be captured of the following perspectives and delivered in the .jpg format electronically and via thumb drive to the Commission's Traffic Operations Engineers.

- Power Meter 1 – Away from power meter with meter centered
- Power Meter 2 – Close up with power meter number
- Cabinet 1 – Away with cabinet centered and door closed
- Cabinet 2 – Close up of entire cabinet with door opened
- Cabinet 3 – Close up of center cabinet interior
- Cabinet 4 – Close up of left cabinet interior
- Cabinet 5 – Close up of right cabinet interior
- Cabinet 6 – Close up of back panel

4.8 RRFB/PHB Timing. The contractor's traffic Engineer shall calculate the duration of flash time for any new or modified RRFB's (rectangular rapid flashing beacons) affected by the project. The contractor's traffic engineer shall be responsible for calculating phase intervals and programming traffic signal controllers for new/modified PHB's (pedestrian hybrid beacons) affected by the project.

4.9 Detection. The contractor's traffic Engineer shall assist the contractor in setting up detection as per plan and/or SL District Traffic Signal Detection System JSP. The contractor's traffic Engineer shall verify that all detectors detect vehicles properly and that each detector input into the traffic signal controller is programmed regarding its intended use. The contractor's traffic Engineer is responsible for optimizing the detector operation by utilizing various detector settings in the traffic signal controller.

4.10 Signal Performance Measures. The contractor's traffic Engineer shall setup traffic signal controllers on the Commission's advanced traffic signal performance measures module unless directed otherwise by the Commission's Traffic Operations Engineers. This includes any work on the Commission's advanced traffic signal performance measures module, traffic signal controller(s), and video detection processor(s). The contractor's traffic Engineer shall provide proof of each traffic signal setup in the module to the Commission's Traffic Operations Engineers. The contractor's traffic Engineer shall setup any traffic signal detectors as system detectors in the Commission's central traffic signal control system.

4.11 Preemption Controller Programming. If preemption is to be provided at a traffic signal, the contractor's traffic Engineer shall program the preemption settings in the traffic signal controller per MoDOT EPG guidelines and at the direction of the Commission's Traffic Operations Engineers. The contractor's traffic Engineer shall test the preempt settings at the traffic signal cabinet to verify proper operation.

4.12 Temporary Traffic Signal Programming. The contractor's traffic Engineer shall be advised that bridge work at Gravois Creek is anticipated to reduce capacity along MO-366. The contractor's traffic Engineer shall be responsible for all controller programming and the evaluation

of left turn phasing for temporary traffic signal modifications. See also the Job Special Provision herein for Temporary Traffic Signals and Lighting.

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

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

- Experience submittal
- Preliminary Traffic Mitigation Plan
- Notification of Detour Implementation
- Time Base Reports, As Needed
- Complaint Resolutions
- Audible pedestrian signal voice message files
- Traffic signal photos
- Notification of Restoration to Normal Operations
- Post Project Report

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

8.0 Method of Measurement. Method of measurement shall conform to Section 902.

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

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

ZZZ. 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.

- MO-366 @ Geyer
- MO-366 @ Sunset Plaza
- MO-366 @ US-61/67 Lindbergh SB
- MO-366 @ US-61/67 Lindbergh NB
- MO-366 @ Sturdy
- MO-366 @ Glenwood
- MO-366 @ Watson Ind – Brookview
- MO-366 @ Pardee
- MO-366 @ Grant
- MO-366 @ Cheshire
- MO-366 @ Mackenzie Point (Jacobs Coal 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 contract should be wired in series with the remote flash output to allow for the circuit to open after **three (3)** hours and bring the signal to flash after the side streets service. The remote flash parameters shall be programmed to red/red flash, unless directed otherwise by the Engineer. The CAT-6 cable and serial cable will be run in a separate conduit from the power cables into the cabinet. All conduits will be internal and not visible from the exterior of either the UPS or signal cabinet. The contractor shall verify all control wiring with the manufacture of the traffic signal cabinet assembly for accuracy and compatibility and perform test to ensure proper operation. The contractor shall be responsible for all controller programming to mask the TS2 features to this setup. Upon completion of all controller programming, contractor shall notify contractor's or Commission's traffic engineer (depending on assignment) for uploading into Commission's central signal control system.

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

- (a) A nominal input voltage of 120 VAC.
- (b) An input voltage range of 85 to 175 VAC.
- (c) Two (2) input voltage boost modes.
- (d) Boost-1 shall increase the input voltage from 94 to 115 VAC.
- (e) Boost-2 shall increase the input voltage from 85 to 101 VAC.
- (f) Two (2) input voltages buck modes.

- (g) Buck-1 shall decrease the input voltage from 154 to 124 VAC.
- (h) Buck-2 shall decrease the input voltage from 175 to 142 VAC.

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

- (a) High line disqualify shall be 130 VAC.
- (b) High line qualify shall be 128 VAC.
- (c) Low line qualify shall be 105 VAC.
- (d) Low line disqualify shall be 100 VAC.
- (e) Input current shall be less than 16A with nominal voltage, full load on the output and charger set at 10A.
- (f) 50/60Hz automatic frequency detection with built-in class A EMI filter and transient suppression.

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

- (a) The output voltage of the UPS shall be 120 VAC \pm 10% in line mode.
- (b) The output voltage of the UPS shall be 120 VAC \pm 6% in backup mode.
- (c) The output frequency of the UPS shall be 60Hz \pm 5% in line mode.
- (d) The output frequency of the UPS shall be 60Hz \pm 5% in backup mode.
- (e) The output waveform of the UPS shall be sinusoidal.
- (f) The output voltage total harmonic distortion (THD) shall be less than 3% with a resistive load.
- (g) The efficiency of the UPS at nominal line voltage shall be greater than 98%.
- (h) The efficiency of the UPS in backup mode shall be greater than 84%.
- (i) The step-load response of the UPS shall be full recovery in $\frac{1}{2}$ -cycle @ 50% change with a resistive load.
- (j) The transfer time of the UPS line to back up and backup to line shall be 5ms typical.
- (k) The line qualification time of the UPS shall be user selectable at 3, 10, 20, 30, 40 and 50 seconds.
- (l) The line qualification time of the UPS default shall be three (3) seconds.

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

- (a) The nominal battery voltage of the UPS shall be 48 VDC.
- (b) The battery charger current of the UPS shall be user programmable for 3, 6, and 10 A.
- (c) The battery charger current default setting for the UPS shall be 6A.
- (d) The battery charger in the UPS shall turn OFF when the battery temperature is 50°C.
- (e) The UPS shall have a user programmable temperature compensated battery charger with setting for -2.5, -4, -5 and -6 mV/°C/Cell.
- (f) The UPS shall have a temperature compensated battery charger with a default setting of -5 mV/°C/Cell.
- (g) The UPS shall have a battery charge with a float voltage of 56VDC maximum.
- (h) The UPS shall have a user configurable low battery warning.
- (i) The UPS shall have a default low battery warning set at 47VDC to indication 40% remaining battery capacity.
- (j) The UPS shall have a low battery shutdown set for 42VDC (10.5VDC per battery).

