STATE OF MISSOURI
HIGHWAYS and TRANSPORTATION COMMISSION

JEFFERSON CITY, MISSOURI

CONSTRUCTING OR IMPROVING
Contract I.D. 181019-F04

THIS JOB SHALL BE CONSTRUCTED UNDER
FEDERAL PROJECT NUMBER(S): FAS S501(49)

J6Q3171E - VARIOUS ROUTES - VARIOUS COUNTIES

BIDDER CHECKLIST
FINAL CHECKLIST BEFORE SUBMITTING BID

1. Submit completed Contractor Questionnaire and/or Contractor Prequalification Questionnaire with attachments not later than seven (7) days prior to the date and hour of the bid opening. See Secs 101-103 of the Missouri Standard Specifications for Highway Construction, and Rule 7 CSR 10-15.010, "Prequalifications to Bid of Certain Contractors". Questionnaire and Contact information are provided on MoDOT's website.

2. All bids shall be submitted electronically using "Bid Express Secure Internet Bidding" at www.bidx.com. Any paper bid submitted will be considered irregular per section 102.8 of the Missouri Standard Specifications for Highway Construction.

3. Please read all items in the bidding document carefully. The EBSX files from MoDOT's website may be used for the itemized bid.

4. If submitted in the name of a firm or corporation, the legal name of the firm or corporation should appear in the space designated, and be signed for by one or more persons legally qualified to execute papers in the name of said firm or corporation.

5. The bidder shall submit a Bid Guaranty meeting the requirements of Sec 102 of the Missouri Standard Specifications for Highway Construction. If submitting a project specific or annual bid bond, bidders must use the MoDOT provided bid bond forms. The project specific bond form is included in the request for bid. The project specific and annual bid bond forms are also available on MoDOT's website. Annual bid bonds shall be executed by June 15th of each year.

6. Submit the Subcontractor Disclosure Form in accordance with the bidding documents. For bids of more than $2,000,000, each bidder shall submit with each bid a disclosure of the subcontracts that have a subcontract value that is equal or greater than twenty percent of the total project bid or subcontracts that are greater than or equal to $2,000,000. If that information is not available at the time of bid the bidder shall submit the "Subcontractor Disclosure Form" pages with MoDOT on or before 4:00 p.m. of the third business day after the bid opening date.

7. Submit the DBE Identification Submittal in accordance with the bidding documents for Federal Projects Only.

8. Alternate Pavements; to exercise this option, separate pay items, descriptions and quantities are included in the itemized proposal for each of the two alternates. The bidder shall bid only one of the two alternates and leave the contract unit price column blank for any pay item listed for the other alternate.

9. When submitting a bid, your bid will still come through with "red" folders. You should make sure that it is not the Schedule of Items folder or the Signature and Identity of Bidder folder. Click on the yellow checkmark (Check

Bid)at the top and it will list any errors in the bid. To view itemized folders, click the Tree View. This will show the status of the individual folders.

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Below is a list of common mistakes made by bidders leading to non-responsive bids. Please refer to the Standard Specifications for the appropriate procedures for completing and submitting a bid.

a) Submitting a paper bid for a project
b) Using a different bid bond form than the one provided
c) Improper use of the Maximum Monetary Value Award Provision
   -only used if bidding more than one project and should be in only one bid proposal
d) Not obtaining a digital ID in advance of the letting
   (obtaining a digital ID may take 5 business days)

****

All questions concerning the bid document preparation shall be directed to the Central Office - Design Division at (573) 751-2876. Project specific questions shall be directed to the project contact listed in the Job Special Provisions.

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*These forms are also available on MoDOT's Website, www.modot.org under Information on the Bid Opening Info page of the Contractor Resources site.

NOTICE TO CONTRACTORS

Electronic bids submitted through the Bid Express website for the proposed work will be received by the Missouri Highways and Transportation Commission until 11:00 o'clock a.m. (prevailing local time) on 10/19/2018.

Bid bonds will be received at the office of the Secretary to the Commission in the Missouri Department of Transportation Central Office Building, 105 West Capitol Avenue, Jefferson City, Missouri; delivered by US Mail should be mailed to: Missouri Highways and Transportation Commission, Attention: State Design Engineer/Bid Bond, P.O. Box 270, Jefferson City, MO 65102 or delivered by parcel delivery services, (such as UPS, Fed Ex, DHL, etc.) should be shipped to Missouri Highways and Transportation Commission, Attention: State Design Engineer/Bid Bond, 105 West Capitol Avenue, Jefferson City, MO 65102.

