Job No. J6I3020C
Interstate 270
St. Louis City/St. Louis County

JOB SPECIAL PROVISIONS TABLE OF CONTENTS (ROADWAY)

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

	MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION 105 W. CAPITOL AVE. JEFFERSON CITY, MO 65102 Phone 1-888-275-6636
	HORNER & SHIFRIN, INC. *401 South 18th Street Suite 400* *St. Louis, MO 63103* *314-531-4321* Certificate of Authority: #000159 Expiration Date: December 31, 2022
	JOB NUMBER: J6I3020C ST. LOUIS CITY, MO ST. LOUIS COUNTY, MO DATE PREPARED: 3/17/2022
Date:	ADDENDUM DATE:
The following items of the Job Special Provisions (Roadway) are authenticated by this seal.	

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JOB
SPECIAL PROVISION

A. General – Federal JSP-09-02G

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 2021 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

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 shall be completed on or before the date specified below. Completion by this date shall be in accordance with the requirements of Sec 108.7.1.

Notice to Proceed: Month XX, 20XX
Completion Date: Month XX, 20XX

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
J6I3020C	**XX**	**$9,800**

3.0 Liquidated Damages for Contract Administrative Costs. Should the contractor fail to complete the work on or before the 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 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 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-02-06K

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

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

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

2.0 Traffic Management Schedule.

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

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

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

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

2.5 Traffic Congestion. The contractor shall, upon approval of the engineer, take proactive measures to reduce traffic congestion in the work zone. The contractor shall immediately implement appropriate mitigation strategies whenever traffic congestion reaches an excess of **10 minutes** to prevent congestion from escalating 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.

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:

12:00 noon July 1, 2022 – 6:00 a.m. July 5, 2022
12:00 noon June 30, 2023 – 6:00 a.m. July 5, 2023
12:00 noon July 2, 2024 – 6:00 a.m. July 8, 2024
12:00 noon July 2, 2025 – 6:00 a.m. July 7, 2025
12:00 noon July 2, 2026 – 6:00 a.m. July 7, 2026

3.1.2 Special Events. This project is within close proximity to the Old Chain of Rocks Bridge, which serves as a venue for Eagle Days hosted by Great Rivers Greenway. This event occurs during the second and third weekends of January each year. The Contractor shall coordinate all lane closures and detours on this project with representatives of Great Rivers Greenway and the Engineer to coordinate and accommodate the Eagle Days event.

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

3.3 The contractor's operations will be allowed a single lane closure during the following working hours. It shall be the responsibility of the engineer to determine if the work hours below may be modified.

Route I-270 Eastbound:
9:00 p.m. - 5:00 a.m. Monday through Sunday

Route I-270 Westbound:
9:00 p.m. - 5:00 a.m. Monday through Sunday

Riverview Drive:
All Day Single Lane Closure in each direction for entire duration of the project

3.4 When the contractor's operations are offline away from traffic or protected behind temporary traffic barrier, and no lane closures are necessary on I-270 or Riverview, the contractor will be allowed to work 24-hours a day, Monday through Sunday.

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 **$1,000 per 15 minute increment** for each 15 minutes that the temporary lane closures are in place and not open to traffic in excess of the limitation as specified elsewhere in this special provision. It shall be the responsibility of the engineer to determine the quantity of unapproved closure time.

3.5.1 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 Interchange Exit Ramp Traffic Flow. The contractor is required to pay special attention at all times 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 relatec to work on this project.

I-270 at Riverview Drive
I-270 at Lilac Drive (during Riverview Drive ramp closures only)

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 avod 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 resultin gin a reduction of the traffic queue on the ramps. Work will not be allowed to proceed or restrictions reinstalled 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.

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

D. Emergency Provisions and Incident Management JSP-90-11A

1.0 The contractor shall have communication equipment on the construction site or immediate access to other communication systems to request assistance from law enforcement or other emergency agencies for incident management. In case of traffic accidents or the need for law enforcement to direct or restore traffic flow through the job site, the contractor shall notify law enforcement or other emergency agencies immediately as needed. The area engineer's office shall also be notified when the contractor requests emergency assistance.

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

Missouri Highway Patrol 573-751-3313		
City of Riverview	City of Bellefontaine	City of St. Louis
Fire: 314-867-3889		Fire: 314-533-3406
Police: 314-868-9130	Police: 314-868-9130	Police: 314-444-5309
St. Louis Chief of Police (314-444-5309) St. Louis County Chief of Police (314-615-4260)		

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.

Lisa Kuntz, Project Manager – North St. Louis County
MoDOT, St. Louis District
1590 Woodlake Drive
Chesterfield, MO 63017

Telephone Number: 314-453-1879
Email: Lisa.Kuntz@modot.mo.gov

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

F. Utilities

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

Utility Name	Known Required Adjustment	Type
David Santiago **Ameren-Missouri (Distribution)** 6440 North Hanley Road Berkley, MO 63134 Telephone: (636) 793-1487 Email: dsantiago@ameren.com	No	Power
Tonya Wells **ATT-Distribution** 402 North 3rd Street St. Charles, MO 63301 Telephone: (636) 949-1323 Email: tw2745@att.com	Yes	Communication
Ray Brooman **Missouri American Water** 727 Craig Road Creve Coeur, MO 63131 Telephone: (314) 996-2214 Email: ray.brooman@amwater.com	No	Water
Nick Eggert **Spire Energy** 6400 Graham Rd Berkeley, MO 63134 Telephone: (314) 330-5720 Email: Nicholas.eggert@spireenergy.com	No	Gas
Justin DeCarlo **St. Louis City Lighting** 1900 Hampton St. Louis, MO 63139 Telephone: (314) 647-3111 Email: decarloj@stlouis-mo.gov	Yes	Lighting
Mark Nankivil **St. Louis City Water Division** 1640 S. Kingshighway Blvd St. Louis, MO 63110 Telephone: (314) 633-9023 Email: mnankivil@stlwater.com	Yes	Water

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 Ameren Electric

Ameren Electric has the following existing facilities within the project limits:

- Overhead facilities running north-south along a power pole run along the east side of Riverview Dr. in the northeast quadrant of Riverview Dr. and I-270. This pole run falls just east of the project limits.
    - No impact to these facilities is anticipated.
- Overhead facilities running from an Ameren pole at Sta. 18+01, 153' RT and a City Lighting utility pole with the slope limits at Sta. 18+69, 89' RT.
    - No impact to these facilities is anticipated.
- Buried facilities crossing the centerline of Riverview Dr. at Sta. 23+92.
    - No impact to these facilities is anticipated.

The contractor shall coordinate with Ameren Electric, as necessary, and take measures to protect in place their existing facilities during construction.

The contractor shall directly contact Ameren Electric to verify the locations of their facilities.

MoDOT cannot warrant the information above which was provided by Ameren Electric.

The contractor shall discuss the planned work as it relates to Ameren Missouri's energized power lines and coordinate with Ameren Missouri for the installation of any insulation covers over the lines and/or any other designated requirements. Please note Ameren Missouri has revised its policy regarding the charges for placement, length of use and relocation of covers. The contractor is advised to contact Ameren Missouri regarding the current policy so the anticipated cost to the contractor can be estimated and a tentative schedule for this payment can be established. The Contractor shall contact Ameren Missouri at least two weeks in advance of when construction work is scheduled to begin to request covers to be placed at a given location.

No direct payment will be made for this provision. The contractor is responsible for any charges from Ameren Missouri for this provision and payment will be directly to Ameren Missouri.

3.0 AT&T Distribution

AT&T Distribution has the following existing facilities within the project limits:

- Buried facilities running north-south along the east edge of pavement on the east side of Riverview Dr. from a manhole at Sta. 6+32, 119' RT, to a handhole at Sta. 20+45, 97' RT.
    - Proposed drainage structure and pipe fall on buried facilities from Sta. 11+94, 89' RT to Sta. 12+07, 90' RT.
        - Four Potholes needed to determine if this facility is in conflict. Pay Item 902-99.02
        - AT&T-D will relocate during construction in coordination with contractor.
    - Proposed drainage falls on and runs parallel to buried facilities from Sta. 12+80, 78' RT to Sta. 15+01, 77' RT.

        - AT&T-D will relocate during construction in coordination with contractor.
- Buried facilities running north-south along the east side of Riverview Dr. from a manhole at Sta. 6+32, 119' RT, to a handhole at Sta. 20+45, 97' RT. This facility crosses under the ramps and I-270 mainline approximately 168' east of the centerline of Riverview Dr.
    - Proposed drainage structure falls on buried telephone facilities just south of ramp 3 on the east side of Riverview between Sta. 10+87, 163' RT and Sta. 10+99, 165' RT.
        - AT&T-D will relocate during construction in coordination with contractor.
- Buried facilities crossing the centerline of Riverview Drive at Sta. 20+37, just north of the slope limits for this project.
    - No impact to these facilities is anticipated.

The contractor shall contact AT&T-D a minimum of 4 weeks ahead of need for adjustment.

The contractor shall coordinate with AT&T (Distribution), as necessary, and take measures to protect in place their existing facilities during construction.

The contractor shall directly contact AT&T (Distribution) to verify the locations of their facilities.

MoDOT cannot warrant the information above which was provided by AT&T (Distribution).

4.0 Missouri American Water Company

Missouri American Water has the following existing facilities within the project limits:

- MAWC 12" HDPE main crossing I-270 between a valve at Sta. 749+21, 215' RT on the south side of I-270, and a valve at Sta. 750+19, 147' LT on the north side of I-270. This main crosses the centerline of the project at Sta. 749+77.
    - No impact to these facilities is anticipated.
- MAWC 12" DI main running east from a valve at Riverview Dr. Sta. 20+29, 47' LT, at the northwest end of the project limits on Riverview Dr. This main runs west from that valve and does not cross into the project limits.
    - No impact to these facilities is anticipated.

The contractor shall coordinate with Missouri American Water Company, as necessary, and take measures to protect in place their existing facilities during construction.

The contractor shall directly contact MAWC to verify the locations of their facilities.

MoDOT cannot warrant the information above which was provided by MAWC.

5.0 Spire Energy

Spire Energy has the following existing facilities within the project limits:

- Buried 4" PL IP main with a 10" encasement running north along the east side of Riverview adjacent to the project limits. This main runs from a gas stop at Sta. 19+09, 96' and continues north through the northern project limits.
    - No impact to this facility is anticipated.
- Buried 2" PL IP main running east from a 4" main through the entrance to the gas station on the east side of Riverview Dr. This main falls just east of the project limits.

- No impact to this facility is anticipated.

The contractor shall contact Spire a minimum of 3 weeks ahead of need for adjustment.

The contractor shall coordinate with Spire as necessary and take measures to protect in place their existing facilities during construction.

The contractor shall directly contact Spire Energy to verify location of facilities.

MoDOT cannot warrant the information above which was provided by Spire Energy.

6.0 St. Louis City Lighting

St. Louis City Lighting has the following existing facilities within the project limits:

- Buried facilities running north under the proposed median on Riverview Dr. from the start of the project limits on the south side of I-270 to a light pole at Sta. 10+02, 28' RT.
  - No impacts to the buried facilities or to the existing light poles in the proposed median are anticipated.
- Buried facilities running east under the northbound lanes of Riverview Dr. from a power pole at Sta. 18+57, 28' RT to a utility pole at Sta. 18+69, 89' RT.
  - No impact to these buried facilities is anticipated.
- Power pole at Sta. 18+69 falls 6' from east edge of pavement.
  - No impact to this facility is anticipated.
- Light pole at Sta. 18+57, 28' RT falls within 2' of the proposed curb line along northbound Riverview Dr. north of I-270.
  - Lighting plans has this pole "To Be Removed."
- Buried facilities running north under the proposed median from an existing light pole at Sta. 18+57, 28' RT through the northern project limits.
  - No impact to the buried facilities is anticipated.

The contractor shall coordinate with St. Louis City Lighting, as necessary, and take measures to protect in place their existing facilities during construction.

The contractor shall directly contact City Lighting to verify the locations of their facilities.

MoDOT cannot warrant the information above which was provided by City Lighting.

7.0 St. Louis City Water

St. Louis City Water has the following existing facilities within the project limits:

- 12" main running north-south under the southbound lanes of Riverview Dr throughout the project limits.
  - Proposed drainage structure crosses 12" main at Sta. 11+85, 11' LT and Sta. 13+49, 12' LT.
    - Three Potholes needed to determine if main is in conflict. Pay Item 902-99.02
    - Relocation will be by Contactor during construction in coordination with City of St. Louis Water Division. The tie in at the 12" main will be completed by City of St. Louis Water Division. Pay Item 603.99.03

    - See JSP, "City of St Louis Water Division 12" Main Relocation"
- Proposed retaining wall/bridge abutment falls on hydrant at Sta. 13+25, 33' LT.
    - Relocation will be by Contactor during construction in coordination with City of St. Louis Water Division. The tie in at the 12" main, 6" pipe lateral and new Fire Hydrant will be completed by City of St. Louis Water Division. Pay Item 603-99.01
        - See JSP, "City of St. Louis Water Division Fire Hydrant Relocation"
- Main of unknown size falls under fill area and under proposed curb along the east side of Riverview Dr. from Sta. 16+83, 69' RT to 16+84, 143' RT.
    - If relocation is needed, the Contactor will relocate the 12" main during construction in coordination with City of St Louis Water Division. City of St. Louis Water Division will complete the tie ins into the 12" main.
- Main of unknown size running crossing the centerline of Riverview Dr. at Sta. 16+85.
    - Proposed drainage structure falls on main at Sta. 16+85, 34' RT.
    - Pothole by Contractor needed at this location to determine if main is in conflict.
    - If relocation is needed, the Contactor will relocate the main during construction in coordination with City of St Louis Water Division. City of St. Louis Water Division will complete the tie in into the 12" main.
- Main of unknown size running east-west and crossing the centerline of Riverview Dr. at Sta. 18+39.
    - Main falls under fill area and proposed curb from Sta. 18+38, 41' RT to Sta. 18+40, 99' RT.
        - No impact to this facility is anticipated.
- Main of unknown size running east-west and crossing the centerline of Riverview Dr. at Sta. 19+13.
    - Main falls under fill area and under proposed curb from Sta. 19+13, 56' RT to Sta. 19+12, 84' RT.
        - No impact to this facility is anticipated.
- Existing water manhole in the southbound lanes of Riverview at Sta. 13+26, 15' LT falls in proposed pavement.
    - will be adjusted to grade by the Contactor during construction in coordination with City of St. Louis Water Division. Pay Item 604-20.10
- Existing water manhole in the southbound lanes of Riverview at Sta. 19+13, 7' LT falls in proposed pavement.
    - will be adjusted to grade by the Contactor during construction in coordination with City of St Louis Water Division. Pay Item 604-20.10
- Existing water manhole in the southbound lanes of Riverview Dr. at Sta. 20+28, 11' LT falls in proposed pavement.
    - will be adjusted to grade by the Contactor during construction in coordination with City of St. Louis Water Division. Pay Item 604-20.10
- Water line of unknown size running from a manhole in Riverview Dr. at Sta. 20+28, 11' LT to a valve at Sta. 20+28, 37' LT.
    - No impact to this facility is anticipated.

The contractor shall coordinate with St. Louis City Water, as necessary, and take measures to protect in place their existing facilities during construction.

The contractor shall directly contact St. Louis City Water to verify the locations of their facilities.

MoDOT cannot warrant the information above which was provided by St. Louis City Water.

G. Potholing Utility Facilities

1.0 Description. The contractor is advised the Utility Companies in the project limits will not "pot hole" their underground utilities facilities for the contractor on this project. The contractor shall be responsible to "pothole" any existing utilities under the pavement or outside the pavement for all the contractor's needs to construct work associated with the project. Core drilling pavement prior to pot holing may be necessary.

2.0 Basis of Payment. All labor, equipment, materials, and restoration necessary to pothole buried utilities shall be paid for under:

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

H. City of St. Louis Water Division 12" Main Relocation

1.1 Description of Work. All work necessary to pothole a 12" City of St Louis Water Main to determine conflict with proposed drainage and to relocate, if necessary, the existing 12" water main crossing Interstate 270 along Riverview Drive. Work shall include furnishing all materials, equipment, and doing all work necessary to complete the relocation of the 12" City of St. Louis Water Main and to properly abandon the existing 12" water main crossing Interstate 270 if conflict with the proposed drainage crossing. The relocated 12" water main shall be in place and fully in service before the old 12" water main if in conflict with the proposed drainage can be abandoned and any work by the contractor to construct the proposed drainage can take place.

1.2 Work Included. The contractor shall furnish and install all pipes, fittings, taps, transition couplings, encasements, and casing pipe including all potholing, excavation, trenching, boring, and backfilling. The contractor shall perform all pressure tests and disinfection of the relocated water main pipe in addition to the removal and disposal of all materials so designated by the City of St. Louis Water Division or the engineer. 6' x 6' pits will be created at the main tap locations for City of St. Louis Water Divisions use to tap the relocated 12" main into the existing main.

1.3 Work by Others. The City of St. Louis Water Division will perform all work related to making the final connections between the contractor installed water main pipe and the existing water main in Riverview Drive and capping the existing lines as indicated.

1.4 City of St Louis Water Division Standards. The contractor shall perform all work to relocate the 12" water main pipe in accordance with current City of St. Louis Water Division standards and specification and to the manufacturer specifications and standards for the materials used.