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

- (a) The UPS shall have a 250VAC @ 20A input circuit breaker.
- (b) The UPS shall have a 50A battery circuit breaker.
- (c) The UPS shall have electronic short circuit protection when operating in backup mode.
- (d) The UPS shall indicate an overload warning with a flashing alarm LED when the load is between 95% and 105% of the rated output for the UPS.
- (e) The UPS shall shutdown in two (2) minutes when operating in backup mode when the load is between 106% and 115% of the rated output for the UPS, and the fault LED shall turn ON. The fault LED shall clear when the overload is removed and the utility line power returns.
- (f) The UPS shall shutdown in one (1) minute when operating in backup mode when the load is greater than 115% and the fault LED shall turn ON. The fault LED shall clear when the overload is removed and the utility line power returns.
- (g) The UPS shall disable the backup mode function when operating in line mode if the load exceeds 115% of the rated output for the UPS. The alarm shall be reset when the overload condition is removed.
- (h) The UPS shall display an alarm LED if the battery ambient temperature is greater than 75°C and disable the backup mode function. The alarm shall clear when the battery ambient temperature is less than 70°C.
- (i) The UPS shall display a fault LED when operating in backup mode and shutdown the inverter if the internal temperature is greater than 110°C. The fault shall clear when the utility power returns and the internal temperature is less than 90°C.
- (j) The UPS shall have output over-voltage protection to electronically shutdown the UPS if the output voltage exceeds 132VAC.
- (k) The UPS shall disable the battery charger in two (2) seconds and display an alarm LED if the battery voltage exceeds 59VDC. The alarm shall be cleared and charge enabled when the battery voltage drops to less than 57VDC.
- (l) The UPS shall limit the charger voltage to 52VDC in the event the battery probe is not installed.
- (m) The UPS shall have a battery circuit breaker with reverse polarity protection. The battery circuit breaker shall trip in the event the battery polarity is wired incorrectly.
- (n) The UPS shall have protection for electrical backfeed to the utility that meets UL 1778 and CSA C22.2 No. 107.1.3 requirements.
- (o) The UPS shall have user-selectable settings that are password protected.
- (p) The UPS shall be cooled by a variable speed fan that is microprocessor and PWM controlled.
- (q) The fan shall be OFF when the ambient temperature is less than 40°C.
- (r) The UPS shall display an alarm LED to indicate the fan is enabled but not turning.
- (s) The UPS shall have a fan that is field replaceable.

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

- (a) The UPS shall have a two (2) line/20-character LCD display and control panel that can be rotated for easy user interface.
- (b) The UPS shall have event and alarm logging with time/date stamping for up to 100 historical events.

- (c) The UPS shall have six (6) independently programmable control relays for control and report functions.
- (d) The UPS shall have two (2) independently programmable timers 0 to 8hr with two (2) time-of-day restrictions on each timer.
- (e) The UPS shall be equipped with a RS-232 port, which can be connected to a laptop.
- (f) The UPS shall be equipped with a SNMP Ethernet card.

2.7 Programmable Dry Contacts. Each UPS system shall have the following requirements for the noted features relating to dry contacts:

- (a) The UPS shall have six (6) sets of normally open (NO) and normally closed (NC) single pole double-throw (SPDT) dry contact relays rated for 250VAC @1A.
- (b) The UPS shall have five (5) sets of dry contact relays that are user programmable, C1 through C5, and one relay contact that is factory configured, C6.
- (c) The UPS shall have dry contact relays that are user programmable via either the RS-232 or (optional) Ethernet communication ports to activate under the following conditions:
- (d) ON BATTERY. The relay is energized whenever the UPS switches to battery power.
- (e) LOW BATTERY. The relay is energized when the battery has reached a user defined low battery level of remaining useful capacity. This alarm is latched when a qualified line returns or the inverter shuts down. The default setting is 47VDC (~40%) of remaining useful battery capacity.
- (f) TIMER 1. The relay is energized after being in backup mode for a given amount of time. This timer is adjustable from 0 to 8hr. The default setting is two (2) hours.
- (g) ALARM. The relay is activated after a specific or general alarm is detected.
- (h) conditions include: line frequency, low output voltage, no temperature probe, overload,
- (i) unconnected batteries, high temperature (>55°C) and low temperature (<-20°C).
- (j) FAULT. The relay is activated after a specific or general fault is detected. These faults
- (k) include: short circuit, low battery voltage (<41VDC), high battery voltage (> 59VDC), overload and over temperature (>75°C).
- (l) OFF. The relay is disabled and will not activate under any condition.
- (m) TIMER 2. Same as TIMER 1.
- (n) TIMER 3. Same as TIMER 1.
- (o) AC/DC FAN CONTROL. The relay is activated when the battery ambient temperature is greater than 35°C or at a user programmable threshold from 25 to 55°C @ 5°C increments.
- (p) The UPS shall have a default dry contact relay configuration of:

C1	ON BATT
C2	LOW BATT
C3	LOW BATT
C4	TIMER
C5	ALARM
C6	48VDC

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

- (a) The UPS shall have AC input and AC output terminal blocks mounted on the front panel. The terminal blocks shall be a 3 pole, 35 amp, 300 volt Eurostyle socket terminal strip (22-8 AWG).

- (b) The UPS shall have six (6) user programmable dry contact relay terminal blocks on the front panel. The terminal blocks shall be 3 pole, 35 amp, 300 volt PLUGGABLE TERMINAL BLOCK (12-26 AWG)
- (c) The UPS shall have one (1) user input and one (1) Automatic Transfer Switch (ATS) terminal block on the front panel. The terminal blocks shall be 3 pole, 35 amp, 300 volt PLUGGABLE TERMINAL BLOCK (12-26 AWG).
- (d) The UPS shall have a DE-9 RS-232 connector on the front panel.
- (e) The UPS shall have an RJ45 Ethernet connector on the front panel.
- (f) The UPS shall have a battery connector on the front panel. The battery connector shall be a 50 amp SB® series type battery connector (16-6 AWG).
- (g) The UPS shall have a RJ14 battery temperature probe connector on the front panel.

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

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

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

- (a) The MPS shall be a self-contained module separate from the UPS
- (b) The MPS shall be shelf or rack mountable.
- (c) The MPS shall have terminal blocks labeled “AC Input”, “AC Output”, “To UPS” and “From UPS”.
- (d) The MPS shall be a Break-Before-Make rotary switch.
- (e) The MPS shall be rated at 120VAC @ 20A.
- (f) The MPS shall have a 5-15R duplex receptacle connected to utility line.
- (g) The MPS shall have a 5-15R receptacle labeled “Optional LA-P” to facilitate a plug-in surge suppressor.

- (h) The MPS shall have a 5-15R receptacle labeled "Optional Battery Heater Mat" to provide non-standby power to a battery heater mat.
- (i) The MPS shall have two (2) positions: one labeled "UPS" to connect the utility line to the UPS, and one labeled "Bypass" to connect the utility line to the load.
- (j) The MPS shall have a 15A circuit breaker labeled "AC Input".
- (k) The MPS shall have a 15A circuit breaker labeled "AC Output".

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

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

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

- (a) The ABS shall be rated for 120VAC @ 20 amps.
- (b) The ABS shall be shelf or rack mountable.
- (c) The ABS shall connect the UPS to the load to allow the UPS to continuously power the load.
- (d) The ABS shall transfer the load to utility line when there is no UPS output voltage.
- (e) The ABS shall be activated by the 120VAC from the UPS.
- (f) The ABS shall have a terminal block labeled "L IN", "NEUT", "GRD" and "L OUT".
- (g) The ABS shall have a six (6) foot line cord labeled "UPS IN".
- (h) The ABS shall have a six (6) foot line cord labeled "UPS OUT".
- (i) The ABS shall have a 5-15R duplex receptacle connected to utility line.
- (j) The ABS shall have a 5-15R receptacle labeled "Optional LA-P" to facilitate a plug-in surge suppressor.
- (k) The ABS shall have a 5-15R receptacle labeled "Optional Battery Heater Mat" to provide non-standby power to a battery heater mat.
- (l) The ABS dimensions shall be 4.6"H x 4.75"W x 6.5"D.
- (m) The ABS weight shall be 4lbs.