(1) PROPOSED WORK: The proposed work, hereinafter called the work, includes:

****(1): Job J6Q3171E Route Various VARIOUS County. ITS improvements in various locations in the St. Louis District, the total length of improvement being 0 miles.

If more than one Job Number is listed for this call, then combination bids will be required on the Jobs listed above.

(2) COMPLIANCE WITH CONTRACT PROVISIONS: The bidder, having examined and being familiar with the local conditions affecting the work, and with the contract, contract documents, including the Missouri Highways and Transportation Commission's "Missouri Standard Specifications for Highway Construction, 2018," and "Missouri Standard Plans for Highway Construction, 2018", their revisions, and the request for bid, including appendices, the special provisions and plans, hereby proposes to furnish all labor, materials, equipment, services, etc., required for the performance and completion of the work. All references are to the Missouri Standard Specifications for Highway Construction, as revised, unless otherwise noted. All questions concerning the bid document preparation shall be directed to the Central Office - Design Division at (573) 751-2876.

(3) PERIOD OF PERFORMANCE: If the bid is accepted, the bidder shall continuously and diligently prosecute the work in such order and manner as will ensure the completion of the work within the time specified in the Job Special Provisions in accordance with Sec 108.

(4) LIQUIDATED DAMAGES: The bidder agrees that, should the bidder fail to complete the work in the time specified or such additional time as may be allowed by the engineer under the contract, the amount of liquidated damages as specified in the Job Special Provisions to be recovered in accordance with Sec 108.

(5) ITEMIZED BID: The bidder should complete the following section in accordance with Sec 102.7. The bidder proposes to furnish all labor, materials, equipment, services, etc. required for the performance and completion of the work, as follows:

Line Number	Item Number	Quantity	Unit	Unit Price	Extension Price
Section 0001 Roadway Items - J6Q3171E					
0010	6169901	1	LS		
MISC. TEMPORARY TRAFFIC CONTROL					
0020	6181000	1	LS		
MOBILIZATION					
Section 0001 Total					
Section 0002 ITS Items - J6Q3171E					
0030	9103700	50.000	EA		
CCTV CAMERA ASSEMBLY, INSTALLED					
0040	9105200	250.000	LF		
CONDUIT, 2 IN., RIGID, IN TRENCH					
0050	9105201	100.000	LF		
CONDUIT, 3 IN., RIGID, IN TRENCH					
0060	9105202	100.000	LF		
CONDUIT, 4 IN., RIGID, IN TRENCH					
0070	9107201	50.000	LF		
CONDUIT, 3 IN., RIGID, PUSHED					
0080	9107202	50.000	LF		
CONDUIT, 4 IN., RIGID, PUSHED					
0090	9108352	500.000	LF		
FIBER OPTIC CABLE, 24-STRAND, 18 SINGLE MODE, 6 MULTIMODE					
0100	9109902	75.000	EA		
MISC. ADVANCED DIAGNOSTICS					
0110	9109902	1.000	EA		
MISC. FandI CAMERA POLE (60FT) AND LOWERING SYSTEM					
0120	9109902	50.000	EA		
MISC. FandI FIBER OPTIC FUSION SPLICE, MULTI MODE					
0130	9109902	1250.000	EA		
MISC. FandI FIBER OPTIC FUSION SPLICE, SINGLE MODE					
0140	9109902	2.000	EA		
MISC. FandI ITS PULLBOX CLASS 1					
0150	9109902	2.000	EA		
MISC. FandI ITS PULLBOX CLASS 2					
0160	9109902	2.000	EA		
MISC. FandI ITS PULLBOX CLASS 5					
0170	9109902	5.000	EA		
MISC. FandI NON-INTRUSIVE VEHICLE DETECTOR POLE					
0180	9109902	1.000	EA		
MISC. FandI TYPE 1 ITS CABINET					
0190	9109902	1.000	EA		
MISC. FandI TYPE 2 ITS CABINET					
0200	9109902	1.000	EA		
MISC. FandI TYPE 5 ITS CABINET					
0210	9109902	1.000	EA		