2.0 Materials

2.1 Submittals. The contractor shall certify that all pipe, pipe fittings, casings, and related materials comply with the applicable specifications and AWWA Standards as stated hereinafter. Each manufacturer shall submit an affidavit of compliance stating that all material meets with the specified requirements.

2.1.1 At least five (5) days in advance of the intention to backfill the water line trench, the contractor shall make available to the engineer a sample of the limestone screening backfill material so that acceptance tests can be performed.

2.2 Products.

2.2.1 Ductile Iron Pipe. The 12" water main pipe to be installed shall be Class 54 ductile iron with restrained joints at pipe joints, fittings, and valves. All water main pipe shall be 12" nominal diameter. The water main pipe installed shall be U.S. TR Flex and shall be in accordance with AWWA specification C151-latest edition and shall be supplied with a bituminous coating and a cement mortar lining. The bituminous coating shall be approximately 1 mil thick and shall be continuous, smooth, and not brittle when cold, nor sticky when hot, and shall be strongly adherent to the pipe. The cement mortar lining shall be not less than 1/16" thick and its composition and application shall be in accordance with AWWA specification C104-latest edition.

2.2.2 Fittings. All pipe fittings shall have a pressure rating of 250 psi and an iron strength of 25,000 psi or a 350 psi pressure rating when made with ductile iron. All pipe fittings shall meet the standard for Gray-Iron and Ductile-Iron fittings, 3 inch through 48 inch, for Water and Other Liquids as approved by the American National Standards Institute and the American Water Works Association ANSI/AWWA C110/A21.10-latest revision. No fittings will have an angle of more than 45°.

2.2.3 Rubber Gasket Joints. All rubber gasket joints shall meet the standards for Rubber Gasket Joints for Ductile-Iron and Gray-Iron Pressure Pipe and Fittings as approved by the American National Standards Institute and the American Water Works Association ANSI/AWWA C111/A21.11-latest revision.

2.2.4 Polyethylene Encasement. All pipe, fittings, valves, etc. shall be encased with polyethylene meeting the standards for Polyethylene Encasement for Ductile-Iron Piping for Water and Other Liquids as approved by the American National Standards Institute ANSI A21.5-latest revision and the American Water Works Association AWWA C105 Standards.

2.2.5 Limestone Screenings for Backfill. Only clean material, free of all trash and debris, shall be used for backfilling. This material shall be limestone screenings conforming to the following gradation:

100% passing	1/2" sieve
70%-80% passing	3/8" sieve
20%-40% passing	#10 sieve
4%-12% passing	#200 sieve

2.2.6 Other Material. All other material not specifically described but, necessary to complete the installation of the 12" water main, shall also be supplied by the contractor.

3.0 Execution

3.1 General. The contractor shall handle and store all material in accordance with AWWA Standard C600-latest revision. Care shall be taken to ensure that the polyethylene encasement on the pipe is not damaged during backfilling operations.

3.2 Underground Utilities. The location of underground utilities as shown on the plan sheets are plotted from data collected from existing records, field locates done by the utility or their locate service provider, and test hole information. There may be other utilities present inside the project limits, the existence of which is presently not known, that are not shown on the plan sheets. The contractor shall follow in accordance with the rules and guidelines of the Missouri One Call system to get utilities marked prior to any excavation work taking place for the potholes or, if required, installation of the 12" water main pipe or for any other incidental excavation related to this project.

3.2.1 Should the contractor desire that any utility be relocated for his convenience, then the contractor shall arrange for such relocation directly with the utility company involved with the full cost billed directly to the contractor.

3.2.2 The contractor should use care and caution to work around and not cause damage to any utility facility encountered while doing the work to pothole or, if necessary, to install the 12" water main pipe. Should the contractor damage or destroy any utility facility through negligence in his work practices, then the contractor shall contact the utility company involved directly and shall arrange and cooperate with the utility for any work necessary to repair or replace the damaged utility. Any costs from the utility for repair or replacement of a damaged utility facility determined to be caused by negligence of the contractor shall be billed directly to the contractor.

3.3 Explosives. The use of explosives is specifically prohibited for this work.

3.4 Subsoil Stabilization. Subsoil which is otherwise solid but, becomes mucky due to construction operations shall be reinforced with one or more layers of crushed limestone or gravel as directed by the engineer. No direct pay shall be made to the contractor for placement of any subsoil stabilization determined necessary by the engineer and this work shall be considered an incidental cost related to the work to install the 12" water main pipe and will be completely covered in the contract unit pricing for the relocation of the 12" St. Louis Water Main along Riverview Drive at Interstate 270.

4.0 Trenching

4.1 General. The contractor shall be responsible for the condition of all excavations created for work incidental to and for installation of the 12" water main pipe. The contractor shall be responsible for properly and adequately draining the excavation and shall protect all excavations from cave-ins or sliding so, that the work of installing the water main pipe, valves, and other related facilities may be carried on safely and efficiently. All slides and cave-ins shall be handled, removed, and corrected by the contractor without compensation at whatever time and under whatever circumstances they may occur.

4.2 Lines and Grades. The minimum trench width for the water main pipe installed shall be 36 inches. The minimum line trench depth for the water main pipe installed shall be 42 inches to 48 inches unless otherwise directed by the engineer. The water main pipe installed shall be bedded on limestone screenings with a minimum thickness of 4 inches (Type 4 Laying Condition, Ductile-Iron Pipe Research Association).

4.2.1 The water main pipe with fittings, valves, and other appurtenances shall be laid in coordination with the City of St. Louis Water Division. Should unanticipated interferences be

encountered during the progress of the work, deviations may be allowed with prior approval of St. Louis City Water Division.

4.3 Changes in Line and Grades. Should there be any changes in the line and grade of the water main pipe caused by unanticipated interferences encountered during installation of the water main pipe that deviate the line and grade from the original path, the contractor shall stop work and get authorization from the engineer before proceeding with any approved changes to the line and grade of the water main pipe installation. The contractor shall submit a written request to the engineer or St. Louis City Water prior to any work resuming for approval of any compensation for additional costs created by the authorized change in the line and grade to the water main pipe installation.

4.4 Additional Excavation. Additional excavation shall be made at each joint to provide adequate workspace to allow for field inspection and to insure proper support over the entire length of pipe. Additional excavation shall also be made where required for placement of the valves and valve boxes, and to provide space for sheeting and bracing where such protection is needed. No direct payment will be made to the contractor for the above items either as additional excavation, backfill, or pavement repairs.

4.5 Unauthorized Excavation. All unauthorized excavation carried beyond or below the lines and grades stated in Sec 4.2, shall be at the contractor's own expense. Any unauthorized excess space between the undisturbed bottom of the excavation and the normal trench depth as stated in Sec 4.2 shall be filled by the contractor at his own expense with approved fill material and compacted as specified herein.

4.6 Sheeting and Bracing.

4.6.1 All sheeting and bracing required for any excavation shall be furnished and placed by the contractor and no direct payment will be made for such sheeting and bracing.

4.6.2 The contractor shall be responsible for the sufficiency of any sheeting and bracing that is used for the work to install the 12” water main pipe and for any damage to persons and property resulting from failure to use such bracing and sheeting, as well as from its improper design, placement, maintenance, or removal. All sheeting and bracing shall be removed as the backfill is made to any excavation. The contractor is cautioned because of the nature of the soil, heavy bracing may be necessary, and the engineer reserves the right to order additional bracing if it is determined proper precautions are not being taken by the contractor for the safety of the work force or to protect adjacent structures, pavement, and property.

4.7 Encasement Removal and Existing Pipe Preparation. The contractor shall remove any existing concrete encasement and clean off as necessary the existing water main pipe to permit proper installation of the transition coupling. Prior to the installation of the transition coupling, the existing water main pipe shall be inspected by a representative of the City of St. Louis Water Division or the by the engineer for approval to proceed with the installation.

4.8 Concrete and Masonry Removal. Should any concrete or masonry structures or debris be encountered in the trench line for installation of the 12” water main pipe, then such concrete and masonry shall be removed from the trench line as required for installation of the water main pipe or as directed by the engineer. Removal of such concrete and masonry structures from the trench line shall be done in such a manner as not to damage any adjacent structures to remain

in place. No direct payment shall be made to the contractor for compliance with what is stated here in Sec 4.8.

4.9 Disposition of Excavated Materials. All materials excavated and otherwise disturbed, damaged, or removed by the contractor shall be promptly removed from the site and disposed of by the contractor at his own expense. A Waste Disposal Agreement shall be executed and signed by the contractor and the engineer before any excavated material is removed from the site. Excavated material can be used as backfill material for the top 1 foot of the trench line outside the curb line of any existing or new pavements or outside the excavation limits of any new structures with prior approval from the engineer. No excavated material shall be stockpiled on site without approval from the engineer.

5.0 Backfilling and Compacting

5.1 General. Excavations shall be clean and free of all trash and debris prior to placement backfill material. Only clean, approved backfill material as specified herein shall be used and no excavated material shall be placed in the trench line without approval from the engineer. No frozen backfill material shall be used nor shall backfill material be placed in or against frozen surfaces.

5.2 Backfilling of any excavated area shall be done in equal lifts not to exceed 1 foot in thickness before compacted. Each lift shall be compacted before placement of any succeeding lifts. A minimum of 4 inches of limestone screenings shall be placed in the trench line and compacted prior to placement of the water main pipe. All backfill material shall be compacted to 90% of the maximum density at optimum moisture content as determined by AASHTO Designation T-180, Method A. The upper 18 inches of any excavated area underneath pavement or new structures shall be compacted to at least 95% of the maximum density at optimum moisture content. The contractor shall mechanically work the backfill material with compaction equipment to achieve the maximum density results specified. All compacted backfill material is subject to approval and removal as directed by the engineer. The contractor shall allow sufficient time during backfilling operations for the engineer to inspect and test the backfill material for compaction.

5.2.1 Any backfill material that has been determined by the engineer to be improperly placed or compacted by the contractor shall be removed by the contractor from the excavation limits to a depth directed by the engineer. The backfill material should then be replaced in the excavation and compacted by the contractor to the satisfaction of the engineer. Any such work to replace any backfill material improperly placed or compacted shall be done at the contractor's own expense.

6.0 Pipe and Fittings

6.1 Installation of all pipes, fittings, and appurtenances shall be installed according to the Installation of Ductile-Iron Water Mains and Their Appurtenances standard approved by the American National Standards Institute and American Water Works Association ANSI/AWWA C600-latest edition.

6.2 The Ductile-Iron Pipe Research Association also publishes a pamphlet titled "A Guide for the Installation of the Ductile-Iron Pipe" which is useful in outlining and describing the proper installation methods.

7.0 Polyethylene Encasement

7.1 The contractor shall install a polyethylene encasement material around all water main pipe, fittings, and valves in accordance with ANSI/AWWA C105/A21.5-latest revision. Joints in the polyethylene material shall be overlapped and shall be sealed with an adhesive tape. Any rips, punctures, or tears in the polyethylene shall be repaired with a small patch of similar polyethylene material wrapped around the damaged area and secured in place with adhesive tape.

8.0 Salvage

8.1 Salvage of all materials removed for installation of the relocated 12" water main pipe, fittings, and valves shall become property of the contractor unless determined otherwise by the STLWD. The contractor shall be responsible for the prompt removal and disposal of any salvaged materials.

9.0 Testing

9.1 The relocated water main pipe shall be subject to a leakage test conducted by the contractor. The contractor shall supply all labor, material, equipment, and supervision required to conduct a leak test. The leak test must be conducted in the presence of a representative from the City of St. Louis Water Division and the engineer. Leakage shall be defined as the quantity of water that must be supplied into the water main pipe, or valve section thereof, to maintain the specified leakage test pressure after the air in the water main pipe has been expelled and the water main pipe is filled with water. The leakage test pressure shall be 150 psi based upon the lowest point of the section of relocated water main pipe being tested and shall be conducted over a period of at least 3 hours. The contractor has the option to conduct the leakage test with the excavation either left open or backfilled. If there is any pressure loss determined within the 3-hour test period on the section of water main pipe being tested, the contractor shall, at no additional cost to the contract, locate and repair or replace the defective items causing the test failure in a manner acceptable to the representative from the City of St. Louis Water Division and the engineer. The contractor shall conduct leakage tests on the relocated section of water main pipe until satisfactory results from the leakage test are achieved and accepted by the representative from the City of St. Louis Water Division and the engineer.

10.0 Disinfection

10.1 The relocated section of water main pipe shall be disinfected per the requirements of the City of St. Louis Water Division and AWWA C651-latest revision after acceptable results have been achieved from the leakage test. Bacterial testing of the disinfected section of water main pipe will be provided by the City of St. Louis Water Division at no cost to the contractor. Appropriate sampling points for collecting the test samples shall be provided to the contractor.

11.0 Payment

11.1 The costs for all materials, potholes, installation, excavation, rock removal, boring, backfilling, and testing of the relocated 12" City of St. Louis Water Division water main and casing pipe shall be included in the following bid items.

Item No.	Type	Description
603-99.03	LF	Trench 12 in. Water Main
902-99.02	EA	Pothole

12.2 Payment shall constitute full compensation for all costs of labor, equipment, materials, potholes, trenching, trenching in rock, boring, boring in rock, backfilling, supervision, coordination with utilities, and all such incidentals as may be required including making all joints electrically conductive, for installing polyethylene encasement, testing, flushing, and all other items of work involved in the installation of the relocated water main pipe and steel casing. Also included will be the cost for any valves, fittings, couplings, bends, spacers, corporation stops, "bosses", valve boxes, frames and covers, cathodic protection, concrete reaction blocking, wrapping tape, bracing, sheeting, dewatering, loading and disposal of excavated material, pavement removal, compacting backfilled material, and all other items of material or work not listed that shall be considered incidental and necessary to successfully complete the relocation of the 12" water main. Final payment for the bid items listed in Sec 12.1 will be based upon the agreed linear foot measurements taken by the engineer and contractor at the time of installation for the 12" water main pipe.

I. City of St. Louis Water Division Fire Hydrant Relocation

1.0 Description of Work. All work necessary to relocate the existing City of St. Louis Water Division fire hydrant and its appurtenances from its current location at station 13+24 32' LT to behind the new curb line of Riverview Drive station 12+06 38' LT, left of centerline Riverview Drive. Work shall include furnishing all materials, equipment, and labor necessary to complete the relocation of the hydrant to behind the new curb line of Riverview Drive.

1.2 Work Included. The contractor shall furnish all excavation, trenching, and backfilling at the locations, new and existing, as directed by the City of St. Louis Water Division. The contractor shall be responsible for the removal and disposal of all materials so designated by the City of St. Louis Water Division or the engineer. Contractor will expose the existing fire hydrant 6" lead from the tap location at the 12" Main and continue exposing the 6" lead back to the existing fire hydrant location at Sta 13+24 32' LT; 6' x 6' pits will be created at the main tap location and at the existing fire hydrant location for City of St. Louis Water Divisions use to Cap out the existing fire hydrant control valve & recover the existing fire hydrant.

1.3 Work by Others. The City of St. Louis Water Division will perform all work, excluding excavation of the existing lead and tap location of the 12" main, related to terminating the existing hydrant lead at the water main pipe in Riverview Drive. The City of St. Louis Water Division will also perform all work and supply all materials related to connecting the hydrant lead pipe to the existing 12" water main pipe in Riverview Drive at the point of connection established by the St. Louis City Water Division. The Contractor is advised that the amount of non-compliant Buy America steel/iron per City of St. Louis Water Division supplied fire hydrant unit is $23.78..

1.4 City of St. Louis Water Division Standards. The contractor shall perform all work to install the relocated fire hydrant assembly at station 12+06, left of centerline Riverview Drive in accordance with current City of St. Louis Water Division standards and specification and to the manufacturer specifications and standards for the materials used.

2.0 Materials

2.1 Submittals. The contractor shall certify that all pipe, pipe fittings, and related materials comply with the applicable specifications and AWWA Standards as stated hereinafter. Each manufacturer shall submit an affidavit of compliance stating that all material meets with the specified requirements.

2.1.1 At least five (5) days in advance of the intention to backfill the water line trench, the contractor shall make available to the engineer a sample of the limestone screening backfill material so that acceptance tests can be performed.

2.2 Products.

2.2.1 Ductile Iron Pipe. The water main pipe to be installed shall be Class 52 ductile iron with restrained joints at pipe joints, fittings, and valves. The water main pipe installed shall be U.S. TR Flex and shall be in accordance with AWWA specification C151-latest edition and shall be supplied with a bituminous coating and a cement mortar lining. The bituminous coating shall be approximately 1 mil thick and shall be continuous, smooth, and not brittle when cold or sticky when hot, and shall be strongly adherent to the pipe. The cement mortar lining shall be not less than 1/16" thick and its composition and application shall be in accordance with AWWA specification C104-latest edition.

2.2.2 Fittings. All pipe fittings shall have a pressure rating of 250 psi and iron strength of 25,000 psi or a 350 psi pressure rating when made with ductile iron. All pipe fittings shall meet the standard for Gray-Iron and Ductile-Iron fittings, 3 inch through 48 inch, for Water and Other Liquids as approved by the American National Standards Institute and the American Water Works Association ANSI/AWWA C110/A21.10-latest revision. No fittings will have an angle of more than 45°.

2.2.3 Rubber Gasket Joints. All rubber gasket joints shall meet the standards for Rubber Gasket Joints for Ductile-Iron and Gray-Iron Pressure Pipe and Fittings as approved by the American National Standards Institute and the American Water Works Association ANSI/AWWA C111/A21.11-latest revision.