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

- (a) The GTS shall sense when a portable generator is connected and transfer the load to the generator after a 30s delay.
- (b) The GTS shall be rated for 120VAC @ 20A.

- (c) The GTS shall be shelf or rack mountable.
- (d) The GTS shall have a terminal block labeled "AC INPUT", "AC OUTPUT" and "GENERATOR INPUT".

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

- (a) The batteries shall be Gel Cell Valve Regulated Lead Acid (VRLA) type specifically designed for outdoor use.
- (b) The batteries shall be designed for "Float Service" to provide 100% out-of-box runtime capacity.
- (c) The batteries shall have Silver Alloy positive plates.
- (d) The batteries shall have a five (5) year full replacement, non-prorated warranty.
- (e) The battery capacity rating at 20hr shall be 94Ah.
- (f) The battery shall be 12VDC.
- (g) The number of batteries in the system shall be four (4) or eight (8).
- (h) The batteries shall be connected to provide 48VDC.
- (i) Batteries for each location shall provide full power for all devices shown on the plans that are powered through the signal cabinet for three (3) hours and then send the signal into all red flash and power that state for an additional three (3) hours.

2.15 Battery Heater Mat.

- (a) The battery heater mats shall be available in four (4) battery and single (1) battery sizes.
- (b) The single battery heater mat shall allow for a Master-Slave configuration so two (2) or more mats can be ganged together.
- (c) The battery heater mats shall plug into a 120VAC/5-15 receptacle.
- (d) The battery mats shall be thermally controlled, turning ON at 5°C and turning OFF at 15°C.
- (e) The battery mats shall be thermally fused for 82°C to prevent thermal runaway.

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

- (a) The battery charge management system shall spread the charge voltage equally across all batteries.
- (b) The battery charge management system shall compensate for batteries with different internal resistances.
- (c) The battery charge management system shall have a quality of final balance of $\pm 100\text{mV}$ maximum between any two (2) batteries in the string.
- (d) The battery charge management system shall have reversed polarity protection.
- (e) The battery charge management system shall be designed to CSA C22.2 No. 107.1 and UL 1778 Standards for safe unattended operation.

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

- (a) The surge suppression shall provide protection from voltage transients appearing on the utility line.
- (b) The surge suppression shall be a plug-in module that is field replaceable.
- (c) The surge suppression shall have a LED indicator that turns OFF when the module is no longer providing protection.
- (d) The surge suppression shall have a clamping voltage of 150VAC.

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

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

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

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

Item Number	Item Name	Unit
902-99.02	Combination Pad Mounted 120V/240V Power Supply and Lighting Controller with UPS	Each

AAAA. Removal of City of Crestwood Owned License Plate Reader (LPR) Equipment

1.0 Description. This work consists of contacting the owner of the solar powered LPR equipment owner and coordinating removal of the existing equipment from the existing traffic signal post.

1.1 General. The existing LPR equipment attached to the existing traffic signal post at MO-366 @ Sturdy Drive shall be removed by the representative of City of Crestwood Police Department as delegated by the contact herein. It is the contractor's responsibility to request the removal through the contact person shown and shall do so 30 days prior to the date set by the contractor for removal of the signal post.

<u>City of Crestwood Contact</u>	<u>Phone Number</u>	<u>MoDOT Permit Number</u>
Kent Meier	314-729-4810	SL-22-084678

1.2 The contractor shall keep the engineer informed of the progress made toward compliance with this provision.

2.0 The removed equipment will remain in the possession of the owner until after the signal reconstruction is completed and accepted for maintenance.

3.0 Basis of Payment. No direct payment will be made for any materials, equipment, time, or labor required to comply with this provision.

BBBB. Powder Coated Traffic Signal Equipment for Crestwood

1.0 Description. This work shall consist of providing a "Shamrock" coated finish on new signal equipment inside the city limits of Crestwood as shown in the construction plans, including on new traffic signal posts and new traffic signal mast arm pole assemblies, banding, and related

mounting hardware. Signal cabinet and power supply cabinets shall not receive a powder coated finish. Powder coating shall be done by the manufacturer; no work on site will be allowed. The work shall conform to Section 902 of the Missouri Standard Specifications for Highway Construction, current edition.

2.0 Basis of Acceptance. The basis of acceptance of the powder coated components will be based on a manufacturer's certification, including certified test results for all performance requirements, submitted by the contractor and upon results of any tests performed by the engineer. The contractor shall repair any areas damaged during the testing process by a written method of repair recommended by the powder coating manufacturer. All repairs shall be subject to the engineer's approval.

3.0 Material.

3.1 Color. The finished powder coating shall be in the color specified in the contract (Sherwin-Williams 6454 'Shamrock').

3.2 Powder Coating Type. The powder coating shall be a urethane or triglycidyl isocyanate (TGIC) polyester resin type.

3.3 Galvanizing. When galvanizing is specified, all surfaces of the component shall be galvanized prior to powder coating in accordance with ASTM A 123. Components shall not be water or chromate quenched prior to powder coating.

3.3.1 Testing of Galvanizing. The procedure for determining the mass of coating shall be in accordance with ASTM A 90. This method shall be used in cases where the area of the test specimen can be accurately tested. On specimens shaped so that the area cannot be calculated, the mass of coating shall be determined with a magnetic gauge in accordance with ASTM E 376. The powder coating shall be removed by solvent removal or other any other method that does not affect the zinc coating.

4.0 Workmanship.

4.1 Fabrication. After fabrication of the component, all welds, bolted connections, holes, cut ends, etc. shall be free of slag, burrs or other imperfections that would affect the overall appearance or performance of the finished product.

4.2 Finish of Galvanized Components. When galvanizing is required prior to powder coating, all galvanized surfaces shall be in accordance with the Finish and Appearance requirements of ASTM A 123 prior to application of the powder coating. Prior to powder coating, all surfaces shall be free of uncoated areas, blisters, flux deposits, gross dross inclusions, lumps, globules, runs, drips, and sags. Zinc high spots, such as metal drip line, and other rough areas shall be removed by cleaning with hand or power tools as described in SSPC Surface Preparation Specification 2 or 3. The zinc shall be removed until the zinc is level with the surrounding area, taking care that the base coating is not removed by the cleaning methods. The final galvanized surface shall be an applicable substrate to ensure proper adhesion of the powder coating. After removal of high spots and other rough areas, the coated surface shall be inspected to verify the required zinc

coating thickness is in accordance with ASTM A 123 utilizing a magnetic field type thickness instrument in accordance with ASTM E 376. Any component that does not comply with the zinc coating thickness requirement before or after removal of high spots or rough areas shall be repaired in accordance with ASTM A 780.

4.3 Finish of Powder Coating. The powder coated surface shall be smooth, free of thin spots, pinholes, blemishes, and other coating imperfections.