MISC. FandI TYPE 7 ITS CABINET

0220	9109902	6.000	EA
	MISC. FIBER OPTIC SPLICE ENCLOSURE		
0230	9109902	150.000	EA
	MISC. FIBER OPTIC TERMINATION		
0240	9109902	50.000	EA
	MISC. INSTALL IN-PAVEMENT WIRELESS SENSORS		
0250	9109902	100.000	EA
	MISC. INSTALL IP-ADDRESSABLE POWER STRIP		
0260	9109902	5.000	EA
	MISC. INSTALL NON-INTRUSIVE ACCESS POINT and ASSEMBLY		
0270	9109902	10.000	EA
	MISC. INSTALL NON-INTRUSIVE VEHICLE DETECTOR ASSEMBLY		
0280	9109902	5.000	EA
	MISC. INSTALL NON-INTRUSIVE WIRELESS REPEATER		
0290	9109902	1.000	EA
	MISC. INSTALL SALVAGED CAMERA POLE		
0300	9109902	1.000	EA
	MISC. INSTALL SALVAGED FIELD CABINET (DUAL)		
0310	9109902	10.000	EA
	MISC. INSTALL SALVAGED FIELD CABINET (SINGLE)		
0320	9109902	10.000	EA
	MISC. INSTALL SALVAGED NON-INTRUSIVE VEHICLE DETECTOR POLE		
0330	9109902	1.000	EA
	MISC. INSTALL SOLAR POWER SYSTEM		
0340	9109902	2.000	EA
	MISC. INSTALL SPREAD SPECTRUM WIRELESS COMMUNICATION EQUIPMENT		
0350	9109902	10.000	EA
	MISC. INSTALL UPS AUTOMATIC GENERATOR SWITCH		
0360	9109902	10.000	EA
	MISC. INSTALL UPS AUTOMATIC TRANSFER SWITCH		
0370	9109902	10.000	EA
	MISC. INSTALL UPS BATTERY		
0380	9109902	10.000	EA
	MISC. INSTALL UPS BATTERY MONITOR		
0390	9109902	10.000	EA
	MISC. INSTALL UPS POWER INVERTER		
0400	9109902	10.000	EA
	MISC. INSTALL UPS SYSTEM ASSEMBLY		
0410	9109902	2.000	EA
	MISC. INSTALL WIRELESS ETHERNET BRIDGE COMMUNICATION EQUIPMENT		
0420	9109902	20.000	EA
	MISC. MODOT BURIED CABLE DRIVABLE DELINEATOR POST		
0430	9109902	1.000	EA
	MISC. PEDESTAL BASE FOR SENSYS REPEATER POLE		
0440	9109902	5.000	EA
	MISC. RACK MOUNTED INTERCONNECT CENTER		
0450	9109902	1.000	EA
	MISC. REMOVE CAMERA POLE		
0460	9109902	20.000	EA
	MISC. REMOVE CCTV CAMERA and ASSEMBLY		

0470	9109902	1.000 EA		
	MISC. REMOVE COMMUNICATION FIELD CABINET (DOUBLE CABINET)			
0480	9109902	1.000 EA		
	MISC. REMOVE COMMUNICATION NODE FIELD CABINET (SINGLE CABINET)			
0490	9109902	50.000 EA		
	MISC. REMOVE IN-PAVEMENT WIRELESS SENSORS			
0500	9109902	5.000 EA		
	MISC. REMOVE NON-INTRUSIVE ACCESS POINT and ASSEMBLY			
0510	9109902	20.000 EA		
	MISC. REMOVE NON-INTRUSIVE VEHICLE DETECTOR ASSEMBLY			
0520	9109902	10.000 EA		
	MISC. REMOVE NON-INTRUSIVE VEHICLE DETECTOR POLE			
0530	9109902	5.000 EA		
	MISC. REMOVE NON-INTRUSIVE WIRELESS REPEATER			
0540	9109902	1.000 EA		
	MISC. REMOVE SOLAR POWER SYSTEM			
0550	9109902	10.000 EA		
	MISC. REMOVE UPS AUTOMATIC GENERATOR SWITCH			
0560	9109902	10.000 EA		
	MISC. REMOVE UPS AUTOMATIC TRANSFER SWITCH			
0570	9109902	10.000 EA		
	MISC. REMOVE UPS BATTERY			
0580	9109902	1.000 EA		
	MISC. REMOVE UPS BATTERY MONITOR			
0590	9109902	1.000 EA		
	MISC. REMOVE UPS POWER INVERTER			
0600	9109902	10.000 EA		
	MISC. REMOVE UPS SYSTEM ASSEMBLY			
0610	9109902	2.000 EA		
	MISC. REMOVE WIRELESS COMMUNICATION EQUIPMENT			
0620	9109902	1.000 EA		
	MISC. SENSYS REPEATER POLE BASE ALUMINUM SQUARE			
0630	9109902	27.000 EA		
	MISC. SIGNAL CABINET NETWORK COMMUNICATION and DEVICE VERIFICATION			
0640	9109902	1.000 EA		
	MISC. TB1-17 ALUMINUM BASE FOR RTMS POLE			
0650	9109902	1.000 EA		
	MISC. TB3-17 ALUMINUM BASE FOR RTMS POLE			
0660	9109902	50.000 EA	$200.00000	$10,000.00
	MISC. TROUBLESHOOTING			
0670	9109903	250.000 LF		
	MISC. CONDUIT, 2 IN., RIGID, PUSHED			
0680	9109903	50.000 LF		
	MISC. CONDUIT, HIGH-DENSITY POLYETHYLENE, 2 IN., IN TRENCH			
0690	9109903	300.000 LF		
	MISC. CONDUIT, HIGH-DENSITY POLYETHYLENE, 2 IN., PUSHED			
0700	9109903	500.000 LF		
	MISC. FandI CABLE IN CONDUIT, #1/0 WIRE, VARIABLE CONDUCTORS			
0710	9109903	250.000 LF		
	MISC. FandI CABLE IN CONDUIT, #14 WIRE, VARIABLE CONDUCTORS			
0720	9109903	100.000 LF		