2.2.4 Polyethylene Encasement. All pipe, fittings, valves, etc. shall be encased with polyethylene meeting the Polyethylene Encasement for Ductile-Iron Piping for Water and Other Liquids as approved by the American National Standards Institute ANSI A21.5-latest revision and the American Water Works Association AWWA C105 Standards.

2.2.5 Limestone Screenings for Backfill. Only clean material, free of all trash and debris, shall be used for backfilling. This material shall be limestone screenings conforming to the following gradation:

100% passing	1/2" sieve
70%-80% passing	3/8" sieve
20%-40% passing	#10 sieve
4%-12% passing	#200 sieve

2.2.6 Other Material. All other material not specifically described but, necessary to complete the relocation and installation of the new hydrant assembly and appurtenances at station 12+06, left of centerline Riverview Drive, shall also be supplied by the contractor.

3.0 Execution

3.1 General. The contractor shall handle and store all material in accordance with AWWA Standard C600-latest revision. Care shall be taken to ensure that the polyethylene encasement on the pipe is not damaged during backfilling operations.

3.2 Underground Utilities. The location of underground utilities as shown on the plan sheets plotted from existing records, field locates done by the utility or their locate service provider, and test hole information. There may be other utilities present inside the project limits, the existence of which is presently not known, that are not shown on the plan sheets. The contractor shall follow the rules and guidelines of the Missouri One Call system to get utilities marked prior to any excavation work taking place for relocation and installation of the relocated hydrant assembly and appurtenances at station 12+06, left of centerline Riverview Drive or for any other incidental excavation related to this project.

3.2.1 Should the contractor desire that any utility be relocated for his convenience, then the contractor shall arrange for such relocation directly with the utility company involved with the full cost billed directly to the contractor.

3.2.2 The contractor should use care and caution to work around and not cause damage to any utility facility encountered while doing the work to relocate and install the relocated hydrant assembly. Should the contractor damage or destroy any utility facility through negligence in his work practices, then the contractor shall contact the utility company involved directly and shall arrange and cooperate with the utility for any work necessary to repair or replace the damaged utility. Any costs from the utility for repair or replacement of a damaged utility facility determined to be caused by the negligence of the contractor, shall be billed directly to the contractor.

3.3 Explosives. The use of explosives is specifically prohibited for this work.

3.4 Subsoil Stabilization. Subsoil, which is otherwise solid but, becomes mucky due to construction operations shall be reinforced with one or more layers of crushed limestone or gravel as directed by the engineer. No direct pay will be made to the contractor for any subsoil stabilization determined necessary by the engineer. Any stabilization of subsoil caused by the contractors work to relocate and install the hydrant assembly and appurtenances shall be considered an incidental cost and no direct payment shall be made to the contractor to stabilize the subsoil. All costs associated with any subsoil stabilization caused by the hydrant relocation and install, will be completely covered in the contract unit price for the relocation and installation of the St. Louis City Water Division hydrant assembly and appurtenances at station 12+06, left of centerline Riverview Drive.

4.0 Trenching

4.1 General. The contractor shall be responsible for the condition of all excavations created for work incidental to and for relocation and installation of the St. Louis City Water Division hydrant assembly at station 12+06, left of centerline Riverview Drive. The contractor shall be responsible for properly and adequate draining the excavation and shall protect all excavations from cave-ins or sliding so, that the work of installing the water main pipe, valves, hydrant

assembly, and other related facilities may be carried on safely and efficiently. All slides and cave-ins shall be handled, removed, and corrected by the contractor without compensation at whatever time and under whatever circumstances they may occur.

4.2 Lines and Grades. The minimum trench width for any water main pipe installed from the tie-in at the water main pipe to the location of the relocated hydrant assembly shall be 36 inches. The minimum line trench depth for any water main pipe installed shall be 42 inches to 48 inches unless otherwise noted on the plan sheets as directed by the engineer. The water main pipe installed shall be bedded on limestone screenings with a minimum thickness of 4 inches (Type 4 Laying Condition, Ductile-Iron Pipe Research Association).

4.2.1 The water main pipe with fittings, valves along with the new hydrant assembly and other appurtenances shall be installed to the lines, grades, and location shown on the plan sheets. Should unanticipated interferences be encountered during the progress of the work, deviations from the lines, grades, and location shown on the plan sheets may be required.

4.3 Changes in Line and Grades. Should there be any changes in the line, grade, or location of the relocated hydrant assembly caused by unanticipated interferences encountered during installation that deviate from the line, grade, or location, the contractor shall stop work and get authorization from the engineer for any changes to the line, grade, or location of the relocated hydrant assembly before proceeding with any further work. The contractor shall submit a written request to the engineer prior to work resuming for compensation of any additional costs created by the authorized changes in the line, grade, or location of the water main pipe, hydrant assembly and appurtenances.

4.4 Additional Excavation. Additional excavation shall be made at each joint to provide adequate workspace to allow for field inspection and to insure proper support over the entire length of pipe. Additional excavation shall also be made where required for placement of the valves, valve boxes, hydrant assembly and appurtenances, and to provide space for sheeting and bracing where such protection is needed. No payment will be made for the above items either as additional excavation, backfill, or pavement repairs.

4.5 Unauthorized Excavation. All unauthorized excavation carried beyond or below the lines and grades stated in Sec 4.2 or as shown on the plan sheets, shall be at the contractor's own expense. Any unauthorized excess space between the undisturbed bottom of the excavation and the normal trench depth as stated in Sec 4.2 or as shown on the plan sheets, shall be filled by the contractor at his own expense with approved fill material and compacted as specified herein.

4.6 Sheeting and Bracing.

4.6.1 All sheeting and bracing required for any excavation shall be furnished and placed by the contractor and no direct payment will be made for such sheeting and bracing.

4.6.2 The contractor shall be responsible for the sufficiency of any sheeting and bracing that is used for the work to relocate and install the hydrant assembly at station 12+06, left of centerline Riverview Drive and for any damage to persons and property resulting from failure to use such bracing and sheeting, as well as from its improper design, placement, maintenance, or removal. All sheeting and bracing shall be removed as the backfill is made to any excavation. The contractor is cautioned because of the nature of the soil, heavy bracing may be necessary, and the engineer reserves the right to order additional bracing if it is determined proper precautions

are not being taken by the contractor for the safety of the work force or to protect adjacent structures, pavement, and property.

4.7 Encasement Removal and Existing Pipe Preparation. City of St. Louis Water Division forces shall remove any existing concrete encasement and clean off as necessary the existing water main pipe in Riverview Drive to permit proper installation of the transition coupling for the new hydrant lead pipe.

4.8 Concrete and Masonry Removal. Should concrete or masonry structures or debris be encountered in the trench line during installation work for the relocation and installation of the relocated hydrant assembly and appurtenances, then such concrete and masonry shall be removed from the trench line as required for installation work to continue or as directed by the engineer. Removal of such concrete and masonry structures from the trench line or for installation of the relocated hydrant assembly shall be done in such a manner as not to damage any adjacent structures that are to remain in place. No direct payment shall be made to the contractor for compliance with what is stated here in Sec 4.8.

4.9 Disposition of Excavated Materials. All materials excavated and otherwise disturbed, damaged, or removed by the contractor shall be promptly removed from the site and disposed of the by the contractor at his own expense. A Waste Disposal Agreement shall be executed and signed by the contractor and the engineer prior to any excavated material being removed from the site. Suitable excavated material can be used as backfill material for the top 1 foot of the trench line or any excavation located outside the curb line of any existing or new pavements or outside the excavation limits of any new structures with approval from the engineer. No excavated material shall be stockpiled on site without approval from the engineer.

5.0 Backfilling and Compacting

5.1 General. Excavations shall be clean and free of all trash and debris prior to placement backfill material. Only clean, approved backfill material as specified herein shall be used and no excavated material shall be placed in the trench line without approval from the engineer. No frozen backfill material shall be used nor shall backfill material be placed in or against frozen surfaces.

5.2 Backfilling of any excavated area shall be done in equal lifts not to exceed 1 foot in thickness before compacted. Each lift shall be compacted before placement of any succeeding lifts. A minimum of 4 inches of limestone screenings shall be placed in the trench line and compacted prior to placement of the water main pipe. All backfill material shall be compacted to 90% of the maximum density at optimum moisture content as determined by AASHTO Designation T-180, Method A. The upper 18 inches of any excavated area underneath pavement or new structures shall be compacted to at least 95% of the maximum density at optimum moisture content. The contractor shall mechanically work the backfill material with compaction equipment to achieve the maximum density results specified. All compacted backfill material is subject to approval and removal as directed by the engineer. The contractor shall allow sufficient time during backfilling operations for the engineer to inspect and test the backfill material for compaction.

5.2.1 Any backfill material that has been determined by the engineer to be improperly placed or compacted by the contractor shall be removed by the contractor from the excavation limits to a depth directed by the engineer. The backfill material should then be replaced in the excavation and compacted by the contractor to the satisfaction of the engineer. Any such work to replace

any backfill material improperly placed or compacted shall be done at the contractor's own expense.

6.0 Pipe and Fittings

6.1 Installation of all pipes, fittings, and appurtenances shall be installed according to the Installation of Ductile-Iron Water Mains and Their Appurtenances standard approved by the American National Standards Institute and American Water Works Association ANSI/AWWA C600-latest edition.

6.2 The Ductile-Iron Pipe Research Association also publishes a pamphlet titled "A Guide for the Installation of the Ductile-Iron Pipe" which is useful in outlining and describing the proper installation methods.

7.0 Polyethylene Encasement

7.1 The contractor shall install a polyethylene encasement material around all water main pipe, fittings, and valves in accordance with ANSI/AWWA C105/A21.5-latest revision. Joints in the polyethylene material shall be overlapped and shall be sealed with an adhesive tape. Any rips, punctures, or tears in the polyethylene shall be repaired with a small patch of similar polyethylene material wrapped around the damaged area and secured in place with adhesive tape.

8.0 Salvage

8.1 Salvage of any and all materials removed that are related to the existing hydrant lead pipe from the existing water main pipe in Riverview Drive to the location of the relocated hydrant assembly, pipes, fittings, and valves, shall become property of the contractor unless determined otherwise by the City of St. Louis Water Division. The existing hydrant assembly shall remain the property of the City of St. Louis Water Division. The contractor is responsible for removal of the existing hydrant assembly and delivery of the existing hydrant assembly to the City of St. Louis Water Division storage yard located at 4600 McRee Avenue, St. Louis MO 63110. There shall be no direct payment to the contractor for removal and delivery of the existing hydrant assembly to the City of St. Louis Water Division yard on McRee Avenue. The contractor shall be responsible for the prompt removal and proper disposal of any other salvaged materials.

9.0 Testing

9.1 The relocated water main pipe shall be subject to a leakage test conducted by the contractor. The contractor shall supply all labor, material, equipment, and supervision required to conduct a leak test. The leak test must be conducted in the presence of a representative from the City of St. Louis Water Division and the engineer. Leakage shall be defined as the quantity of water that must be supplied into the relocated water main pipe, or valve section thereof, to maintain the specified leakage test pressure after the air in the water main pipe has been expelled and the water main pipe is filled with water. The leakage test pressure shall be 150 psi based upon the lowest point of the section of relocated water main pipe being tested and shall be conducted over a period of at least 3 hours. The contractor has the option to conduct the leakage test with the excavation either left open or backfilled. If there is any pressure loss determined within the 3-hour test period on the section of water main pipe being tested, the contractor shall, at no additional cost to the contract, locate and repair or replace the defective items causing the test failure in a manner acceptable to the representative from the City of St.

Louis Water Division and the engineer. The contractor shall conduct leakage tests on the relocated section of water main pipe until satisfactory results from the leakage test are achieved and accepted by the representative from the City of St. Louis Water Division and the engineer.

10. Basis of Payment. The cost for all removals, materials, installation, excavation, backfilling, and testing for the relocation of the City of St. Louis Water Division hydrant assembly and appurtenances shown on the plan sheets at station 12+06 left of centerline Riverview Drive, shall be paid for at the price listed in the contract for the following bid item:

Item No.	Type	Description
603-99.01	Lump Sum	Relocation City of St. Louis Water Hydrant at station 12+06

10.1 This payment shall constitute full compensation for all costs of labor, equipment, materials, trenching, backfilling, supervision, coordination with utilities, and all such incidentals as may be required including making all joints electrically conductive, for installing polyethylene encasement, testing, flushing, and all other items of work involved in the relocation of the hydrant assembly and appurtenances. Also included will be the cost for any valves, fittings, couplings, bends, spacers, corporation stops, "bosses", valve boxes, frames and covers, cathodic protection, concrete reaction blocking, wrapping tape, bracing, sheeting, dewatering, loading and disposal of excavated material, pavement removal, compacting backfilled material, and all other items of material or work not listed that shall be considered incidental and necessary to successfully complete the relocation of the City of St. Louis Water Division hydrant assembly at station 12+06 left of centerline Riverview Drive.

J. MSD As-built Submittals (Permit #20MSD-00466)

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 **20MSD-00466** and subsequent revisions after all drainage structures related to the project have been constructed or adjusted.

1.1 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.

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

2.0 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.

K. Required Combination Bid

1.0 Description. A special bidding procedure will be used on this project to determine the successful bidder. This provision applies to the Illinois Department of Transportation (IDOT), I-270 Chain of Rocks Bridge, Contract #76J90 and the Missouri Department of Transportation (MoDOT) Riverview Interchange, Job No. J6I3020C are being let as a REQUIRED COMBINATION BID. Interested pre-qualified contractors are REQUIRED to bid on both contracts. If a bidder does not bid on both contracts, they will be considered a non-responsive Bidder. IDOT and MoDOT will review each bid for conformance to their respective State's procedures for award. The winning low bid will be the bidder who's combined bid (IDOT Contract #76J90 + MoDOT Job No J6I3020C = Low Bid) is the lowest, while meeting each State's respective requirements for award. Each contract will be awarded by the individual state to the lowest responsive bidder with the lowest combination of bids. If a bidder would be declared non-responsive then the project will be awarded to the next bidder with the lowest combination of bids. A joint announcement on the required combination project award will be made after each state has given concurrence. This will be a special letting and not follow the normal project award letting announcements.

The contractor shall be responsible for the traffic staging coordination between the two projects, while maintaining both project schedules. Delays due to traffic staging between the two contracts will not be considered for delays caused by the other project in the required combination bid. Delays due to events outside the contractor's control will be eligible for consideration according to each State's respective guidelines for delays.

L. Potential Construction Delays Due to High Water

1.0 Description. The project completion date will be extended one calendar day for each calendar day the Contractor is unable to progress critical path items of the work when the Mississippi River stage as measured on the Mississippi River at St. Louis Gage is at or above the elevations tabulated below for any days that critical path items of the work cannot be performed due to a closure of the river by the U.S. Coast Guard.

Datum	Elevation
Gage Reading	26.7ft
NGVD29	406.7
NAV88	406.3

These river delays will be noncompensable. The Contractor's progress schedule, current at the time of the high water event will be used for the purposed of identifying critical path activities and the total number of calendar days the contract will be extended.

Gage readings and historical information for the Mississippi River at St. Louis can be found at:

https://water.weather.gov/ahps2/hydrograph.php?wfo=lsx&gage=eadm7&prob_type=stage&source=hydrograph

M. Potential Construction Delays Due to Low Water

1.0 Description. The project completion date will be extended one calendar day for each calendar day the Contractor is unable to progress critical path items of the work when the Mississippi River stage as measured on the Mississippi River at St. Louis Gage is at or below the elevations tabulated below for any days that critical path items of the work cannot be performed due to low water depths.

Datum	Elevation
Gage Reading	-2.68ft
NGVD29	377.3
NAV88	376.9

These river delays will be noncompensable. The Contractor's progress schedule, current at the time of the low water event will be used for the purpose of identifying critical path activities and the total number of calendar days the contract will be extended.

River bottom elevations may prevent full navigation without correction if the Mississippi River stage as measured on the Mississippi River at St. Louis Gage is at or below the elevations tabulated below

Datum	Elevation
Gage Reading	4.32ft
NGVD29	384.3
NAV88	383.9

Dredging of the channel may be performed to provide the depth of river required for bridge work. Dredging methods are limited mechanical excavation or the use of a dust bin, the use of a cutterhead as a method for dredging activities is prohibited.

Gage readings and historical information for the Mississippi River at St. Louis can be found at:

https://water.weather.gov/ahps2/hydrograph.php?wfo=lsx&gage=eadm7&prob_type=stage&source=hydrograph

N. Modified Pavement Marking Removal

1.0 Description. The first sentence of Sec 620.50.3.2 shall be removed and replaced with the following:

> Where required, measurement for the removal of pavement markings will be made to the nearest linear foot per 4-inches of width. No additional pay factor, based upon 4-inches of width, shall be included for removals unless the striping

width is greater than 6-inches. 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.

2.0 Pavement Marking Removal shall be in accordance with Section 620.50 and specifically as follows with the exception in Section 1.0 above.

3.0 Construction Requirements. Removal of all pavement marking within the project limits shall be as shown on the plans or as approved by the engineer. Pavement marking shall be completely removed to the satisfaction of the engineer with minimal damage to the pavement. The contractor shall use an approved **water blasting method** to remove the pavement marking on concrete surfaces. No more than five percent of the existing marking shall remain. The pavement surface shall not be left scarred with an image that might mislead traffic. Any excess damage or scarring of the pavement shall be repaired at the contractor's expense. It shall be the contractor's responsibility to determine what type of material needs to be removed.