5.0 Powder Coating Application. The powder coating shall be applied in accordance with all requirements of the supplier of the powder coating material. When powder coating is to be applied over galvanized surfaces, the powder coating application shall also be in accordance with the requirements supplied by the galvanizer. This shall include storage and pre-treatment of the component prior to application of the powder coating. If there is a conflict in the application method between the powder coating supplier and the galvanizer, the powder coater shall resolve the conflict prior to application of any powder coating.

6.0 Performance Requirements. The finished components shall be delivered to the project site with no damage to the powder coating. The contractor shall repair any damaged areas in accordance with the requirements of the powder coating manufacturer at the engineer's discretion. Damage to the powder coating may be the cause for rejection. The powder coating of the finished components shall be in accordance with the following requirements:

Item	Test Method	Requirement
Salt Spray Corrosion, 500 hrs, single scribe	ASTM B 117	Creepage shall not exceed ¼" in either direction from scribe
Cross Hatch Adhesion, min	ASTM D 3359	5A and 5B
Pencil Hardness, Gouge, min	ASTM D 3363	F
Pencil Hardness, Scratch, min	ASTM D 3363	F
Coating Thickness, mils, min ^a	ASTM E 376	3.0
Gloss, 60°, min	ASTM D 523	20
Chemical Resistance ^b	ASTM D 1308	Coating shall show only a slight circular mark

^a For components with an underlying non-magnetic coating over steel, the powder coating thickness will be the difference in thickness measurements with and without the powder coating.

^b The open spot test shall be performed with 5 drops 95% toluene/5% MEK for 30 s.

7.0 Basis of Payment. Payment for furnishing and installing the powder coated signal equipment shall be included with the cost of the post or pole, as noted in the item description. No additional compensation will be provided for compliance with this item. A listing of the specific pay items with powder coating are:

Item No.	Description	Unit
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902-99.02	Powder Coating Signal Equipment, 15 Ft Post	Each
902-99.02	Powder Coating Signal Equipment, 8 Ft Post	Each
902-99.02	Powder Coating Signal Equipment, 4 Ft Post	Each
902-99.02	Powder Coating Signal Equipment, Type CL Post w / 20' Mast Arm	Each
902-99.02	Powder Coating Signal Equipment, Type CL Post w / 30' Mast Arm	Each
902-99.02	Powder Coating Signal Equipment, Type CL Post w / 35' Mast Arm	Each
902-99.02	Powder Coating Signal Equipment, Type CL Post w / 50' Mast Arm	Each
902-99.02	Powder Coating Signal Equipment, Type C Post w / 20' Mast Arm	Each
902-99.02	Powder Coating Signal Equipment, Type C Post w / 25' Mast Arm	Each
902-99.02	Powder Coating Signal Equipment, Type C Post w / 30' Mast Arm	Each
902-99.02	Powder Coating Signal Equipment, Type C Post W/ 40' Mast Arm	Each
902-99.02	Powder Coating Signal Equipment, Type C Post w / 45' Mast Arm	Each
902-99.02	Powder Coating Signal Equipment, Type C Post w / 50' Mast Arm	Each
902-99.02	Powder Coating Signal Equipment, Type BL Post w / 30' Longest Mast Arm	Each
902-99.02	Powder Coating Signal Equipment, Type BL Post w / 40' Longest Mast Arm	Each

CCCC. Painting of Existing Crestwood Signal Equipment

1.0 Existing signal equipment and sign mast arm and posts at locations indicated in the plans and quantity sheets shall be painted in accordance with the following provision.

2.0 Precautions shall be taken with the galvanizer to ensure that the galvanized materials are not water or chromate after galvanizing. Surfaces to be painted shall be prepared in accordance with ASTM D-6386 "Standard Practice for Preparation for Zinc (Hot-Dip Galvanized) Coated Iron and Steel Product and hardware Surface for Painting" using the method for "partially weathered galvanized steel". This includes checking for the presence of a chromate conversion coating or wet storage stain and removing if necessary, smoothing the surface, removing any oil or grease, and priming with one coat (1-2 mils) of a penetrating epoxy sealer meeting the requirements of MSP-96-07C. Surfaces shall then be given two coats (2 mils minimum each) of a color identified as "Shamrock" and matching Sherwin-Williams Paint Color # 6454. It shall be a polyurethane finish coat. Primer and finish coat shall be products from the same manufacturer and used in accordance with the manufacturer's instructions.

3.0 The contractor shall submit to the engineer a detailed painting plan, including product data sheets and finish color sample, prior to the work.

4.0 Payment for painting existing signal equipment, sign mast arms and posts, and appurtenances above the base plate including the exposed bolts, completely in place, including all materials, equipment, tools, labor, and work incidental thereto, shall be considered to be completely covered by the contract unit bid for the following pay items at locations shown on the construction plans:

Item No.	Description	Unit
902-99.01	Painting New Sappington Intersection Signal Equipment	Lump Sum
902-99.01	Painting NB Glenwood Sign Mast Arm and Post	Lump Sum

DDDD. Rectangular Rapid Flashing Beacon Assembly

1.0 Description. Rectangular Rapid Flashing Beacon (RRFB) Assemblies shall be installed at the locations indicated in the plans. Rectangular Rapid Flashing Beacon Assemblies shall consist of one signal post with pedestrian crossing signs and rapid flashing beacons (RRFBs) facing traffic. Each pedestrian crossing shall have two RRFB assemblies, one on each side, as shown on the plans.

2.0 Beacon Requirements.

2.1 General Conditions. RRFB assemblies shall meet requirements set forth by this JSP and in the MUTCD and found at:

http://mutcd.fhwa.dot.gov/resources/interim_approval/ia11/fhwamemo.htm

An RRFB assembly shall consist of two rapidly and alternately flashed rectangular yellow indications having LED-array based pulsing light sources, and shall be designed, located, and operated in accordance with the detailed requirements specified below.

- a. Each post shall have front and rear facing signs and RRFBs for a total of 6 pedestrian signs, 3 instructional signs, and 6 plaques, and 12 RRFBs per crossing.
- b. Power for the RRFBs shall be supplied from solar panel and battery capable of supplying the appropriate power sufficient for 4 RRFBs per post. The solar panel and battery shall be installed on the same post.
- c. The two yellow warning signs shall be fluorescent yellow-green signs.

2.2 Restrictions.

- (a) An RRFB shall only be used to supplement a W11-2 (Pedestrian) with a diagonal downward arrow (W16-7p) plaque, located at or immediately adjacent to a marked crosswalk.

- (b) An RRFB shall not be used for crosswalks across approaches controlled by YIELD signs, STOP signs, or traffic control signals. This prohibition is not applicable to a crosswalk across the approach to and/or egress from a roundabout.
- (c) An RRFB shall not be installed independent of the crossing signs for the approach the RRFB faces. The RRFB shall be installed on the same support as the associated W11-2 (Pedestrian) and plaque.

2.3 Beacon Dimensions and Placement in Sign Assembly.

- (a) Each RRFB shall consist of two rectangular-shaped yellow indications, each with an LED-array based light source. Each RRFB indication shall be a minimum of approximately 5 inches wide by approximately 2 inches high.
- (b) The two RRFB indications shall be aligned horizontally, with the longer dimension horizontal and with a minimum space between the two indications of approximately seven inches (7 in), measured from inside edge of one indication to inside edge of the other indication.
- (c) The outside edges of the RRFB indications, including any housings, shall not project beyond the outside edges of the W11-2 sign.
- (d) As a specific exception to 2003 MUTCD Section 4K.01 guidance, the RRFB shall be located between the bottom of the crossing warning sign and the top of the supplemental downward diagonal arrow plaque (or, in the case of a supplemental advance sign, the AHEAD plaque), rather than 12 inches above or below the sign assembly.

See example photo at:

http://mutcd.fhwa.dot.gov/resources/interim_approval/ia11/fhwamemo.htm#image

2.4 Beacon Flashing Requirements.

- (a) When activated, the two yellow indications in each RRFB shall flash in a rapidly alternating "wig-wag" flashing sequence (left light on, then right light on).
- (b) As a specific exception to 2003 MUTCD Section 4K.01 requirements for the flash rate of beacons, RRFBs shall use a much faster flash rate. Each of the two yellow indications of an RRFB shall have 70 to 80 periods of flashing per minute and shall have alternating but approximately equal periods of rapid pulsing light emissions and dark operation. During each of its 70 to 80 flashing periods per minute, one of the yellow indications shall emit two rapid pulses of light and the other yellow indication shall emit three rapid pulses of light.
- (c) The flash rate of each individual yellow indication, as applied over the full on-off sequence of a flashing period of the indication, shall not be between 5 and 30 flashes per second, to avoid frequencies that might cause seizures.
- (d) The light intensity of the yellow indications shall meet the minimum specifications of Society of Automotive Engineers (SAE) standard J595 (Directional Flashing Optical Warning Devices for Authorized Emergency, Maintenance, and Service Vehicles) dated January 2005.

2.5 Beacon Operation.

- (a) The RRFB shall be normally dark, shall initiate operation only upon pedestrian actuation, and shall cease operation at a predetermined time after the pedestrian actuation. The length of actuation shall be programmable and changeable.
- (b) All RRFBs associated with a given crosswalk (including those with an advance crossing sign, if used) shall, when activated, simultaneously commence operation of their alternating rapid flashing indications and shall cease operation simultaneously.
- (c) A pedestrian instruction sign with the legend PUSH BUTTON TO TURN ON WARNING LIGHTS should be mounted adjacent to or integral with each pedestrian pushbutton. Push buttons shall meet American's with Disabilities Act (ADA) requirements in both location and design with both visible and audible feedback when pushed, as well as the requirements set forth in the JSP titled "Audible Pedestrian Signals and Signing."
- (d) The duration of a predetermined period of operation of the RRFBs following each actuation should be based on the MUTCD procedures for timing of pedestrian clearance times for pedestrian signals.
- (e) A small light directed at and visible to pedestrians in the crosswalk will be installed integral to the RRFB or push button to give confirmation that the RRFB is in operation.

2.6 Other.

- (a) Except as otherwise provided above, all other provisions of the MUTCD applicable to Warning Beacons shall apply to RRFBs.
- (b) The signs shall meet the requirements of Sec 903. The minimum height of the lowest sign shall be seven feet if mounted in sidewalk to meet ADA requirements.
- (c) The post shall be meet MoDOT signal standards in Sec 902. The post will be located so that a minimum of four feet of walkable sidewalk is maintained.
- (d) The Engineer and the District Engineer or his/her designee must approve the site for the RRFB installation. The Engineer, Contractor and the District Traffic Engineer or designee shall field check the location together at least 7 days in advance before the planned installation date. The contractor should coordinate with them in advance and follow their instructions and recommendations. Contact Information is below:

Brian Umfleet
(314)-275-1540

3.0 Method of Measurement. Measurement for installation of RRFBs will be made per each assembly. No measurement will be made for individual items that make up the RRFB assembly.

4.0 Basis of Payment. All labor, equipment, and materials necessary to install the beacons, signs, pedestrian actuation, post, foundation, solar panels, batteries, and other equipment to have a fully operational RRFB system will be included in the pay item below.

Item No.	Unit	Description
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902-99.02	Each	Rectangular Rapid Flashing Beacon
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EEEE. Passive Pedestrian Detection for RRFBs

1.0 Description. The contractor shall select a passive pedestrian detection system from one of the following manufacturer's to be incorporated into the two new RRFB assemblies along MO Route 366.:

TAPCO

MS SEDCO

FLIR

1.1 The selected system shall be either a video detection system, an infrared radar detection system, a thermal imaging detection system or a microwave sensor detection system that automatically activates the RRFB without a pedestrian pushing the push button to cross MO Route 366. The selected system shall work in tandem with the installed push button detectors.

1.2 The manufacturer of the selected system shall provide an onsite representative when the contractor installs the passive pedestrian detection system. This onsite representative shall provide training to MoDOT staff just prior to the system being operational.

2.0 Basis of Payment. Payment for the passive pedestrian detection system, including all material, components, labor and testing of the system selected by the contractor for the RRFBs shall be:

Included in the cost of Pay Item 902-99.02 for Rectangular Rapid Flashing Beacon, Each

per JSP – Rectangular Rapid Flashing Beacon Assembly

FFFF. 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.	Description	Unit
202-20.10	Removal of Improvements	Lump Sum

GGGG. Remove and Relocate Existing Ground Mount Sign

1.0 Description. This item provides for relocating and mounting existing signs and those identified as "special", including any existing backing bars, of various sizes to new posts at locations shown on the plans. The Contractor shall be responsible for all existing signs, including any existing backing bars, to be relocated. During construction, if any sign, including any backing bars, to be relocated is lost, stolen, or damaged in any way, the Contractor shall be responsible for all costs.

2.0 Construction Requirements. The contractor shall install new sign support posts at the locations shown and then relocate and mount existing signs, including any existing backing bars, to the new posts. All work shall be in accordance with the construction requirements of Section 903.

3.0 Method of Measurement. Measurement will be made per each for relocating and mounting existing signs, including any existing backing bars, to new posts. Measurement for any concrete footings, structural steel posts, pipe posts, perforated square steel tubes and anchor sleeves, and breakaway assemblies will be made in accordance with Section 903.

4.0 Basis of Payment. All costs incurred for relocating and mounting existing signs, including existing backing bars, to new posts at the locations shown, complete in place, will be paid for at the contract unit price for:

Item No.	Description	Unit
903-99.02	Remove and Relocate Existing Ground Mount Sign	Each

4.1 Payment for all other labor, equipment, material, and incidental items will be considered completely covered by the bid items included in the contract.

HHHH. Removal and Replacement of Traffic Signs

1.0 Description. Existing traffic signs that have to be removed prior to proposed traffic signs being installed and that are determined essential to the safe and orderly flow of traffic by the Engineer shall be temporarily re-erected immediately by the Contractor at temporary locations in a manner approved by the Engineer. The existing signs shall remain temporarily erected until the final permanent signing has been installed. The Contractor shall maintain the existing signs in a straight and neat condition for the duration of the temporary mounting.

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

IIII. Signs in Concrete

1.0 Description. There are proposed signs located in areas to be covered with new concrete (concrete islands, concrete medians, concrete approaches, concrete sidewalks, etc.). It is recommended to the Contractor that they install the sign post anchor or footing prior to covering the area with new concrete. If the Contractor elects to cover the area with the new concrete prior to installing the proposed sign post anchor or footing, there will be no direct payment for the work required to cut or drill a hole in the new concrete in order to install the proposed sign post anchor or footing.