4.0 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.

5.0 Basis of Payment. The accepted quantity of pavement marking removal including all labor, equipment, and material necessary to remove the existing marking will be paid for at the contract unit price for the following pay item:

Item 620-70.01	Pavement Marking Removal	LF
Item 620-70.02	Pavement Marking Removal (Symbols)	EA

O. 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 on 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.

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

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.

P. Seeding, Fertilizing and Erosion Control Blanket

1.0 Description. All areas disturbed by the contractor's operations and not specified to be covered with sod, shall be fertilized and seeded. In lieu of mulch, the seeded areas shall be covered by an erosion control blanket.

2.0 Fertilizing. All work shall be in accordance with Sec 801. Fertilizer shall be applied at the following rate:

Nitrogen (N)	80 lb. per acre
Phosphoric Acid (P_2O_5)	160 lb. per acre
Potash (K_2O)	80 lb. per acre
Effective Neutralizing Material	2700 lb. per acre

3.0 Seeding. All work shall be in accordance with Sec 805. The following seed mixture shall be applied at the rate specific in pounds of pure live seed per acre:

Tall Fescue	80 lb. per acre
Annual Ryegrass	8 lb. per acre
White Clover	2 ½ lb. per acre
Total	90 ½ lb. per acre

4.0 Erosion Control Blanket. All work shall be in accordance with Sec 806. All seeded areas shall be stabilized with erosion control blanket in lieu of mulch.

5.0 Method of Measurement and Basis of Payment. Measurement and payment shall be in accordance with Sec. 805 and 806. 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	Item Name	Units
805-20.00A	Seeding – Warm Season Mixtures	Acre
806-41.33	Type 1C Erosion Control Blanket	S.Y.

Q. Prime Contractor Requirements JSP-16-09

1.0 The limitation in Sec 108.1.1 of the Missouri Standard Specifications for Highway Construction that "the contractor's organization shall perform work amounting to not less than 40 percent of the total contract cost" is waived for this project. Instead, for the purposes of constructing this project only, the less restrictive terms of the Federal Highway Administration's rule at Title 23 Code of Federal Regulations (CFR) § 635.116(a) shall apply, so that the contractor must perform project work with its own organization equal to not less than 30 percent of the total original contract price. All other provisions in Sec 108.1.1 et seq. of the Missouri Standard Specifications for Highway Construction shall remain in full force and effect, and shall continue to govern the contractor and its subcontractors, in accordance with the provisions of Title 23 CFR § 635.116.

R. Parallel Bar Grates and Bearing Plates

1.0 Description. This work shall consist of removing and installing new 2'x4' parallel bar grate and bearing plates on existing inlets has indicated in the plans or as directed by the engineer.

2.0 Construction Requirements. For existing inlets requiring new 2'x4' parallel bar grates and bearing plates, the contractor shall provide and install these as directed by the engineer.

3.0 Method of Measurement. Measurement of new 2'x4' parallel bar grates and bearing plates shall be per each.

4.0 Basis of Payment. Payment for furnishing the labor, materials, and equipment necessary to install new 2'x4' parallel bar grates and bearing plates shall be paid for by the contract unit price for Item Number 614-99.02, Parallel Bar Grate and Bearing Plate (2 FT. x 4 FT.), per each.

S. Temporary Traffic Control, Special

1.0 Description. All work necessary to maintain safe and efficient traffic flow through the work areas shall be provided by the contractor. This will include furnishing, relocating, and removing temporary traffic control devices and the removal and relocation or covering and uncovering of existing signs and other traffic control devices in accordance with the contract documents or as directed by the engineer. All signs, vertical panels, barricades, and other materials/devices necessary for maintenance of traffic during construction are included in this item. Other items as noted in the plans, including changeable message boards, temporary signals, temporary paving, temporary striping, and truck mounted attenuators have been quantified separately and will be paid for as standard pay items.

2.0 Work requirements. Work shall be in accordance with Sec 616, Sec 612, and the contract plans.

2.1 General Requirements.

2.1 Traffic Control shall be according to the applicable sections of the Standard Specifications, the "Manual on Uniform Traffic Control Devices for Streets and Highways", any special details and Highway Standards contained in the plans, and the Special Provisions contained herein.

2.2 A minimum of 11 feet lanes will be provided on all roadways for Traffic Control during construction, with the exception of the EB on-ramp from Riverview Driver which can be narrowed for 10'.

2.3 A minimum of 2 feet offset will be provided from the edge of travelled way to the face of all temporary barriers, drums or channelizers.

2.4 Existing utility crossings shall be maintained, and any relocations need to be coordinated with their respective utility owners.

2.5 A minimum posted speed of 50 mph and 30 mph shall be maintained along the mainline and ramps respectively.

2.6 The Contractor shall be required to notify the local municipalities, emergency response agencies (i.e.: fire, ambulance, police), regional transportation authorities, and school bus companies regarding any changes in traffic control.

2.7 The contractor is responsible for coordination of work and traffic control with the adjacent ongoing projects including with IDOT for the Chain of Rocks Bridge plans east of Station 1779+53.84 (EB I-270).

2.8 A Traffic Control Plan developed by the Contractor will need to be approved in writing by the MoDOT at least seventy-two (72) hours in advance of commencing with the work. All lane closures shall be in accordance with the requirements of the Missouri Department of Transportation, Traffic Control Special Provisions, the Standards, and as directed by the Engineer. The traffic control shall be done in a manner, which minimizes the amount of disruption to traffic.

3.0 Method of Measurement. The quantities shown on the plans shall be considered an estimate and may be subject to change based on field conditions. This work will not be measured for payment, but will be considered a lump sum unit. Any Value Engineering proposals to the temporary traffic control will not be paid through value engineering but will be covered under:

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

4.0 Basis of Payment.

4.1 Partial payments will be made as follows:

(a) The first partial payment will be made when five percent of the original contract amount is earned. This payment will be the lesser of 50 percent of the contract price for the item of temporary traffic control or 5 percent of the original contract price.

(b) The second partial payment will be made when 50 percent of the original contract amount is earned. This payment will be the lesser of 25 percent of the original contract price for the item of temporary traffic control or 2.5 percent of the original contract price.

(c) The third partial payment will be made when 75 percent of the original contract amount is earned. This payment will be the lesser of 20 percent of the original contract price for the item of temporary traffic control or 2 percent of the original contract price.

(d) When the engineer has accepted the contract for maintenance in accordance with Sec 105, the remaining contract price for the item of temporary traffic control will be paid.

(e) The above partial payment schedule may be adjusted by the engineer if proof of invoices submitted by the contractor demonstrate additional temporary traffic control costs were incurred earlier than the above proposed schedule. The total payment for temporary traffic control will not exceed the bid amount for Temporary Traffic Control, lump sum, unless covered by a cost change order as referenced in the following Section 4.3.

4.1.1 For the purposes of this provision, the term “original contract price” will be construed as the total dollar value of the construction items (excluding temporary traffic control) of the original contract.

4.2 Temporary traffic control will be paid for at the contract lump sum price for Item 616-99.01, Temporary Traffic Control. 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) Providing channelizers.

(f) Worker apparel.

(g) Flaggers, pilot vehicles, and appurtenances at flagging stations.

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

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

(j) Removing existing pavement markings, and removing and relocating temporary pavement markings as necessary for staging operations. Removal of pavement markings shall not mar the surface of permanent concrete pavement.

4.3 Any additional work deemed necessary by the engineer that requires temporary traffic control and is not covered by the contract plans will be included in the cost change order for the additional work. However, if the added work is required in a stage where temporary traffic control is already in place, no additional traffic control pay will be allowed in this case.

5.1 SEQUENCE OF CONSTRUCTION

Note that the Traffic Control Plans are for work west of Eastbound I-270 Station 1779+53.84, only. Work east of Eastbound Station 1779+53.84 will be handled by IDOT. Refer to IDOT plans for details.

The suggested Maintenance of Traffic is as follows:

PHASE 1A:

1. Maintain I-270 traffic on existing roadway.
2. Construct medians on Riverview Drive outside of proposed bridge footprint.
3. Construct permanent shoulders on westbound entrance ramp (Ramp 1).
4. Begin bridge foundation construction.

PHASE 1B:

1. Maintain I-270 traffic on existing roadway, but in narrowed lanes.
2. Construct eastbound I-270 River Bridge.
3. Construct eastbound I-270 bridge over Riverview Drive.
4. Construct permanent and temporary I-270 pavement as shown in the plans.
5. Construct eastbound entrance ramp (Ramp 4) and portions of remaining ramps as shown in the plans.
6. Construct temporary Ramp 2 connection.
7. Close Ramps 2 and 4 during this phase. Ramps 2 and 4 shall not be closed concurrently.

PHASE 1C:

1. Shift I-270 traffic to north on temporary and permanent westbound pavement. Thru traffic remains on existing river bridge.
2. Shift eastbound entrance ramp to new ramp pavement and shift eastbound entrance ramp to Mississippi River bridge.
3. Construct eastbound I-270 pavement.
4. Construct gap in I-270 pavement over eastbound entrance ramp.

PHASE 1D:

1. Shift eastbound I-270 traffic to eastbound Riverview and river bridges.
2. Construct portion of westbound off ramp (Ramp 3) as shown in the plans.

PHASE 2A-0:

1. Close westbound on and off ramps (Ramp 1 and 3) and start detours.

2. Construct remaining Ramp 1 and 3 temporary connections. Shift ramp traffic to these connections as quickly as possible to limit time detours are required. Ramps 1 and 3 shall not be closed concurrently.
3. Shift westbound I-270 traffic to new bridges and previously constructed pavement. All thru traffic on new bridges.
4. Demolish existing river bridge and Riverview Drive bridges.
5. Construct new westbound river and Riverview Drive bridges.
6. Construct westbound I-270 pavement as shown in the plans.

PHASE 2A:

1. Shift westbound I-270 traffic to new bridges and previously constructed pavement. All thru traffic on new bridges.
2. Demolish existing river bridge and Riverview Drive bridges
3. Construct new westbound I-270 River Bridge and Riverview Drive Bridges.
4. Construct westbound I-270 pavement as shown in the plans.

PHASE 2B:

1. Construct gap in westbound I-270 pavement between bridges,
2. Finish construction on westbound on ramp (ramp 1)

PHASE 2C:

1. Shift eastbound and westbound I-270 traffic to permanent configuration.
2. Complete remaining ramp connections
3. Remove Remaining temporary pavement
4. Construct I-270 eastbound off ramp (Ramp 2), use detour.
5. Final lane configuration and permanent striping

T. NTCIP Compliant Changeable Message Sign (Contractor Furnished and Retained)

1.0 Description. All solar powered changeable message signs, hereinafter referred to as a CMS, shall be in accordance with these specifications.

2.0 Material. Each CMS shall consist of an all LED (light emitting diode) matrix message board, solar/battery power supply and a user-operated interface, as specified, all mounted on a heavy duty, towable trailer.

2.1 Each CMS shall be either Full Matrix or Character Matrix, and have the following minimum characteristics:

(a) Full Matrix - Each CMS shall be the Full Matrix type with the capability of providing one, two, and three lines of individual changeable characters with minimum heights of 52 (1300), 28 (700), and 18 (450) inches (mm), respectively. Full Matrix signs shall be capable of both static and dynamic graphics, and full display sized messages.

(b) Character Matrix (Three Line) – Each CMS shall consist of a minimum of three lines containing eight individual changeable characters per line. Each character shall be a minimum of 12 inches wide and 18 inches (450 mm) high.

(c) Sign firmware shall comply with the current FHWA and DOT (Department of Transportation) NTCIP standards and support all NTCIP mandatory objects.

(d) The sign controller shall be remotely accessible by the MoDOT St Louis District Transportation Management Center (TMC) through the Commission's ATMS (Advanced Traffic Management System) software, currently TransSuite provided by TransCore. The contractor will be responsible for ensuring the CMS is added to the ATMS software.

(e) The CMS shall have a cellular data modem compatible with the district's current cellular IP (packet data) service provider and be capable of allowing the MoDOT St. Louis District TMC ATMS software to have full control of the NTCIP compliant CMS controller remotely. Modem shall be capable of being programmed with a static IP.

(f) The sign shall have a GPS unit that can assist in locating the sign's position when polled by the TMC. The GPS unit must be remotely accessible by the TMC and be part of or work with the provided communication modem.

(g) Physical access to the onboard computer shall be protected by a padlock or other locking handle mechanism. Electronic access to the onboard computer shall be protected by a username and password.

2.2 Full matrix CMS and character matrix CMS shall meet the following:

(a) The overall sign dimensions shall not be less than 72 inches (1800 mm) high x 126 inches (3150 mm) wide.

(b) The CMS shall be legible up to a distance of 650 feet (200 m) for both day and night operations and shall be visible for ½-mile (800 m) with 18 inch (450 mm) characters.

(c) When fully raised in the display position, the bottom of the CMS board shall be at least a height of 7 feet (2100 mm) from the ground and shall be able to rotate a complete 360 degrees atop the lift mechanism. A sight tube, used to aim the CMS board to oncoming traffic, shall be installed on the CMS board or mast. The CMS shall have an electrical- hydraulic lifting mechanism that includes a manual lifting and lowering relief mechanism as a backup. It also must be able to be locked into various viewing angles as determined best for the motorists by the CMS operator.

(d) All LED displays and control circuitry shall be operational from -20 F (-29 C) to 120 F (50 C). The LED's shall have a rated life of 100,000 hours. The LED's shall be ITE amber in color on a flat black background.

(e) The CMS face shall be constructed that if an individual panel or pixel fails the rest of the face shall continue to display the message.

(f) All costs and coordination needed for testing to verify modem communication, sign NTCIP compliance, remote GPS status polling, ability to control the sign via the St. Louis District's ATMS software provided by TransCore shall be the sole responsibility of the Contractor. Full integration into TransCore's ATMS shall be completed at least 5 business days prior to use of the CMS in the project. TransCore contact information will be provided to the contractor by contacting MoDOT's Gateway Guide staff at 314-275-1526 or via email at ggtech@modot.mo.gov with details of the request. No other support shall be provided by MoDOT other than TransCore contact information. Information provided shall include, at a minimum, CMS make and model, IP address,

and proposed locations and messages.

(g) The Contractor shall be responsible for all monthly cellular service fees for the duration of the project.

(h) The unit shall be able to withstand a 65-mph (105-kmph) maximum road wind speed. The trailer shall be able to support the fully extended CMS board in an 80-mph (130-kmph) wind load.

(i) Solar charging system shall allow for total autonomy of 24/7/365 continuous operation.

(j) All exterior surfaces except the sign face shall be cleaned, primed, and finished with two coats of Highway Safety Orange and the sign interior itself shall be cleaned and finished with one coat of corrosion inhibiting primer and two coats of flat black. The sign face shall be covered with a rigid translucent material to prevent damage to the sign face caused by the environment.

3.0 Construction Requirements. Prior to placing a CMS on a project, the engineer shall verify proposed CMS location is void of conflict with another DMS or CMS locations presently established. If a conflict is present, the engineer shall contact the Traffic Management Center (TMC) at 314-275-1526 to mitigate. If no conflict is present, engineer shall provide Traffic Management Center (TMC) with the Job Number, Route, County, specific CMS location, and a CMS identification number that is permanently affixed to the CMS. The engineer and contractor shall verify the message displayed on board is compliant with CMS messaging policies. The contractor shall place the CMS 6 feet [2 meters] off of the right edge of shoulder at the location shown on the plans or as directed by the engineer. The CMS shall be placed so that the right side of the unit is advanced approximately 3 degrees ahead with the direction of traffic. CMS shall not be located in medians. CMS shall be delineated with a minimum of five non-metallic channelizing devices. Installation, including location and placement, shall be approved by the engineer. If needed, the contractor shall relocate the CMS as directed by the engineer.

3.1 When not in use, the CMS shall be stored no closer than 30 feet [10 meters] to the edge of pavement carrying traffic, unless it is in a properly protected area or an off-site storage area or as otherwise directed by the engineer.

4.0 Basis of Payment. All expenses incurred by the contractor in integrating, maintaining, relocating, operating and protecting the changeable message signs as outlined above shall be paid for at the contract unit price for Item 616-99.02 Changeable Message Sign, Contractor Furnished and Retained, per Each.

4.1 Cost for channelizers shall be included in the contract unit price for CMS.

4.2 Cost for cellular phone hookup and monthly usage fee for the duration of the project shall be included in the contract unit price for CMS.

Item No.	Type	Description
616-99.02	Each	NTCIP COMPLIANT CHANGEABLE MESSAGE SIGN (CONTRACTOR FURNISHED AND RETAINED)

U. Temporary Barrier

1.0 Description. This work shall consist of all necessary operations for furnishing, installing, and removing temporary concrete barrier as shown in the plans.

2.0 Construction Requirements.

2.1 Temporary concrete traffic barrier shall conform to the requirements of Section 617.

2.2 All temporary concrete traffic barrier shall be three-loop style.

2.3 All temporary concrete traffic barrier installed on roadway shall be anchored to the pavement using asphalt pin barrier system as required by MoDOT Engineering Policy Guide. Any temporary concrete traffic barrier installed on bridge deck shall be anchored using tie-down straps per Standard Plan 617.20E, as required by MoDOT Engineering Policy Guide.

2.4 All barrier and appurtenances shall remain the property of the contractor.

2.5 Delineators shall be placed on all temporary concrete traffic barrier on the top and both sides, spaced at 25-foot intervals and shall meet all other requirements of Section 617.30.

2.6 The top 12 inches of anchorage holes placed in the roadway pavement shall be filled after removal of the asphalt pin with an approved bituminous pavement crack sealant per Section 413.50.2. Anchorage holes placed in the bridge deck for tie-down straps shall be filled with epoxy mortar after removal of the bolt per Standard Plan 617.20E. Any excess damage or scarring of the pavement due to the installation or removal of anchors shall be repaired at the contractor's expense.

2.7 Any hardware left in the existing bridge decks from the tie-down straps shall be stainless steel.

2.8 Steel Barrier Alternate. As an alternate to temporary concrete traffic barrier, a temporary steel traffic barrier system may be used. The steel barrier alternate system must be documented as MASH (Manual for Assessing Safety Hardware) approved. The Contractor shall submit details and letter of MASH compliance of the proposed steel barrier system to the Engineer for approval. It is the Contractor's responsibility to modify the traffic control plans and bridge staging details for the bridges to accommodate the width of the steel barrier system and its accepted crash tested deflections, and submit the modified plans to the Engineer for approval. The Contractor shall submit to the Engineer for approval the locations and details of pinned anchorages of the steel barrier system. The anchor type, size, and spacing must match that used in the MASH accepted testing or be certified by the manufacturer to provide equal or greater anchorage strength to that provided for test installations.

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

Item	Section/Specification
Temporary Concrete Barrier	1064
Anchor Bolts	ASTM A 307
Bituminous Pavement Crack Sealant	AASHTO M 324
Type III Epoxy	1039
Sand for Mortar	1039

4.0 Measurement. Measurement of temporary traffic barrier and relocated temporary traffic barrier will be made to the nearest ½ linear foot for each continuous length and totaled to the nearest linear foot for the sum of the lengths.

5.0 Basis of Payment. Payment for all labor, equipment, and material costs to install temporary concrete traffic barrier, provide and maintain delineators, and remove the temporary concrete traffic barrier from the project shall be completed covered by item numbers:

Item No.	Type	Description
6173600D	LF	Temporary Traffic Barrier Contractor Furnished/Retained
6175010A	LF	Relocating Temporary Traffic Barrier

V. Liquidated Damages Specified (For Demolition of the Existing I-270 bridges over Riverview, and Setting Beams for the Proposed I-270 bridges over Riverview

1.0 Description. All work necessary to remove the entire superstructure of the existing I-270 bridges over Riverview shall be performed while Riverview is closed and within a single weekend per bridge removal. All lanes of Riverview beneath the I-270 bridge shall be closed from Friday night at 7:00pm to the following Monday morning at 5:00am. If the contractor does not have all lanes of traffic open on Riverview prior to **5:00 am on Monday morning**, the Commission, the traveling public, and state and local police and governmental authorities will be damaged in various ways, including but not limited to, increased construction administration cost, potential liability, traffic and traffic flow regulation cost, traffic congestion and motorist delay, with its resulting cost to the traveling public. These damages are not reasonably capable of being computed or quantified. Therefore, the contractor will be charged with liquidated damages specified in the amount of **$1,000 per every 15 minutes past 5:00 am on Monday morning** that all lanes of Riverview beneath I-270 are not open in excess of the limitation as specified elsewhere in the special provision. It will be the responsibility of the engineer to determine the quantity of excess closure time.

1.1 The said liquidated damages specified will be assessed in addition to any other liquidated damages charged under the Missouri Standard Specifications for Highway Construction, as indicated elsewhere in this contract.

W. Liquidated Damages Specified (EB I-270 on-ramp from Riverview Closure)

1.0 Description. As specified in the Work Zone Traffic Management JSP, the contractor shall be allowed to completely close the on-ramp from Riverview Drive to Eastbound I-270, one time on the project during Phase 1B of the Traffic Control and Protection Plans to complete the on-ramp reconstruction work. If all on-ramp reconstruction work, including all new pavement, barrier, guardrail, pavement drainage and striping is not complete and the ramp reopened to traffic when the new Eastbound I-270 bridge over the Mississippi River is completed (Phase 1C of the Traffic Control and Protection Plans), the Commission, the traveling public, and state and local police and governmental authorities will be damaged in various ways, including but not limited to, increased construction administration cost, potential liability, traffic and traffic flow regulation cost, traffic congestion and motorist delay, with its resulting cost to the traveling public. These damages are not reasonably capable of being computed or quantified. Therefore, the contractor will be charged with liquidated damages specified in the amount of **$2,000** per day for each full day that all work specified above is not complete and the ramp has not been reopened 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. Construction delays due to external events or construction of the new Mississippi River Bridges outside of the Contractor's control may be eligible for consideration according to each State's respective guidelines for delays, and per the discretion of the Engineer.

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

X. Liquidated Damages Specified (EB I-270 on-ramp/off-ramp from/to Riverview Closure)

1.0 Description. As specified in the Work Zone Traffic Management JSP, the contractor shall be allowed to completely close the on-ramp from Riverview Drive to Eastbound I-270 (Ramp 4) one time, and the off-ramp from Eastbound I-270 to Riverview Drive (Ramp 2) two times on the project to complete the ramp reconstruction work. These closures are both permitted during Phase 1B of the Traffic Control and Protection Plans. The Contractor shall not close these ramps concurrently during Phase 1B construction, and Ramp 2 must be restored to traffic using temporary and/or permanent paving prior to Ramp 4 being closed. If both Ramps 2 and 4 are closed concurrently, the Commission, the traveling public, and state and local police and governmental authorities will be damaged in various ways, including but not limited to, increased construction administration cost, potential liability, traffic and traffic flow regulation cost, traffic congestion and motorist delay, with its resulting cost to the traveling public. These damages are not reasonably capable of being computed or quantified. Therefore, the contractor will be charged with liquidated damages specified in the amount of **$2,000** per day for each full day that all work specified above is not complete and the ramp has not been reopened to traffic in excess of the limitation as specified elsewhere in this special provision. It shall be the responsibility of the engineer to determine the quantity of excess closure time.

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

Y. Liquidated Damages Specified (WB I-270 on-ramp/off-ramp from/to Riverview Closure

1.0 Description. As specified in the Work Zone Traffic Management JSP, the contractor shall be allowed to completely close the on-ramp from Riverview Drive to Westbound I-270 (Ramp 1) one time, and the off-ramp from Westbound I-270 to Riverview Drive (Ramp 3) one time on the project to complete the ramp reconstruction work. These closures are both permitted during Phase 2A-0 of the Traffic Control and Protection Plans. The Contractor shall not close these ramps concurrently during Phase 2A-0 construction. If both Ramps 1 and 3 are closed concurrently, the Commission, the traveling public, and state and local police and governmental authorities will be damaged in various ways, including but not limited to, increased construction administration cost, potential liability, traffic and traffic flow regulation cost, traffic congestion and motorist delay, with its resulting cost to the traveling public. These damages are not reasonably capable of being computed or quantified. Therefore, the contractor will be charged with liquidated damages specified in the amount of **$2,000** per day for each full day that all work specified above is not complete and the ramp has not been reopened to traffic in excess of the limitation as specified elsewhere in this special provision. It shall be the responsibility of the engineer to determine the quantity of excess closure time.

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

Z. Cover Existing Overhead Signs

1.0 Description. This work shall consist of temporarily covering 'Exit Only' and guide sign overhead panels on existing sign trusses and any additional signs listed in the contract along with installing 'Closed' sign plaques on the existing signs as well. Uncovering of the signs and the removing of the 'Closed' plaques shall be included within the cost of this pay item. The contractor shall uncover signs and remove 'Closed' plaques once the traffic control stage is completed for each roadway/bridge which has signs to be covered and plaques to be installed.

2.0 Basis of Payment. The accepted quantity of covering/uncovering existing signs and installing/removing 'Closed' plaques on existing signs will be paid at the contract unit price for the pay item included in the contract. All labor, equipment and material cost required to fulfill this requirement shall be included in the unit price for the following pay item:

Item No.	Description	Type
903-99.02	Cover Existing Overhead Signs	Each

AA. Temporary Wall

1.0 Description. This work shall consist of furnishing materials and placement of temporary retaining walls constructed in accordance with these specifications and in reasonably close conformity with the lines, grades, design and dimensions shown on the plans or otherwise established. Dimensions and elevations shown on the plans shall be considered approximate and used for estimating purposes only.

1.1 The temporary walls are located on the plans for construction of a temporary Ramp 2 (EB off-ramp) connection. The Contractor may locate the temporary wall differently than that shown

on the plans with the approval of the Engineer. No additional payment shall be made for change in wall location or subsequent changes in labor or materials for the relocation.

1.2 The Contractor is solely responsible for determining the dimensions of the temporary wall and ensuring that the temporary wall is compatible with the construction of the temporary and permanent paving shown in the Traffic Control and Protection Plans.

2.0 Design Requirements. The design by the wall system supplier shall consider the internal stability of the reinforced soil mass and shall be in accordance with acceptable engineering practice and these specifications. The design life of the structure shall be 3 years unless otherwise specified by the owner.

2.1 Temporary walls shall be designed and detailed by Wall Designer and Wall Manufacturer.

2.2 The design shall insure that the temporary wall is capable of supporting all applicable dead loads, any contributed live load from staged traffic handling, and any construction loads while not interfering with load distribution of final roadway configuration.

2.3 The soil parameters assumed for the design shall be those shown on the plans for the permanent MSE Wall or as specified by the Engineer.

3.0 Materials. The contractor shall make his own arrangements to purchase the materials covered by this section of the specifications.

3.1 Inspection of the foundation conditions, the materials of construction, and the construction procedures is the responsibility of the owner or the owner's representative. Inspection is not the responsibility of the wall system supplier.

4.0 Construction Requirements. The wall system components for the temporary walls shall be constructed in accordance with the wall system supplier's recommendations and construction manual. The temporary walls shall be constructed vertical or as near vertical as the wall system will allow.

5.0 Method of Measurement. No measurement shall be made.

6.0 Basis of Payment. Payment for the above described work, including all material, equipment, labor and any other incidental work necessary to complete this item, will be included in the contract lump sum price for "Temporary Wall" for each Wall where a temporary wall is required.

6.1 The estimated area (square foot) of the temporary wire faced MSE Wall required is shown on the Plans and is based on the lines, grades, design, dimensions and subsurface conditions used to develop the contract drawings. The actual limits of the temporary wall may vary from those shown on the plans, either decreased or increased, depending on the conditions encountered during the work. All variations shall be approved by the Engineer.

BB. Additional Mobilization for Striping

1.0 Description. This provision provides compensation for additional mobilization for temporary striping, as specified herein.

2.0 Additional Mobilization for Temporary Striping. Additional mobilization to perform temporary striping, beyond the initial occurrence, may be necessary as specified in Sec 616 and as required per the Engineer. Mobilization of all equipment, workers and materials necessary to perform temporary striping shall be considered included in this work.

2.1 Measurement of the number of occurrences authorized by the engineer to mobilize equipment onto the project to perform temporary striping will be made per each occurrence, except for the initial occurrence and as specified herein. No measurement will be made for mobilization necessary to perform repair work to previously striped areas or for mobilization necessary due to removal of equipment prior to completion of striping all areas available for striping, as determined by the engineer.

3.0 Basis of Payment. The accepted occurrences of Additional Mobilization for Striping will be paid for under 618-99.02, ADDITIONAL MOBILIZATION FOR TEMPORARY STRIPING, at a fixed unit price of $600 per each occurrence. Payment for the initial occurrence to mobilize for temporary striping, and any additional mobilization costs in excess of the fixed price, shall be considered completely covered under other items.

Item Number	Type / Description	Unit
618-99.02	Additional Mobilization for Striping	EA

CC. Optional Temporary Pavement Marking Paint NJSP-18-07B

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 2023, 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 2022, 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.

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

Item Number	Description	Unit
6209901	TEMPORARY PAVEMENT MARKING PAINT	LS

DD. Sign Mounting Bracket for Barrier Wall

1.0 Description. This work shall consist of fabricating and installing sign mounting brackets for signs mounted to the Type 'D' Permanent Concrete Traffic Barrier. This work shall be in accordance with applicable portions of Section 617, 903 and Division 1000 of the Standard Specifications and specifically as follows.

2.0 Construction Requirements. The mounting bracket plate, flanges and anchor sleeve shall be fabricated from 3/8" steel and then galvanized after fabrication. The mounting bracket shall be installed to the top of the Type 'D' Permanent Concrete Traffic Barrier by anchor bolts

per the manufacturer's recommendations and as approved by the engineer. The signs shall be mounted to pipe posts as shown in the signing plans and then installed into the anchor sleeve portion of the sign mounting bracket. See special sheets for bracket details.

3.0 Basis of Payment. All expenses incurred by the contractor for fabricating and installing the sign mounting brackets shall be considered completely covered by the contract unit price for the following bid item:

Item No.	Unit	Description
903-99.03	Each	Sign Mounting Bracket for Barrier Wall

EE. Settlement Gauge

1.0 Description. As specified with the addition of the following text: Settlement gauges are installed to permit determination of the rate at which the natural ground is subsiding under embankment. The rate of settlement usually controls the time when the surcharge may be removed. The major problem associated with settlement gauges is binding of the rod used for measurement when the fill moves laterally and warps the sleeve pipe surrounding the gauge.

2.0 Material. As specified.

3.0 Construction Requirements. As specified.

4.0 Basis of Payment. As specified with the addition of the following text: Use of surcharge material is at the option of the contractor and at the contractor expense. Gauges that become inoperative are not considered satisfactory for payment purposes. Standard Specifications requires the contractor to repair or replace damaged gauges at the contractor expense.

FF. Pore Pressure Measuring Device

1.0 Description. As specified with the addition of the following text: Pore pressure measurement devices are used to determine natural ground water pressures and pore water pressures induced by embankment construction. The rate of placing embankment is frequently controlled by the increase in pore pressure measurements.

2.0 Material. As specified.

3.0 Construction Requirements. As specified.

4.0 Basis of Payment. As specified.

GG. Optional Temporary Pavement

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

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

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

2.2 No additional payment will be made for aggregate base quantities outside the limits of the final surface area as computed and shown on the plans.

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

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

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

HH. ACO HighwayDrain HD200

1.0 Description.

1.1 This work shall consist of furnishing and installing a new ACO HighwayDrain HD200 trench drain. The trench drain assembly shall consist of grates, concrete encasement, and connections to drop inlets.

1.1 Trench drain shall have a nominal width of 8 inches.

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

2.1 Trench Drain. All materials shall meet or exceed AASHTO H-20 loading criteria.

2.1.1 Grates.. Grates shall be ductile iron or other durable material that meets or exceeds AASHTO H-20 loading criteria. Grates shall have a minimum open area of 60%.

3.0 Construction Requirements

3.0.1 All work shall be in accordance with the ACO HighwayDrain HD200 manufacturer's recommendations and as approved by the engineer.

3.1.2 Trench drain shall either be pre-sloped at a minimum slope of 0.50% or installed at a slope meeting 0.50%.

3.1.3 Contractor is required to install non-removable grates within the limits shown on the plans. Grates shall be affixed in a manner that reduces the chance of being dislodged by traffic. Bolting or other locking devices are not acceptable.

3.1.4 Contractor is required to modify the existing drop inlet and provide a drainage connection from the trench drain to facilitate drainage into the existing system as shown on the plans.

Contractor shall also clean out all debris from the existing inlet and flush the inlet and pipe run to ensure proper drainage.

3.1.5 Trench drain finished grade should match grade of median as directed by the Engineer.

3.1.6 The trench drain shall be encased in concrete at a minimum of 8" wide and a minimum of 8" deep around the trench drain.

4.0 Method of Measurement. Final measurement will not be made.

5.0 Basis of Payment. Payment will be made for compliance with this provision including all labor, equipment, and material necessary with installation of the trench drain assembly at the contract unit price for the following pay item:

Item 730-99.03	ACO HighwayDrain HD200	LF

II. Supplemental Revisions JSP-18-01T

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.

COVID-19 Safety

1.0 Description. The coronavirus disease 2019 or COVID-19 has reached a pandemic stage across the United States, including the State of Missouri. To reduce the impact of COVID-19 outbreak conditions on businesses, workers, customers and the public, the contractor shall be aware of all COVID-19 guidance from the Center for Disease Control (CDC) and other government health mandates. The contractor shall conduct all operations in conformance with these safety directives. The guidance may change during the project construction and the contractor shall change and adapt their operation and safety protocols accordingly.

2.0 Safety Plan. The contractor shall include these procedures in the project safety plan as called for in the contract documents and revise the safety plan as needed.

3.0 Essential Work. In accordance with any state or local Stay at Home Order, care for the infrastructure has been deemed essential and MoDOT is moving forward with construction projects, this project is considered essential and the contractor and their employees, subcontractors and suppliers are considered essential business and performing essential functions.

4.0 Basis of Payment. Compliance with regulations and laws pertaining to COVID-19 is covered under Sec 107 of the Missouri Standard Specifications for Highway Construction. No direct payment will be made for compliance with this provision.