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

JJJJ. Install MoDOT Furnished IP-Addressable Power Strip

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

2.0 Installation Requirements. The contractor shall mount the power strip on the back side of the ITS Type 7 ITS cabinet (or any open space of other ITS cabinets away from the door) and on any open space of the signal cabinet with the power cable facing away from the door or other devices. The old power strip as well as any other inactive devices, if present, should be removed to make room. If the contractor has any question regarding the inactive

devices, they should contact MoDOT signal shop supervisor. The power source shall be hardwired to cabinet auxiliary breaker with no plug in to any cabinet outlet allowed.

3.0 Acceptance Testing. The Contractor shall contact MoDOT St. Louis ITS staff to verify remote communication to the power strip upon installation and while still on-site. They also shall provide a list of devices and designated port assignments to the ITS group so they can update that port description in the Power Strip software.

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

Item Number	Unit	Description
910.99-02	Each	Install MoDOT Furnished IP-Addressable Power Strip

KKKK. ITS Pull Box

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

2.0 Materials.

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

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

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

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

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

LLLL. ITS Conduit

1.0 Description.

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

2.0 Materials.

2.1 Use PVC conduit meeting the requirements of Sec 1060.

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

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

3.0 Construction Requirements.

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

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

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

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

3.2 Directional Drilling.

3.2.1 Preliminary Site Work. Determine all utility locations near the path of the proposed bore, including depth. Use this information to avoid damage to utilities and/or facilities within the work area. Provide this information, including the sources, to the engineer a minimum of five working days prior to boring. Do not bore until the engineer approves that submittal. Prior to boring, expose all utilities for which it is customary and safe to do so.

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

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

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

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

3.3 Intercept Existing Conduit with Proposed Pull Box.

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

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

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

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

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

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

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

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

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

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

3.4 Install Conduit into Existing Pull Box.

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

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

3.4.3 Install the conduit.

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

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

4.0 Basis of Payment.

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

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

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

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

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

MMMM. Repair ITS Conduit

1.0 Description. This work shall consist of repairing conduit of any size as approved by the engineer. This work is to facilitate installation of new cable in existing conduit. The extent and locations of this work is unknown and will be determined during project construction.

2.0 Construction Methods.

2.1 If conduit is found to be damaged to an extent that the new cable cannot be pulled through it, it will be the judgment of the Engineer whether excavate the damaged section for repair or replace the entire run of conduit.

2.2 The contractor shall splice existing conduit at as described in the plans or as directed by the Engineer. Existing conduit for repair will be spliced in a weather tight fashion using in-kind materials and methods approved in advance by the Engineer.

2.3 The contractor shall backfill-excavated areas with clean fill free of large stones or rubble. The finished grade shall match the surrounding grade to maintain existing drainage patterns and the work area will be restored to match the surrounding area.

2.4 The Contractor shall submit in writing his anticipated method of splicing the conduit to the Engineer for approval prior to performing the work.

3.0 Measurement and Payment. Measurement and payment for work covered by this specification includes equipment, tools, materials, necessary to clean and splice existing conduit sufficient for pulling new cable. Payment will be made as follows:

Item No.	Type	Description
910-99.03	Linear Feet	Conduit Repair

3.1 If the entire run of conduit needs to be replaced, new conduit will be paid for under the pay item, Conduit, HDPE, Trench, 2" or Conduit, 2" HDPE, Drill, 2" as required.

NNNN. Fiber Optic Cable Installation, Relocation, and Replacement

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

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

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

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

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

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

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

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

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

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

2.6.2 Rack-Mounted Interconnect Center. The enclosure shall have brackets and all other hardware required for rack mounting in an EIA standard 19-in. equipment rack. It shall take up

no more than three rack units (1¾ inch each) in the cabinet. It shall have front and rear doors. It shall hold at least four splice trays. These enclosures are typically used in ITS device cabinets.

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

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

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

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

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

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

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

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

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

2.9.4 The closure shall accommodate 144 single mode fiber splices.

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

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

2.9.7 Designed for butt splicing.

2.9.8 No encapsulated materials shall be allowed.

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

3.0 Construction Requirements.

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

3.2 Cable Installation.

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

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

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

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

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

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

3.2.7 Use an approved lubricant, in the amount recommended by the cable manufacturer, to facilitate pulling the cable. After the cable has been installed, wipe the exposed cable in a pull

box, junction box, or cabinet clean of cable lubricant with a cloth before leaving the pull box, junction box, or cabinet.

3.2.8 When installing new fiber optic cable store 30 feet of slack fiber in every intermediate pull box, unless otherwise noted on plans. Additional slack storage, as indicated on the plans, is required in designated pull boxes. At cabinet locations, where cable runs from the pull box directly to an equipment cabinet, store 60 feet of slack fiber optic cable in the pull box, unless otherwise noted on plans. Additionally, treat the cable returning from the cabinet to the pull box as a separate cable, and store 60 feet of slack for these links, unless otherwise noted on plans. Store slack cable neatly on the walls of the pull box using racking hardware acceptable to the engineer. If the length of fiber optic cable being relocated does not allow for fully meeting these slack requirements, maximize fiber slack at cabinets before providing slack in pull boxes.

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

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

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

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

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

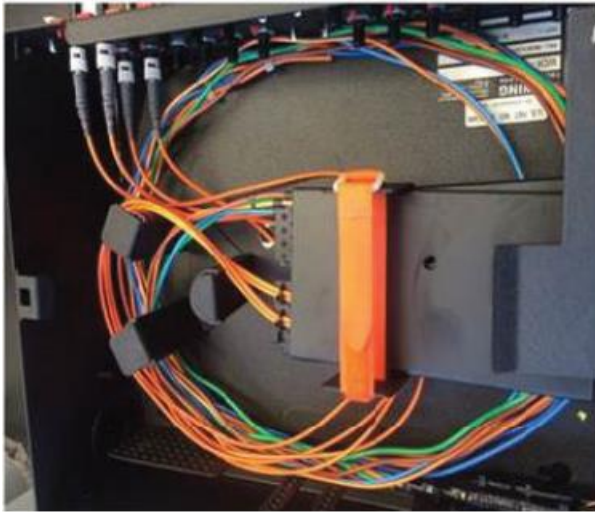
3.3.4 Use a different splice tray for each buffer tube color. If an enclosure contains multiple buffer tubes of the same color, but none of the fibers in one of the tubes are spliced to fibers in other tubes of the same color, use a separate splice tray for that tube.

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

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

Prior to final acceptance and transition of ownership, the contractor shall meet with the Engineer to demonstrate the tracer-wire and locate system is working properly throughout the entire fiber, tracer wire and locate system.

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



Acceptable



Unacceptable

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

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

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

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

4.0 Acceptance Testing.

4.1 General. Test the fiber after installation, including all splicing and termination, is complete. Note, however, that this test procedure involves measuring the loss of fiber installed by others before splicing to it. For each fiber optic link, including spare fibers, determine whether the optical loss is within the limits permitted by these specifications. A link is a continuous segment of fiber between one connector (or unterminated end) and another connector (or unterminated end). When testing links that do not have connectors on both ends, use a mechanical splice to attach a pigtail to the unterminated fiber for the duration of the test.