Anti-Discrimination Against Israel Certification

By signing this contract, the Company certifies it is not currently engaged in and shall not, for the duration of the contract, engage in a boycott of goods or services from the State of Israel, companies doing business in or with Israel or authorized by, licensed by, or organized under the laws of the State of Israel, or persons or entities doing business in the State of Israel as defined by Section 34.600 RSMo. This certification shall not apply to contracts with a total potential value of less than One Hundred Thousand Dollars ($100,000) or to contractors with fewer than ten (10) employees.

JJ. Contractor Quality Control NJSP-15-14

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

2.0 Quality Control Plan.

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

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

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

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

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

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

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

4.0 Work Planning and Scheduling.

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

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

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

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

4.4.1 A list of typical Hold Point events is available on the MoDOT website. Use of the Hold Point process will only be required for the project-specific list of Hold Points, if any, that the engineer submits to the contractor in advance of the work. The engineer may make changes to the Hold Point list at any time.

4.4.2 Prior to all Hold Point inspections, the contractor shall verify the work has been completed in accordance with the contract and specifications. If the engineer identifies any corrective actions needed during a Hold Point inspection, the corrections shall be completed prior to

continuing work. The engineer may require a new Hold Point to be scheduled if the corrections require a follow-up inspection. Re-scheduling of Hold Points require a minimum 24-hour advance notification from the contractor unless otherwise allowed by the engineer.

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

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

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

KK. Tree Clearing Restriction

1.0 Description. The project is within the known range of the federally endangered gray bat, Indiana bat, and threatened northern long-eared bat. These bats are known to forage within riparian corridors and roost within trees with suitable habitat characteristics during summer months. MoDOT believes that suitable roost trees still exist within the project area according to the 2016 IDOT study of the project area.

1.1 To avoid negative impacts to roosting Indiana and northern long-eared bats, removal of suitable roost trees will only be allowed between November 1 and March 31.

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

LL. Section 404 and 408 Permit Delays

1.0 Description. The contractor and the Commission understand and agree that there has been and may continue to be a delay in the issuance of the 404 and 408 permits for this project. This permit delay may result in restraints on the contractor's ability to perform work on this project.

2.0 The 404 and 408 permit application has been submitted to USACE for the project and the full submittal can be found in the electronic deliverables. (File Name: I-270 over Mississippi River USACE Section 404 Application.pdf and I-270 over Mississippi River USACE Section 408 Application.pdf) The Section 404 permit identified the total permanent impacts to wetlands within the project area is 1.19 acres and the total temporary impacts to wetlands within the project area is 2.24 acres.

2.1 The 404 and 408 permits are anticipated to be issued by the Corps of Engineers by the notice to proceed date of this project, however, this date is not warranted and a later date is equally possible. The contractor and the Commission understand and agree that due to a delay in the issuance of the 404 and 408 permits, the work site for this job may not be available for the contractor to commence work on the job site or parts of it until after the notice to proceed date. Therefore, the parties mutually agree that the notice to proceed date on this project will not be issued until after 404 and 408 permits have been issued, unless the engineer and the contractor mutually decide that the notice to proceed date should be issued

on an earlier date. If the 404 and 408 permits are obtained earlier than the notice to proceed date, the contractor may request an earlier date to proceed.

2.2 The contractor will not have general access to the work site for construction purposes until the date the notice to proceed is issued. However, the contractor and its subcontractors may proceed to order necessary supplies, materials, and equipment for this project, and may visit the available portions of the job site to prepare for the later construction work, prior to the date the notice to proceed is issued.

2.3 The contractor is required to plan its order of work, manpower and equipment loading, and bid, taking into consideration all effects of delayed issuance of the 404 and 408 permits. Any effects, impacts, cumulative impacts or consequences of delay in issuance of the 404 and 408 permits shall be non-compensable. This shall include any claim for extra work, as well as delay effects on work not delayed, suspension or acceleration of the work, differing site condition, interference or otherwise.

2.4 The contractor and the Commission understand and agree that by executing this contract, the contractor releases the Commission from any possible liability under this contract or for a possible breach of this contract for failing to make the job site available until the notice to proceed is issued in accord with the terms of this contract, or for failing to timely and promptly issue the notice to proceed to the contractor, and for all direct and indirect, incidental, or consequential damages or losses the contractor may suffer from this delay in making the job site available or issuing a timely notice to proceed. The contractor further waives any possible claim, action, cause of action, or right to sue the Commission, Missouri Department of Transportation, or their members, employees, agents of representatives which the contractor may have by contract, at law or in equity, concerning the delay in issuing the notice to proceed of making the job site available, or any liability, losses, or damages the contractor may have experienced as a result of those Commission actions.

2.5 The contractors SOLE REMEDY for any delay in issuance of the 404 and 408 permits is that the completion date of this contract shall be extended, day for day, for each day that delayed issuance of the 404 and 408 permits actually interferes with the major items of work as of the time of the occurrence both as shown by the contractor's current progress schedule and as determined by the engineer.

2.6 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.

MM. Delayed Possession of Right of Way

1.0 Description. The contractor's attention is directed to the fact that not all parcels are in possession of the Commission. All required new Right of Way for parcel 1, Metropolitan Park and Recreation District, has not been acquired at this time.

1.1 The contractor shall not enter or proceed with physical construction across said Parcel Number 1 until authorization is granted by the engineer. The contractor will take no action that will result in unnecessary inconvenience, disproportionate injury or any other action coercive in nature to the business or operations thereon. Possession is anticipated to be obtained with NEPA approval.

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

1.3 The contractor and the Commission understand and agree that by executing this contract, the contractor releases the Commission from any possible liability under this contract or for a possible breach of this contract for failing to make the job site available until the possession of the parcels is authorized by the engineer, and for all direct and indirect, incidental, or consequential damages or losses the contractor may suffer from this delay in making the job site available or issuing a timely authorization. The contractor further waives any right the contractor may have by contract, at law or in equity to challenge the validity or enforceability of the contract, in return for the award of this contract to the contractor at its stated contract prices as bid for the required work. It is provided, however, as contractors SOLE REMEDY for any delay in possession of the above parcel that the completion date of this contract may be extended, day for day, for each day that delayed possession actually interferes with the major items of work as determined by the engineer.

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

NN. Disposition of Existing Signal/Lighting and Network Equipment

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 {or specific equipment listed here}, 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, Preventive Maintenance/ITS
Cell: (314) 565-6726

Mr. Ron Mize, Traffic Supervisor, Emergency Signal Maintenance
Cell: (314) 565-6727

Mr. Brian Ducote, Senior Signal EM Electric Technician
Cell: (314) 205-7319

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 Item No. 202-20.10, “Removal of Improvements”, per lump sum.

OO. 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 items LUMINAIRE, LED-A , TOP MOUNT and LUMINAIRE LED-B, TOP MOUNT, per each.

PP. 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 luminaries. 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 items LIGHTING POLE, 30 FT and LIGHTING POLE, 45 FT, per each.

QQ. Underpass Luminaire

1.0 Description. This work shall consist of furnishing and installing underpass luminaires as indicated in the plans. The underpass luminaires shall conform to all MoDOT specifications and material requirements. LED fixtures are required, and must exceed 8,000 lumens. Units manufactured by Atlas, TWH or RAB are acceptable for use on this project.

2.0 Basis of Payment. Payment for furnishing and installing underpass luminaires shall include all materials, mounting hardware, equipment, tools, labor, and work incidental thereto, and shall be considered completely covered by the contract unit price for item LUMINAIRE, UNDERPASS, per each.

RR. Maintenance of Roadway Lighting

1.0 Description. This work shall consist of maintaining proposed and existing lighting within the project limits throughout the duration of this project. All work shall be completed in accordance with Section 901 of the Standard Specifications.

All lights within the project limits shall be illuminated each night, unless prior arrangements have been made with MoDOT. Additional light poles, cabinets, or connections may be necessary to accomplish the requirements of this specification. The contractor shall arrange for temporary provisions to provide power to all affected lights on all affected circuits when construction operations require the severing of all or part of an existing circuit. The main areas of concern for this project are the following: Riverview intersection at EB ramps, Riverview intersection at WB ramps, and illumination of I-270 merges. If the contractor chooses to power a light or lighting circuit from a lighting controller cabinet or source different than the existing, the contractor shall provide the engineer with calculations detailing the lighting controller cabinet and the circuit's ability to handle the additional loading.

2.0 Basis of Payment. Payment for maintenance of a functional roadway lighting system throughout duration of this project shall be considered completely covered by the contract unit price for item MAINTENANCE OF ROADWAY LIGHTING, lump sum.

SS. Remove MoDOT Lighting Equipment

1.0 Description. This work shall consist of removing MoDOT lighting equipment as indicated in the plans. Per direction by MoDOT personnel, all MoDOT equipment other than network communication devices are to be transported to the Commission's maintenance lot located at

2309a Barrett Station Rd., Ballwin, MO 63021. The contractor shall notify the Commission's representative 24 hours prior to each delivery by calling Jim Collier (314) 565-6729 or Ron Mize (314) 565-6727. 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 located at 14301 South Outer Forty, Chesterfield, MO 63017. The contractor shall notify the Commission's representative 24 hours prior to each delivery by calling *Dennis Hixson (314) 565-6726* and providing details for the delivery.

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.

2.0 Basis of Payment. Payment for removal of existing MoDOT lighting equipment, including salvage and/or delivery to appropriate MoDOT's facility shall be considered completely covered by the contract unit price for item REMOVAL OF IMPROVEMENTS, lump sum.

TT. Remove City Lighting Equipment

1.0 Description. This work shall consist of removing City of St. Louis lighting equipment as indicated in the plans. Per direction by the City of St. Louis personnel, all unused equipment removed from the project limits shall be delivered to the City Street Department at 1900 Hampton Avenue. 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. Delivery shall be within 2 working days of removal unless prior arrangements have been made. All items returned shall be tagged with the date removed, project number and location/intersection.

2.0 Basis of Payment. Payment for removal of existing lighting equipment, including delivery to the City's Traffic Division shall be considered completely covered by the contract unit price for item REMOVAL OF IMPROVEMENTS, lump sum.

UU. Modify Existing Pullbox

1.0 Description. This work shall consist of drilling opening(s) in the existing pullboxes as shown on the plans. The number of openings to be drilled are indicated on the lighting and ITS plan sheets. The size of opening shall be drilled only to accommodate the size of conduit; remainder of opening to be filled with waterproof material prior to backfilling the area. Upon completion of the conduit work, the pullbox shall be adjusted to the finished grade. As identified in some locations on the plans, pullboxes may only need to be adjusted to final grade, with no openings drilled.

2.0 Basis of Payment. Payment for this work shall be considered completely covered by the contract unit price for item MODIFY EXISTING PULLBOX, per each.

VV. Power Supply Assembly, Type 2, 240/120 V, Signal & 4 Circuit Ltg & UPS

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.

- ***Riverview & EB Ramps***
- ***Riverview & WB Ramps***

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 ±10% in line mode.
(b) The output voltage of the UPS shall be 120 VAC ±6% in backup mode.
(c) The output frequency of the UPS shall be 60Hz ±5% in line mode.
(d) The output frequency of the UPS shall be 60Hz ±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 ½-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:

1. ON BATTERY. The relay is energized whenever the UPS switches to battery power.
2. 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.
3. 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.
4. ALARM. The relay is activated after a specific or general alarm is detected. The alarm conditions include: line frequency, low output voltage, no temperature probe, overload, unconnected batteries, high temperature (>55°C) and low temperature (<-20°C).
5. FAULT. The relay is activated after a specific or general fault is detected. These faults include: short circuit, low battery voltage (<41VDC), high battery voltage (> 59VDC), overload and over temperature (>75°C).
6. OFF. The relay is disabled and will not activate under any condition.
7. TIMER 2. Same as TIMER 1.
8. TIMER 3. Same as TIMER 1.
9. 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.
10. The UPS shall have a default dry contact relay configuration of:

C1	ON BATT
C2	LOW BATT
C3	LOW BATT
C4	TIMER
C5	ALARM
C6	48VDC

2.8 Mechanical. Each UPS system shall have the following mechanical requirements:
(a) The UPS shall have AC input and AC output terminal blocks mounted on the front panel. The terminal blocks shall be Weco p/n 324-HDS/03 or equivalent.
(b) The UPS shall have six (6) user programmable dry contact relay terminal blocks on the front panel. The terminal blocks shall be JITE p/n PTB750B-03-1-03-3 or equivalent.
(c) The UPS shall have one (1) user input and one (1) Automatic Transfer Switch (ATS) terminal block on the front panel. The terminal blocks shall be JITE p/n PTB750B-03-1-03-3 or equivalent.
(d) The UPS shall have a DE-9 RS-232 connector on the front panel.
(e) The UPS shall have an RJ45 Ethernet connector on the front panel.
(f) The UPS shall have a battery connector on the front panel. The battery connector shall be an Anderson p/n SB50 or equivalent.
(g) The UPS shall have a RJ14 battery temperature probe connector on the front panel.

2.9 Environmental. Each UPS system shall have the following environmental requirements:
(a) The operating temperature range of the UPS shall be -40° to 55°C with the capability of operating @ 800W for up to 2hr at 74°C ambient.
(b) The storage temperature range of the UPS shall be -40° to 75°C.
(c) The operating and storage humidity (non-condensing) range of the UPS is up to 95% RH.

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

2.10 Manual Bypass Switch. Each UPS system shall include a manual bypass switch (MPS). UATS assemblies that include items referenced individually need not be duplicated. The MPS shall have the following specifications:
(a) The MPS shall be a self-contained module separate from the UPS
(b) The MPS shall be shelf or rack mountable.
(c) The MPS shall have terminal blocks labeled “AC Input”, AC Output”, “To UPS” and “From UPS”.
(d) The MPS shall be a Break-Before-Make rotary switch.
(e) The MPS shall be rated at 120VAC @ 20A.
(f) The MPS shall have a 5-15R duplex receptacle connected to utility line.
(g) The MPS shall have a 5-15R receptacle labeled “Optional LA-P” to facilitate a plug-in surge suppressor.
(h) The MPS shall have a 5-15R receptacle labeled “Optional Battery Heater Mat” to provide non-standby power to a battery heater mat.
(i) The MPS shall have two (2) positions: one labeled “UPS” to connect the utility line to the UPS, and one labeled “Bypass” to connect the utility line to the load.
(j) The MPS shall have a 15A circuit breaker labeled “AC Input”.
(k) The MPS shall have a 15A circuit breaker labeled “AC Output”.

2.11 Automatic Transfer Switch. Each UPS system shall include an automatic transfer switch (ATS) with the following requirements:
(a) The ATS shall be rated for 120VAC @ 40A.
(b) The ATS shall be shelf or rack mountable.
(c) The ATS shall transfer the load to UPS when the utility line fails or is unqualified.
(d) The ATS shall transfer the load to utility line when the utility line is available and qualified.
(e) The ATS shall be activated by a 48VDC input from the UPS.
(f) The ATS shall have a terminal block labeled “L IN”, “NEUT”, “GRD” and “L OUT”.
(g) The ATS shall have a six (6) foot line cord labeled “UPS IN”.
(h) The ATS shall have a six (6) foot line cord labeled “UPS OUT”.
(i) The ATS shall have a 5-15R duplex receptacle connected to utility line.
(j) The ATS shall have a 5-15R receptacle labeled “Optional LA-P” to facilitate a plug-in surge suppressor.

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

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

(a) The ABS shall be rated for 120VAC @ 20 amps.
(b) The ABS shall be shelf or rack mountable.
(c) The ABS shall connect the UPS to the load to allow the UPS to continuously power the load.
(d) The ABS shall transfer the load to utility line when there is no UPS output voltage.
(e) The ABS shall be activated by the 120VAC from the UPS.
(f) The ABS shall have a terminal block labeled “L IN”, “NEUT”, “GRD” and “L OUT”.
(g) The ABS shall have a six (6) foot line cord labeled “UPS IN”.
(h) The ABS shall have a six (6) foot line cord labeled “UPS OUT”.
(i) The ABS shall have a 5-15R duplex receptacle connected to utility line.
(j) The ABS shall have a 5-15R receptacle labeled “Optional LA-P” to facilitate a plug-in surge suppressor.
(k) The ABS shall have a 5-15R receptacle labeled “Optional Battery Heater Mat” to provide non-standby power to a battery heater mat.
(l) The ABS dimensions shall be 4.6"H x 4.75"W x 6.5"D.
(m) The ABS weight shall be 4lbs.

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

(a) The GTS shall sense when a portable generator is connected and transfer the load to the generator after a 30s delay.
(b) The GTS shall be rated for 120VAC @ 20A.
(c) The GTS shall be shelf or rack mountable.
(d) The GTS shall have a terminal block labeled “AC INPUT”, “AC OUTPUT” and “GENERATOR INPUT”.

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

(a) The batteries shall be Gel Cell Valve Regulated Lead Acid (VRLA) type specifically designed for outdoor use.
(b) The batteries shall be designed for “Float Service” to provide 100% out-of-box runtime capacity.
(c) The batteries shall have Silver Alloy positive plates.
(d) The batteries shall have a five (5) year full replacement, non-prorated warranty.
(e) The battery capacity rating at 20hr shall be 94Ah.
(f) The battery shall be 12VDC.
(g) The number of batteries in the system shall be four (4) or eight (8).
(h) The batteries shall be connected to provide 48VDC.
(i) Batteries for each location shall provide full power for all devices shown on the plans that are powered through the signal cabinet for three (3) hours and then send the signal into all red flash and power that state for an additional three (3) hours.

2.15 Battery Heater Mat.

(a) The battery heater mats shall be available in four (4) battery and single (1) battery sizes.
(b) The single battery heater mat shall allow for a Master-Slave configuration so two (2) or more mats can be ganged together.
(c) The battery heater mats shall plug into a 120VAC/5-15 receptacle.

(d) The battery mats shall be thermally controlled, turning ON at 5°C and turning OFF at 15°C.
(e) The battery mats shall be thermally fused for 82°C to prevent thermal runaway.

2.16 Battery Charge Management System. Each UPS system shall have a battery charge management system with the following requirements:
(a) The battery charge management system shall spread the charge voltage equally across all batteries.
(b) The battery charge management system shall compensate for batteries with different internal resistances.
(c) The battery charge management system shall have a quality of final balance of ±100mV 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 included with this item. Additionally, utility company coordination, service connection/cables/conduit shall be included with the item POWER SUPLY, TYPE 2, 240/120 V, SIGNAL & 4 CIRCUIT LTG & UPS, per each.

WW. <u>CCTV Camera Assembly (Commission Furnished)</u>

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 included with this item) 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 version of TransSuite that the St. Louis District is currently operating (TransSuite version 19.4):

CCTV Manufacturer	Model	Connection Type
CostarHD (formerly known as Cohu)	4220HD RISE Dome	Outdoor cat5e
WTI	Viper H.264 HD30L	Outdoor cat5e
Axis	Q6155-E Dome	Outdoor cat5e
Bosch	MIC 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 µs)
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 installing the Commission furnished camera assembly installation includes testing, grounding testing, mounting hardware, extension pole, cabling, and miscellaneous equipment for fully operational camera assembly. Payment for this work shall be considered completely covered by the contract unit price for item CCTV CAMERA ASSEMBLY (COMMISSION FURNISHED), per each.

XX. Remove MoDOT ITS Equipment

1.0 Description. This work shall consist of removing MoDOT ITS equipment as indicated in the plans. Per direction by MoDOT personnel, all MoDOT equipment other than network communication devices are to be transported to the Commission's maintenance lot located at 2309a Barrett Station Rd., Ballwin, MO 63021. The contractor shall notify the Commission's representative 24 hours prior to each delivery by calling Jim Collier (314) 565-6729 or Ron Mize (314) 565-6727. 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 located at 14301 South Outer Forty, Chesterfield, MO 63017. The contractor shall notify the Commission's representative 24 hours prior to each delivery by calling *Dennis Hixson (314) 565-6726* and providing details for the delivery.

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.

3.0 Basis of Payment. Payment for removal of existing MoDOT ITS equipment, including salvage and/or delivery to appropriate MoDOT's facility shall be considered completely covered by the contract unit price for item REMOVAL OF IMPROVEMENTS, lump sum.

YY. Relocate MoDOT ITS Equipment

1.0 Description. This work shall consist of relocating ITS equipment, such as wireless detectors, CCTV cameras and poles, and ground mounted ITS cabinet as shown in the plans. All unused foundations must be removed 12 inches minimum below finished grade. This item should include all time, labor, mounting hardware, and cabling to reestablish connection of the traffic monitoring and communication devices. Full functionality of all relocated equipment shall be demonstrated to the MoDOT inspector prior to acceptance of the work.

RELOCATE EXISTING CCTV ASSEMBLY
The contractor shall remove the existing CCTV pole and camera assembly (camera, cable, PoE power injector, surge arresters, power pack, encoder, device server, extension pipe, etc.) from existing foundation and re-install it on the new foundation as shown on the plans and test it for proper operation.

RELOCATE DETECTOR UNIT
The contractor shall remove the existing detector and related equipment and re-install it on the relocated pole as shown on the plans. The contractor shall recalibrate and reconfigure the sensor per manufacturer specifications and to the satisfaction of the engineer.

RELOCATE TRAFFIC CABINET
The contractor shall remove the existing ground mounted traffic cabinet with related equipment, and re-install it on a new base as shown on the plans. Concrete for the new base is under separate pay item. The contractor shall reconnect and test the relocated cabinet.

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 new mounting 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 pole and camera assembly or those parts required in Section 2.2 on facilities 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.

3.0 Acceptance Testing.

3.1 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.

3.2 The Contractor shall submit in writing his anticipated method of splicing the conduit to the Engineer for approval prior to performing the work.

4.0 Basis of Payment. Payment for relocation of existing ITS equipment, shall be considered completely covered by the contract unit price for item RELOCATE MODOT ITS EQUIPMENT, lump sum.

ZZ. ITS Pull Box

1.0 Description. This item shall consist of providing and installing ITS pull boxes with concrete pads as shown in the plans. ITS pull boxes must comply with Section 1062 of the Missouri Standard Specifications for Highway Construction.

2.1 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.

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

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

3.0 Basis of Payment. Payment for this work shall be considered completely covered by the contract unit price for item ITS PULL BOX, CLASS 1 and ITS PULL BOX, CLASS 5, per each.

AAA. Pole Mounted ITS Cabinet, Type 5

1.0 Description. This item shall consist of providing and installing a pole mounted, powered ITS cabinet. Connecting power to the cabinet, hardware for attachment to pole, and supplying all necessary internal components to accommodate the project will be considered incidental to this item. Network switch is *not* included in this pay item.

3.0 Basis of Payment. Payment for this work shall be considered completely covered by the contract unit price for item POLE MOUNTED ITS CABINET, TYPE 5, per each

BBB. Install Communication Equipment

1.0 Description. Install Commission-furnished communication equipment in new and existing roadside cabinets, including existing traffic signal cabinets. Connect it to power, communication, and ground. Test the completed installation and report any problems to the engineer. Trouble shoot to the point of identifying the particular device that is causing the communication problem.

2.0 Materials.

2.1 Ethernet switches, video encoders, fiber optic data modems, and device servers will be provided by the Commission. These will include power cables except for the CCTV cameras (see Install CCTV Camera Assembly JSP for details).

2.2 The contractor shall provide any other cables such as Category 5E patch cords, coax patch cords, and short serial cables, etc. as required.

3.0 Construction Requirements.

3.1 Provide to the engineer a detailed schedule of installation of Commission-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 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 IE3300 Ethernet Switch. 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 "Unswitched Outlets" (meaning it is always on and cannot be rebooted remotely).

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, and all miscellaneous hardware required for a safe, fully operational system. Payment for furnishing and installing these materials shall be covered under item INSTALL COMMUNICATION EQUIPMENT, per each.

CCC. Fiber Optic Cable Installation & Relocation

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 conduit system. Relocated cable must be carefully removed from the existing conduit system without being damaged.

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 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.

3.2.2 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.

3.2.3 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.

3.2.4 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.

3.2.5 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.

3.2.6 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.

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

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

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

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

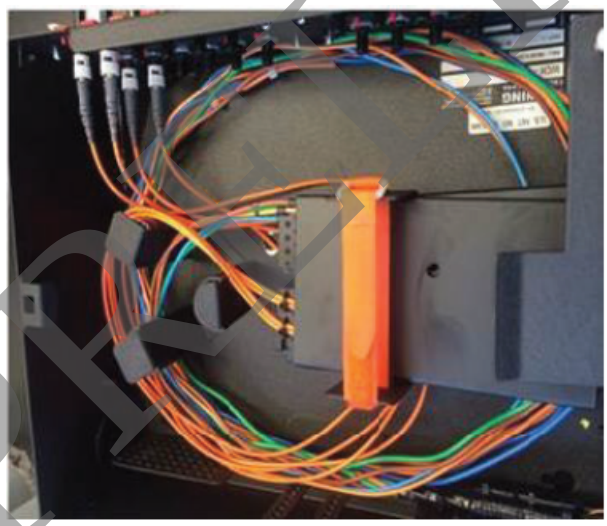
3.3.3 Prior to splicing to a fiber installed by others, measure and record the optical loss over that fiber. See section 4.0 of this provision.

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

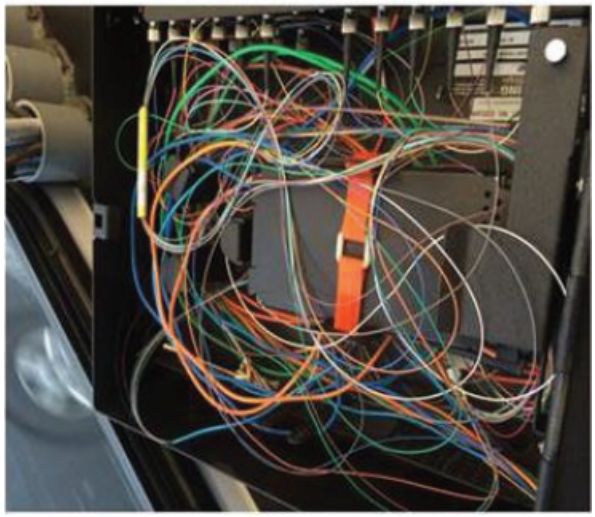
3.4 Termination. Terminate fibers by splicing them to factory-made pigtails. Cap all connectors that are not connected to a mating connector.

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

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



Acceptable



Unacceptable

3.7 Required Fiber Splicing, Installation and Testing Experience. Submit resumes, certificates and references detailing fiber installation, splicing and testing for on-site personnel to

the engineer for approval. Subcontractors used on the project are considered part of the contractor's team and are also required to submit resumes, certificates and references. Submit to the engineer references including client project manager, phone number and project experience. Demonstrate successful completion of fiber optic cable installation and splice training courses by providing certificates of completion. Failure to comply may result in a declaration of noncompliance.

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

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

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

4.0 Acceptance Testing.

4.1 General. Test the fiber after installation, including all splicing and termination, is complete. Note, however, that this test procedure involves measuring the loss of fiber installed by others before splicing to it. For each fiber optic link, including spare fibers, determine whether the optical loss is within the limits permitted by these specifications. A link is a continuous segment of fiber between one connector (or unterminated end) and another connector (or unterminated end). When testing links that do not have connectors on both ends, use a mechanical splice to attach a pigtail to the unterminated fiber for the duration of the test.

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

(a) If the link includes fiber installed by others, use an optical loss test set to measure and record the optical loss over that portion of the link before it is spliced to new fiber.

(b) Calculate the maximum allowable loss for the completed link, both at 1310 nm and at 1550 nm. Use the following formula:

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

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

(c) Calibrate an optical loss test set and provide evidence satisfactory to the engineer that the set produces accurate results at both wavelengths. This can be a demonstration that the set correctly measures the loss of a test fiber whose loss is known.

(d) Use the test set to measure the loss of the link under test. Record the result at both 1310 nm and 1550 nm. Arrange for the engineer or his representative to witness these tests.

(e) If the measured loss exceeds the calculated maximum, use an optical time domain reflectometer and other test equipment to troubleshoot the link. Take whatever corrective action is required, including cable replacement, to achieve a loss less than the calculated maximum.

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

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

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

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

8.0 Basis of Payment. Payment for items covered by this specification include the acceptance testing and guarantee, in addition to fusion splices, pigtails, jumpers, and connectors and all materials and equipment necessary for a fully operational system. Payment for furnishing and installing these materials shall be covered under items: FIBER OPTIC CABLE, 24 SM, per lineal foot, RELOCATE FIBER OPTIC CABLE, 72 SM, per lineal foot, FIBER ENCLOSURE (WALL MOUNT), per each, and FIBER ENCLOSURE (RACK MOUNT), per each.

DDD. Conduit

1.0 Description. 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 No direct payment shall be made for compliance with this provision.

EEE. 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. Initial contact must be made at least seven calendar days before work that may impact the existing communications network commences. Contact the ITS staff via an email at SLITS@modot.mo.gov. 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.

FFF. MoDOT Buried Cable Driveable Delineator Post

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

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

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

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

3.0 Basis for Payment. Payment for the 'Buried Cable' delineator post shall be considered full compensation for all contractor-provided equipment items, labor, and material to complete the described work and shall be incidental to fiber optic cable installation and relocation.

GGG. ITS Asset Management

1.0 Description. For all locations where any ITS (Intelligent Transportation System) components are existing, modified, or added to, the contractor shall be responsible for populating and updating Commission's fiber 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 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.

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

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. No direct payment shall be made for compliance with this provision.

HHH. 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 contactor 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.

III. ITS Site Restoration

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

2.0 Basis of Payment. The cost of restoration of disturbed areas will be incidental to the project. No direct payment will be made for any materials or labor, which is performed under this provision.

JJJ. 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. Units shall be considered completely covered by the contract unit price for item IP-ADDRESSABLE POWER STRIP (COMMISSION FURNISHED), per each.

KKK. Thermoplastic Pavement Markings

1.0 Description. This work shall consist of installing a minimum of 1.5 inch black outside contrast border surrounding any pavement marking arrow installed on existing or proposed concrete pavement.

2.0 Basis of Payment. Payment for installing the 1.5 inch black outside contrast border shall be included in the cost of the pavement marking arrow included in the plans.

LLL. Install Detector Assembly

1.0 General.

1.1 Description. The contractor shall install a Commission-furnished detector and mounting bracket on a metal pole, and a Commission-furnished power supply and communication interface panel in a nearby cabinet (usually on the same pole). The pole and cabinet shall be paid for separately. The contractor shall provide cables connecting the detector to the equipment in the cabinet and to ground, and set up and test for proper operation.

1.2 Qualified Personnel. The Commission's agreement with the detector manufacturer obligates the manufacturer to train the Commission's installation contractors in the unpacking, assembling, mounting, positioning, connecting to the communication network, set up, and testing of the detectors. The training is free to the contractor, and is conducted at the jobsite. The contractor shall not perform any work until the manufacturer has certified the contractor as qualified. Only personnel who have been trained by the manufacturer shall participate in the detector installation, setup, and testing. A Commission representative will be present to observe the training.

1.2.1 Contractors certified under a previous Commission contract need not be trained a second time, but only personnel who received the training shall participate in the detector installation and testing.

1.3 Support During Installation. The Commission's agreement with the detector manufacturer obligates the manufacturer to provide both on-site and remote factory support.

2.0 Materials.

2.1 Detector, mounting bracket, cable connector (detector end), power supply, and communication interface panel will be provided by the Commission.

2.2 The contractor shall provide outdoor cabling in accordance with the detector manufacturer's recommendations. Communication cabling shall be shielded. Cables connecting to the detector shall be stranded and shall be of a gauge compatible with the Commission-furnished connector. Communication cable connecting a Type 5 cabinet to a Type 7 cabinet shall be shielded Category 5 cable. Power cable connecting a Type 5 cabinet to a Type 7 cabinet shall be two-conductor, 14 AWG.

2.3 The contractor shall 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 install the detector in accordance with the manufacturer's recommended procedure for side-fired installation. The contractor shall take care to install it at the recommended height, and note that the recommended mounting height is relative to the

road surface, not the base of the pole. The contractor shall strap the detector's mounting bracket to the pole with metal bands so that it faces the detection zones shown on the plans.

3.2 The contractor shall install the power and communication cables between the cabinet and detector. If the detector and cabinet are mounted on the same pole, the pole shall constitute the raceway, except where the cables leave the pole to make connections. The contractor shall use the Commission-furnished connector to connect the cables to the detector. If two separate cables are used for power and communication, the contractor shall use silicone sealant at the point where the two cables enter the connector to prevent the entry moisture and bugs.

3.3 The contractor shall aim and lock the detector to provide the coverage area required for one detection zone per lane.

3.4 Using the set-up software from the detector manufacturer, the contractor shall set up the detection zones and operating parameters. The set up shall include speed calibration using measured reference speeds. The contractor shall provide all equipment needed for the setup work, such as a radar gun, software, computer, tools, and cables. When the detector is operating properly and has passed its acceptance test, the contractor shall deliver the values of all the detector's operating parameters to the engineer in printed or computer-readable form.

4.0 Acceptance Testing.

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

4.2 After installing the detector, the contractor shall test it using procedures developed by the contractor and approved by the engineer. These tests shall include confirmation of the accuracy of counts and average speed in each lane. Both results shall be within ten percent of independently measured values during a 15-minute period. The test will be witnessed by the engineer. If the installed detector fails to operate properly and the problem cannot be fixed by changing the setup parameters, the detector shall 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 detector installation includes cables connecting to the detector, testing, documentation of setup parameters, and all miscellaneous hardware required for a safe, fully operational detector. Communication and power cables connecting a Type 5 cabinet to a Type 7 cabinet will be paid for under separate items. Units shall be considered completely covered by the contract unit price for item DETECTOR ASSEMBLY (COMMISSION FURNISHED), per each.

MMM. Lane Reduction Arrows

1.0 Description. This work shall consist of installing special pavement markings as shown in the plans.

2.0 Lane reduction arrows shown in the plans shall be in accordance with MUTCD Figure 3B-24F and shall be preformed thermoplastic pavement marking in accordance with Section 620 of the Standard Specifications. The lane reduction arrows installed on concrete pavement shall have a minimum of 1.5 inch black outside contrast border surrounding the lane reduction arrow. This black contrast border shall be either preformed thermoplastic paint or acrylic waterborne paint.