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

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

$$\begin{aligned} \text{Maximum link loss} = & \text{Measured loss over portion installed by others} \\ & + (\text{Fiber length in km}) \times (0.35 \text{ for } 1310 \text{ nm and } 0.25 \text{ for } 1550 \text{ nm}) \\ & + (\text{Number of fusion splices}) \times (0.05) \\ & + (\text{Number of mechanical splices [for temp. connection]}) \times (0.3) \\ & + (\text{Number of connections}) \times (0.5) \end{aligned}$$

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

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

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

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

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

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

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

0000. Install or Relocate Existing Communication Equipment

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

2.0 Materials.

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

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

3.0 Construction Requirements.

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

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

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

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

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

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

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

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

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

1.0 General.

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

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

2.0 Materials.

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

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

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

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

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

- a) UL listed and labeled to current editions of UL 497B and UL 497C

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

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

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

3.0 Construction Requirements.

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

3.2 The contractor shall use the latest manufacture camera firmware.

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

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

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

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

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

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

4.0 Acceptance Testing.

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

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

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

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

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

QQQQ. CCTV Camera Relocation

1.0 Description. The contractor shall remove the existing stand-alone CCTV camera assembly on pole (camera, cable, PoE (Power over Ethernet) power injector, surge arresters, power pack, encoder, device server, extension pipe, etc.) from existing location to new location as shown on the plans and test it for proper operation. The CCTV camera pole shall be installed on a new concrete foundation, and the existing foundation shall be removed.

2.0 Materials Requirements.

2.1 Foundation. Concrete and reinforcing shall comply with Sec 901.

2.0 Construction Requirements.

2.1 Before removing the existing CCTV camera assembly, the contractor shall inspect all related CCTV camera parts and report to the SLITS Group via an email to SLITS@modot.mo.gov any damage or concern items. Also verify with the SLITS Group that the camera has a quality images and the pan-tilt-zoom works properly.

2.2 The contractor shall replace the CCTV cable from the switch to the pole location. Either an outdoor rated Cat-5 cable or manufacturer provided composite cable (power plus network), depending on the type of camera in place, shall be used with no substitution of cable types allowed. Contractor will provide documentation for either type of cable. In cases where a composite cable is used and the PoE, surge arrester or power pack is damaged, the contractor shall replace them with the MoDOT furnished parts respectively.

2.3 The contractor shall exercise reasonable care in the handling of the equipment during removal, temporary storage, and installation. Should any of the equipment be damaged by the contractor's negligence, it shall be replaced at the contractor's expense.

2.4 The contractor shall install the existing CCTV camera assembly or those parts required in Section 2.2 at the new CCTV pole location as shown on the plans, make all necessary connections, program the CCTV camera per manufacturer specifications, and work with the SLITS Group to test the relocated camera for proper operation.

4.0 Acceptance Testing.

4.1 After installing the camera assembly, test it using manufacturer recommended procedures to demonstrate that high quality video is be transmitted and that the pan, tilt and zoom functions are operating properly. Also, use a device that measures resistance to ground using the three-point fall-of-potential method to demonstrate that the resistance from the air terminal to ground does not exceed 8 ohms. If the installed camera assembly fails to operate properly, and the problem cannot be fixed by changing the wiring or setup parameters, the camera assembly will be deemed defective and the contractor shall return it to the manufacturer for replacement. Except for costs borne by the manufacturer under his warranty agreement, the cost of replacement shall be borne entirely by the contractor.

5.0 Basis of Payment. Measurement and payment for camera assembly removal and installation includes cables, testing, grounding, and all miscellaneous hardware required for a safe, fully operational relocated camera assembly. Installation of new foundation and removal of existing foundation is incidental to the following pay item. Payment will be made as follows:

Item No.	Description	Unit
910-99.02	Remove and Relocate Existing CCTV Camera	Each

RRRR. CCTV Extension Pole Installation

1.0 Description. Furnish and install a 20' x 4" extension pole to the existing signal upright pole as shown on the plans. CCTV Camera assembly installation is paid separately.

2.0 Material. See details in the plans. A metallic finish means a natural aluminum finish. Free from blemishes.

The contractor shall demonstrate to the Engineer that the brackets are installed properly and bandings are tight to the signal and extension poles.

3.0 Basis of Payment. Measurement and payment for CCTV the extension pole includes materials, installation and all miscellaneous hardware required for a fully operational system.

Item No.	Type	Description
910-99.02	Each	CCTV Extension Pole, 20' Metallic Finish

SSSS. Coordination with ITS Staff and Utility Locates

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

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

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

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

subject to the need for ITS devices in the area to be used to manage other traffic impacting workzones.

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

TTTT. ITS Asset Management Tool

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

2.0 Construction Requirements.

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

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

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

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

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

3.0 Acceptance Testing.

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

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

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

Item No.	Type	Description
910-99.01	Lump Sum	ITS Asset Management Tool

UUUU. MoDOT ITS Equipment within Project Limits

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

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

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

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

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

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

VVVV. MoDOT ITS Assets Relocation

1.0 Description. The work consist of relocating existing MoDOT Intelligent Transportation System (ITS) facilities (conduit, cable, and/or pull boxes) that may be in conflict with this project construction sections as noted in the plans.

2.0 Materials. The materials used for relocating MoDOT ITS facilities shall be per MoDOT Approved Product List (APL) and meet all MoDOT Specifications. If the material is not in the APL, the contractor shall submit material specification documents to the Engineer and the MoDOT ITS group (via an email in advance to SLITS@modot.mo.gov) for review and approval.

3.0 Construction Requirements. The Contractor shall be aware there are numerous utilities present along the route in this contract. Utility locates were not performed during the design phase of the project; therefore, the extent of conflicts with utilities are unknown.

3.1 The contractor shall exercise reasonable care relocating MoDOT ITS Assets. Damage to any MoDOT facilities within the area of work caused by the contractor will be deemed by the Engineer as either “non-emergency” or “emergency” upon notification of the damages. Repair to damages will be performed as follows:

- a) Non-Emergency: Contractor will have 4 hours to propose a repair plan to the Engineer for a complete repair within 3 business days.
- b) Emergency: Upon notification of the damage, Contractor must immediately submit a repair plan to the Engineer which will take no more than 4 hours to respond on-site and complete repairs within 48 hours of notification of damage.
- c) In either case, if the proposed plan is unacceptable for any reason to MoDOT, repairs will be made by MoDOT with all costs billed to the Contractor.

3.2 The ITS In-Ground Facilities located within the project limits are a crucial part of the traffic operation system for this area. It is imperative that the downtime be kept to a minimum when replacing, removing, or modifying any existing ITS In-Ground Facilities.

3.3 Prior to any in-ground work, the Contractor shall request for utility locates by contacting Missouri One Call (1-800 DIG-RITE or mo1call.com) for any in-ground installation locations as per plans. If there are any conflicts with MoDOT ITS Assets, the Contractor is responsible for relocation to the satisfaction of the Engineer prior to any in-ground work.

3.4 In the case of a conduit conflict, the Contractor shall trench an area beyond the in-ground work limits, install one or two conduits (must be the same quality as the existing conduit) using Split Duct Method, relocate the existing cables into the new conduit, and seal the conduit joints per manufacturer specifications.

3.5 The Contractor shall coordinate this work with the MoDOT ITS group and have the Engineer’s approval prior to performing this task.

3.6 The contractor shall perform a fiber testing (see below requirements) before and after relocating MoDOT fiber cables at the nearest Node Cabinet at each site as shown on the plans and submit that report to the SLITS Group for review and approval.