3.0 Basis of Payment. Payment for furnishing and installing the pavement markings noted above, including all materials, equipment, tools, labor, and work incidental thereto (including the 1.5 inch black outside border), and shall be considered to be completely covered by the contract unit prices for the following:

Item No.	Type	Description
620-99.02	Each	Lane Reduction Arrow, Preformed Thermoplastic Pavement Marking

NNN. Pavement Marking Layout

1.0 Description. The striping lane lines on sections of roadway with multiple traffic lanes in one direction shall be placed in a manner in which the start and stop points for all intermittent lane lines match and line up even transversely across all traffic lanes. For all installations of intermittent pavement markings care should be taken to align the skips longitudinally to consistently match the spacing of the existing UIP intermittent lane lines at both start and end points of the improvement section.

2.0 Construction Requirements. The contractor shall submit to the Engineer for review and approval a pavement marking installation plan. This plan will include the contractor's proposal for installing the intermittent pavement markings to meet the requirements outlined above.

2.1 Final striping will not begin until the contractor has received approval of the pavement marking installation plan.

3.0 Basis of Payment. All cost and expenses incurred by the contractor in fulfilling the requirements of the provision shall be considered incidental to pavement marking cost.

OOO. Remove and Relocate Signs

1.0 Description. The contractor shall remove and relocate all ground mount signs as noted in the plans. The contractor shall relocate signs near their existing locations unless noted in the plans.

2.0 Method of Measurement. Measurement for the removal and relocation of ground mount signs will be made per each. Regardless of the number of signs on a given ground-mount post, each sign relocated shall be considered as a quantity of 1 each.

3.0 Basis of Payment. All labor, equipment and material, with the exception of sign posts and post footings, to complete the described work will be paid for at the contract unit price for:

Item 903-99.02	Remove & Relocate Ground Mount Signs	Each

PPP. ATC Traffic Signal Controller

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

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

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

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

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

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

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

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

QQQ. 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. Unless otherwise specified, the interior of the cabinet shall be white. 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.

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

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

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

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

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

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

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

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

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

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

3.0 Testing.

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

3.2 Each assembly shall be delivered with a signed document detailing the cabinet final tests performed.
The cabinet shall be assembled and tested by the controller manufacturer or authorized local distributor to ensure proper component integration and operation.

4.0 Warranty and Training.

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

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

4.3 MoDOT may require training on the maintenance and operation of NEMA TS2 cabinet assemblies. Maintenance and operation personnel shall be trained on troubleshooting, maintenance and repair of cabinets and all serviceable equipment. Training shall include field level troubleshooting and bench repair. This training shall be for a minimum of sixteen hours over two days. Training shall be conducted at a time and location mutually agreeable by the contractor and the signal shop traffic supervisor or as directed by MoDOT.

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

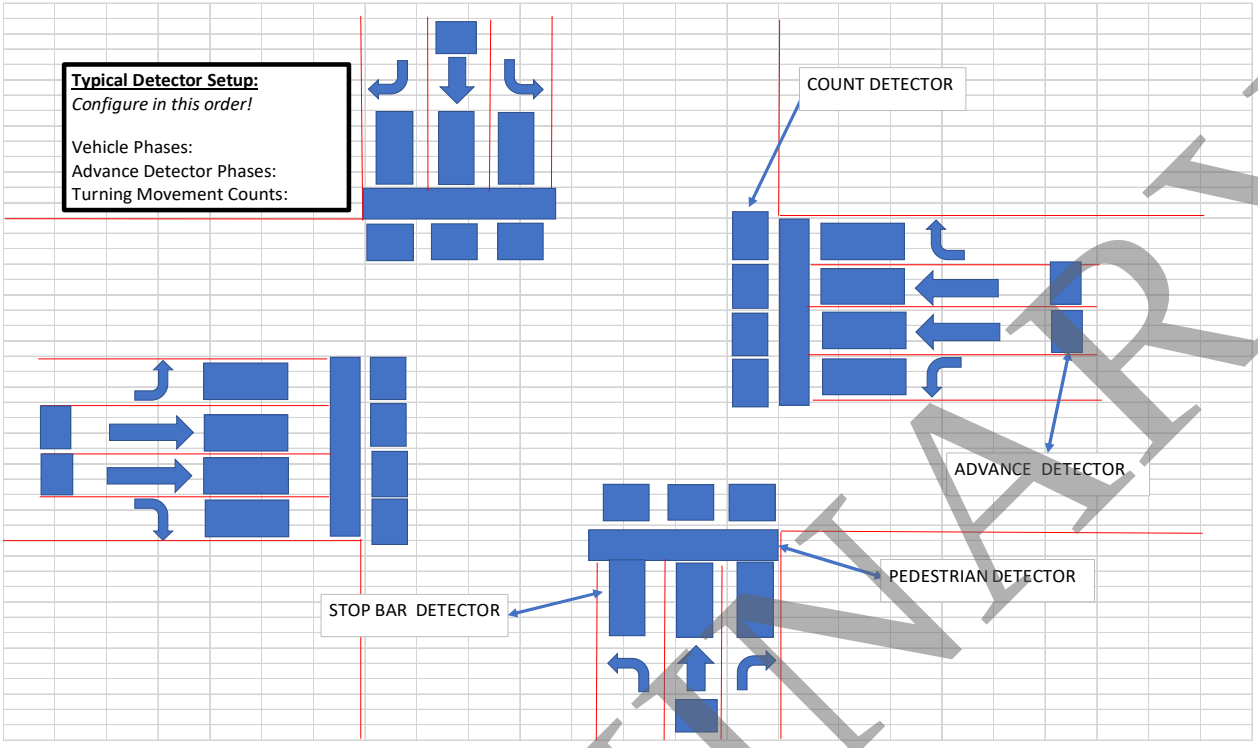
6.0 Basis of Payment. Payment included with cost of pay item Controller Assembly Housing, NEMA TS2 Controller paid per each. Payment will be considered full compensation for all labor, equipment and material to complete the described work as shown on the plans. No additional payment will be made to provide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

RRR. SL District Traffic Signal Detection System

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

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

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



[INSTRUCTIONS: Configure detector setup per project and/or intersection. Double click to edit Excel file base.]

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

[INSTRUCTIONS: Insert any approaches 45 MPH + or where engineering judgment dictates the need for dilemma zone detection.]

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

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

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

3.0 Performance Measures. In addition to presence detection, the detection system shall be capable of providing data to an advanced traffic signal controller that can perform at a minimum

the following calculations in real time for each detection zone without the addition of another device:

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

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

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

- Induction Loop
- Video Image
- Radar

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

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

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

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

4.2.2 Material. The video detection system shall consist of power supply, hard-wired video cameras, all necessary video and power cabling with end connectors, mounting brackets, surge protection as recommended by the manufacturer, video detection processors/extension modules capable of processing the number of camera and phase combination video sources shown on the project plans. The video detection system will be defined as the complete assembly of all required equipment and components for detection of vehicles. Each video detection system shall consist of the video camera(s), lightning arrester for video cabling,

processor unit(s), control device (track ball or keypad; no mouse allowed), software and license for system control via a computer (if applicable), communication components, and a color monitor. The video detection system shall have the most current available firmware installed. All camera views shall be obtainable without requiring the disconnection and reconnection of cables within the system. The video detection systems in the list below are the only systems that are tested, fully functional, and approved for use in the St. Louis District.

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

4.2.3 Installation Requirements. The video detection system shall be installed per the manufacturer's recommendations. The installer shall be certified by the video detection system's manufacturer to install the system. All CAT5 cable runs (if used) shall be continuous without splice from the cabinet to the camera. If requested by the engineer, a factory certified representative from the supplier shall be available for on-site assistance for a minimum of one day during installation. The bottom of the video camera shall be mounted a minimum of 30 feet (9.0 m) above the pavement, unless otherwise indicated on the plans or approved 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).

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

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

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

4.2.7 Video Camera and Housing. The camera shall produce a color video image of vehicles during daylight hours, with an optional production of black and white images during nighttime hours. The video shall produce a clear image for scenes with a luminance from a minimum

range of 0.18 to 929 foot-candles (2.0 to 10,000 lux). The camera shall provide a minimum resolution of 430 lines horizontal (TVL) and 350 lines vertical under NTSC operation. The camera shall include an electronic shutter or auto iris control based on average scene luminance and shall be equipped with an auto iris lens. sun shield that prevents sunlight from directly entering the lens. The sun shield shall include a provision for water diversion to prevent water from flowing in the camera field of view and shall be able to slide forward and back.

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

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

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

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

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

4.3.2 Material

4.3.2.1 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
  - Matrix
  - Advance
  - Advance Extended
- Iteris Vector

Provide a radar advance detection system with the following features.

- Shall be able to track/detect a minimum of 64 objects

- Shall be able to operate in a temperature range between -30 degrees and 165 degrees F
- The detection range shall cover the dilemma zone distances covered in section 2.1
- The detection zones shall be configurable based off several factors' such as classification, ETA, speed, presence and delay.
- The radar sensor shall be forward fire
- The sensor shall operate in the 25 GHz band
- The sensor shall be housed in a sealed IP-67 enclosure

4.3.2.2 Power and Communications.

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

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

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

4.3.4 Construction Requirements.

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

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

{NOTE: Adjust 4.3.4.2 depending on the availability of an induction card rack in cabinets}

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

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

4.3.4.4 Acceptance Testing. The contractor shall develop a proposed test procedure for the CTAD and submit it to the Engineer for approval. It must include visual verification of vehicle detections being received. Each detector shall be tested separately. Revise the proposed test procedure until it is acceptable to the Engineer. Provide all equipment and personnel needed to

safely conduct the tests. Arrange for the Engineer's representative to witness the tests. Give the Engineer a report documenting the result of the tests.

4.3.5 Documentation and Software.

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

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

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

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

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

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

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

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

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

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

SSS. Network Connected Signal Monitor

1.0 Description. The Commission's signal cabinet shall have a flashing yellow arrow compatible monitor installed with an internal RJ-45 plug for 10/100 Ethernet communication that

is connected to the Commission's computer network through Commission furnished Ethernet switch and allow a remote user running the monitor's software to interface with any specific monitor.

2.0 Performance.

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

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

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

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

3.0 Construction Requirements.

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

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

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

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

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

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

TTT. Traffic Signal Maintenance and Programming

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

2.0 Qualified Traffic Engineer

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

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

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

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

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

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

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

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

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

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

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

3.0 Existing Traffic Signals and Communication System

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

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

3.2 Once a ramp closure has been implemented by the contractor, the contractor shall then be solely responsible for the following signals' controller programming until completion of all closures necessary to complete the contractor's work. Maintenance at these locations for items other than controller programming issues or incidents caused by controller programming or other construction done by the contractor shall remain with the Commission or City of St. Louis. If any part of an existing traffic signal or its controller within the limits of this project has otherwise been modified or adjusted by the contractor, or the contractor makes any roadway changes to reduce the traffic capacity through a signalized intersection within the limits of the project, or the contractor begins work at an intersection with signals already in operation, the contractor shall then be solely responsible for that signal's controller programming and all signal maintenance as specified in 902.2 and 902.3, except for power costs, until Final Acceptance of the project. Traffic signal maintenance and timing responsibilities shall be broken down in accordance with the below schedules:

Signals Affected:

WB 270 Ramps at Lilac
EB 270 Ramps at Lilac
EB 270 Ramp at Bellefontaine
Dunn Rd at Bellefontaine

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

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

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

4.0 Existing Traffic Signal Maintenance and Response

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

4.2 The contractor must supply a contact name and phone number who will be responsible for receiving signal timing complaints for the engineer and the City. These complaints may be forwarded directly to the contractor by someone other than the engineer or City'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 also notify the Commission's Traffic Engineers and the City's representative within 12 hours of the complaint as to the remedy. The contractor shall submit to the engineer and City's representative a weekly report of complaints received and remedies performed throughout the duration of the project.

5.0 Original Signal Controller Programming and Acceptance

5.1 The contractor will be responsible for restoring the original signal controller programming at existing intersections and coordination plans for each intersection immediately upon ramp re-opening. The engineer and the City shall preserve and house the original controller files and provide the contractor with access to those files in order to perform the restoration of the original plans. Normal plan restoration can be done by a manual command in the signal control system or a preprogrammed time-of-day command change. For any locations rendered offline at the time of re-opening, these locations shall be returned to normal operation by hand. The Contractor shall notify the Engineer, the Commission's Traffic Engineers and the City within one (1) hour of removal of the detour plans. The contractor will be relieved of signal programming maintenance at an existing restored intersection once 48 consecutive hours have passed

without a programming malfunction, including restoring normal signal programming to the satisfaction of the Commission and the City. If an agency desires any changes from an original plan, the agency will assume immediate maintenance of the signal in order to implement desired changes.

6.0 Post Project Report

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

7.0 Deliverables

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

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

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

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

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

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

UUU. Contractor Verification of Signal Base Locations

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

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

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

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

VVV. Coordination with MoDOT Signal Shop for Cabinet Entry

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

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

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

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

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

WWW. Tubular Overhead Sign Truss

1.0 Description. This work shall consist of providing all costs for all labor and materials associated with the span, cantilever, and butterfly trusses, from the bottom of the baseplate on up, as illustrated in the Standard Plans, plans, signing details, and signing cross-sections.

2.0 Prior to ordering the trusses, the Contractor shall verify the dimensions with the Engineer.

3.0 Basis of Payment. Payment for furnishing all labor, equipment, materials, and incidentals will be paid for at the contract unit price per lump sum as follows:

Item No.	Type	Description
903-99.01	LS	Misc. 78 Ft. Span Sign Truss
903-99.01	LS	Misc. 30 Ft. Cantilever Sign Truss
903-99.01	LS	Misc. 22 Ft. Butterfly Sign Truss

XXX. Missouri Logos

1.0 Description. Special Supplemental Guide Signs, which show the motorist services and sites available on a crossroad at or near an interchange, are within the limits of the project. These signs may include Specific Service Signing (Logos), Tourist-Oriented Destination signs (TODS), traffic generator signs for privately owned and operated tourist-oriented activity sites, and signing for Colleges, State and Federal Agency sites, Welcome Center Affiliate sites and State Correctional Centers.

1.1 These signs shall remain visible to and effective for the traveling public during all stages of construction.

1.2 Any work involving the relocation (permanent or temporary), repair, replacement or legend modification required for these signs is the responsibility of Missouri Logos. The contractor shall be solely responsible for determining if the project will affect these signs due to contractor operations during construction of this project. The contractor shall be responsible for coordinating this work with them using the contact information below and providing full cooperation during this work.

Ron Young – Missouri Logos
Phone: (573) 893-6662 (Mon-Fri 8 am - 5 pm)
Email: ryoung@interstatelogos.com

Missouri Logos, LLC
4742-A County Club Dr.
Jefferson City, MO 65109
Phone: 800-666-3514
Email: missourilogos@interstatelogos.com
Web: missouri.interstatelogos.com

2.0 Replacement costs of any business specific logo panels damaged by vandalism or natural forces are the responsibility of the specified business. Any Supplemental Guide Sign damaged because of the contractor's action shall be replaced at the contractor's expense.

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 this provision.

YYY. Removal and Delivery of Existing Signs JSP-12-01B

1.0 Description. All Commission-owned signs removed from the project shall remain the property of the Commission and shall be disassembled and delivered as specified herein.

2.0 Disassembly and Delivery. All Commission-owned signs, not to include abandoned billboard signs, designated for removal in the plans, and any other signs designated by the engineer, shall be removed by the contractor and delivered to the address below.

Missouri Department of Transportation - Operations Complex
2309 Barrett Station Road
Sign Building
Ballwin, MO 63021

2.1 The contractor shall notify the Signing Supervisor at least 48 hours in advance of delivering any signing materials to this location and make arrangements for delivery during normal business hours. Contact information is below:

Mike Love, Signing / Striping Supervisor
Office: (314) 205-7313, Cell: (314) 624-3318

2.2 Signs shall be removed from sign supports and structures prior to delivery. Sign supports, structures and footings shall become the property of the Contractor and removed from the project. Any oversized sign panels shall be disassembled or cut into widths of 8-feet or less with no restriction on length. Signs shall be stacked neatly in bins provided by MoDOT at the delivery site.

2.3 Any hardware (brackets, u-bolts, aluminum I-beams, etc.) associated with removals involving overhead sign supports shall also be salvaged and delivered to this site.

3.0 Basis of Payment. All costs associated with removing, disassembling, storing, and transporting of signs shall be considered as completely covered by the contract unit price for the following:

Item No.	Type	Description
202-20.10	Lump Sum	Removal of Improvements

ZZZ. Remove Pole and Relocate Traffic Sensor

1.0 Description. The contractor shall remove, relocate, and/or salvage the following items as described below. The contractor shall be responsible for contacting MoDOT staff prior to removal as directed in the Gateway Guide Coordination JSP.

2.0 Salvage Solar Panels and Cabinet. The solar panels and corresponding batteries, cabinet, and all existing equipment shall be salvaged from the pole at the southwest corner of the BNSF Railroad Bridge.

2.1 Traffic Sensor Relocation. The traffic sensor, along with the corresponding mounting hardware and cabling, shall be removed from its location on the pole at the BNSF Railroad Bridge and relocated onto the existing camera pole located approximately 200 feet west. The contractor shall recalibrate and reconfigure the sensor per manufacturer specifications and to the satisfaction of the engineer.

2.2 Remove Pole. Once all items are removed, relocated, and/or salvaged from the original pole 200 feet downstream of the BNSF Railroad Bridge, the contractor shall remove the pole.

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.

4.0 Basis of Payment. All costs incurred for complying with this provision shall be considered completely covered by the contract unit price for Item No. 910-99.02 EACH, RELOCATE TRAFFIC SENSOR.