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

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

$$\begin{aligned} \text{Maximum link loss} = & \text{Measured loss over portion installed by others} \\ & + (\text{Fiber length in km}) \times (0.35 \text{ for } 1310 \text{ nm and } 0.25 \text{ for } 1550 \text{ nm}) \\ & + (\text{Number of fusion splices}) \times (0.05) \\ & + (\text{Number of mechanical splices [for temp. connection]}) \times (0.3) \\ & + (\text{Number of connections}) \times (0.5) \end{aligned}$$

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

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

3.6.02 Test Result Documentation. Prepare a diagram showing all of the links tested in this project. For the portions installed in this project, show the equipment cabinets, splices, and pigtails. On each line representing a link, show the maximum allowable loss and the actual loss. The actual loss shall be the one measured after all corrective actions have been taken. Submit 5 copies of this diagram to the engineer, along with the calculations for the maximum allowable loss. Submit the diagrams and calculations in an electronic format acceptable to the engineer.

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

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

3.7 The Contractor shall trench an area beyond the in-ground work limits, install one or two conduits (must be the same quality as the existing conduit) using Split Duct Method, relocate the existing cables into the new conduit, and seal the conduit joints per manufacturer specifications.

3.8 Upon completion of this work, the Contractor shall contact the MoDOT ITS group (via email at slits@modot.mo.gov) to verify that all existing MoDOT ITS devices are online and request inspection of this work. Acceptance of this work shall be the sole judgment of the Engineer and the MoDOT ITS group's engineer.

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

4.0 Basis of Payment. Payment for "MoDOT ITS Assets Relocation" shall be paid as Linear Feet and shall include the trenching, conduit installation, conduit coupling, pull boxes, sealing materials, cable relocation, needed fiber testing, restoration of all disturbed area, all labor and work incidental thereto, and shall be considered to be completely covered by the contract unit price for the following pay item:

Item No.	Description	Unit
910-99.03	MoDOT ITS Assets Relocation	Linear Feet

WWWW. Removal of Existing Fiber Optic Cable

1.0 Description. This work shall consist of removal of the existing fiber cable and the tracer wire, if applicable, from existing conduit as shown on the plans. Installation of the new fiber optic cable shall be paid under separate pay item.

2.0 Construction Requirements. The removal of existing fiber optic cables be completed as approved by the Engineer and shall conform to current Missouri Standard Specifications for Highway Construction.

2.1.1 Signal conduit, pull box, or other signal cable damage by construction activity shall be replaced by the contractor at the contractor's expense.

2.1.2 Existing, unused fiber optic cable and tracer wire shall be removed between Geyer Rd and Old Sappington Rd traffic signal cabinets, as well as between the Crestview Lane and Route P traffic signal cabinets as noted in the quantity sheet (including approximate linear feet of fiber) or shown in the plans.

2.1.3 MoDOT's ITS Asset Management Tool (currently the Nexus system) shall be updated to indicate the removal and replacement of the fiber optic cable as shown on the plans.

2.1.4 See separate Job Special Provision for specific guidance regarding update to the MoDOT ITS Asset Management Tool.

2.1.5 The existing conduit containing the existing, unused fiber optic cable may be abandoned.

2.1.6 Any unused pull box, owned by MoDOT, within this project limits shall be removed and filled properly.

2.1.7 No direct pay shall be made for the removal of pull boxes to satisfy the requirement of this provisions.

2.1.8 The Contractor shall not disturb any pull box owned and maintained by other agencies within this project limits.

3.0 Acceptance Testing. Contractor shall demonstrate that all existing fiber has been removed and all original connection points at the upstream intersection are clean and free of obstruction. No direct payment will be made for this testing.

4.0 Measurement and Payment. All costs associated with this work shall be considered completely covered by the following pay item. Please see the above noted segments and the plans for details.

Item No.	Type	Description
910.99.01	Lump Sum	Removal of Existing Fiber Optic Cable

XXXX. Remove In-Pavement Wireless Detection System

1.0 Description. The contractor shall remove the existing Sensys Travel Time Access Points (AP), repeaters and related devices inside the signal cabinet(s) at the below noted intersections, tag them properly and deliver those to MoDOT SL District Signal Shop at the Barrett Station Road Complex. All Sensys Travel Time related cables shall be removed and disposed of properly by the contractor. If the existing Sensys In-Pavement Sensors are being impacted by this project's pavement improvements, those pucks must be removed, disposed of and the hole shall be filled properly by the contractor. If the pavement improvement is not impacting those In-pavement sensors, they can be left-in-place or covered by the new pavement.

Sensys Travel Time In-Pavement Wireless System Intersections within the project limits:

- a. Watson Rd (Rte 366) at S Geyer Road Intersection
- b. Watson Rd (Rte 366) at S Sturdy Road Intersection
- c. Watson Rd (Rte 366) at Crestview LaneRoad Intersection
- d. Watson Rd (Rte 366) at S Elm Ave/Rock Hill Rd Intersection
- e. Watson Rd (Rte 366) at Laclede Station Road/Heege Road Intersection
- f. Watson Rd (Rte 366) at S Route P Intersection

2.0 Construction Requirements.

2.1 The contractor **shall remove the existing** Sensys Travel Time Access Points (AP), repeaters and related devices inside the signal cabinet(s) at the noted intersections, tag them properly and deliver those to MoDOT SL District Signal Shop at the Barrett Station Road Complex. This work shall be coordinated with MoDOT SL District Signal Shop Supervisor.

2.2 The existing Sensys Intersection Detection or Bluetooth Systems shall NOT be disturbed unless otherwise noted in the plans.

3.0 Measurement and Payment.

3.1 Measurement and payment for items covered by this specification include the training, documentation, and acceptance testing, in addition to all materials and equipment necessary to restore the system to be fully operational. No direct pay for installation of any device or any epoxy required by the manufacturer to construct a fully functional system.

Item Number	Description	Unit
910-99.02	Remove In-Pavement Wireless Detection System Per Intersection	Each

YYYY. Adjust to Grade MoDOT Pull Boxes

1.0 Description. This work shall consist of adjusting to grade existing ITS, signal, and lighting pull boxes as directed and approved by engineer. If it is unfeasible to adjust the existing pull box to grade, the contractor shall replace the pull box while maintaining all existing fiber and electrical connections as per other special provisions. All Pull Box adjustments to grade shall be completed where indicated on drawings and directed by Engineer. Pull boxes within the pedestrian access route shall be placed at grades compliant with ADA. If the pull box to be adjusted is within a proposed curb ramp, the pull box shall be relocated outside the curb ramp limits. Relocation of these pull boxes is included in the adjust to grade pay item.

1.0 Material. All materials and construction requirements shall conform to Secs 901 and 902 as well as Sec 910 and Division 1000.

3.0 Construction Requirements. This item shall consist of furnishing and installing “Adjust to Grade MoDOT Pull Box”, complete, in place. All of the following is considered part of this work: ITS, connections, maintaining ITS network, grounding, electrical connections, wiring, foundations, covers, connectors, etc. required to the complete the Pull Box Adjust to Grade.

All construction shall be completed according to Missouri Department of Transportation standards.

4.0 Basis of Payment. Payment for furnishing all labor, equipment, materials, and incidentals necessary to Adjust Pull Boxes to Grade shall be completely covered by the contract unit price for the following pay item:

Item Number	Description	Unit
910-99.02	Adjust to Grade MoDOT Pull Box	Each

There shall be No Direct Pay for adjusting ITS connections, electrical connections, wiring, or other adjustments to the ITS, signal, and lighting infrastructure except as identified by other pay items within this contract.