	MISC. FandI CABLE IN CONDUIT, #2 WIRE, VARIABLE CONDUCTORS		
0730	9109903	100.000	LF
	MISC. FandI CABLE IN CONDUIT, #2/0 WIRE, VARIABLE CONDUCTORS		
0740	9109903	100.000	LF
	MISC. FandI CABLE IN CONDUIT, #4 WIRE, VARIABLE CONDUCTORS		
0750	9109903	500.000	LF
	MISC. FandI CABLE IN CONDUIT, #6 WIRE, VARIABLE CONDUCTORS		
0760	9109903	1000.000	LF
	MISC. FandI CABLE IN CONDUIT, #8 WIRE, VARIABLE CONDUCTORS		
0770	9109903	250.000	LF
	MISC. FandI CABLE IN CONDUIT, VIDEO COAXIAL CABLE		
0780	9109903	500.000	LF
	MISC. FandI CABLE IN CONDUIT: CAT5E OUTDOOR RATED CABLE		
0790	9109903	5000.000	LF
	MISC. FandI FIBER OPTIC CABLE, 24-STRAND SINGLE MODE		
0800	9109903	1000.000	LF
	MISC. FandI FIBER OPTICE CABLE, 72-STRAND SINGLE MODE		
0810	9109903	5000.000	LF
	MISC. FandI TRACE WIRE		
Section 0002 Total			$10,000.00

Section 0003
Prev. Maint. Items - J6Q3171E

0820	9109902	64.000	EA
	MISC. PM AIR CONDITIONING UNITS FOR NODE CABINETS		
0830	9109902	636.000	EA
	MISC. PM CCTV CAMERA, ASSEMBLY, POLE, and FIELD CABINET		
0840	9109902	323.000	EA
	MISC. PM COMMUNICATION LINK AND ASSEMBLY		
0850	9109902	35.000	EA
	MISC. PM COMMUNICATION NODE FIELD CABINET		
0860	9109902	2.000	EA
	MISC. PM DMP, ASSEMBLY, POLES, FOUNDATION, AND CABINET		
0870	9109902	169.000	EA
	MISC. PM DMS, ASSEMBLY, POLE, FOUNDATION and FIELD CABINET		
0880	9109902	36.000	EA
	MISC. PM NON-INTRUSIVE VEHICLE DETECTOR STATIONS (BLUETOOTH)		
0890	9109902	337.000	EA
	MISC. PM NON-INTRUSIVE VEHICLE DETECTOR STATIONS (MICROWAVE)		
0900	9109902	20.000	EA
	MISC. PM SOLAR POWER SYSTEM		
0910	9109902	32.000	EA
	MISC. PM UNINTERRUPTIBLE POWER SUPPLY (UPS) FOR NODE CABINETS		
0920	9109902	1.000	EA
	MISC. PM WITH REPAIRS - MODOT APPROVED CCTV		
0930	9109902	1.000	EA
	MISC. PM WITH REPAIRS - MODOT APPROVED CCTV CABLES AND WIRES		
0940	9109902	1.000	EA
	MISC. PM WITH REPAIRS - MODOT APPROVED CCTV CAMERA, ASSEMBLY, POLE, and FIELD CABINET		
0950	9109902	1.000	EA

	MISC. PM WITH REPAIRS - MODOT APPROVED CCTV CONNECTORS		
0960	9109902	1.000	EA
	MISC. PM WITH REPAIRS - MODOT APPROVED CCTV DEVICE SERVER		
0970	9109902	1.000	EA
	MISC. PM WITH REPAIRS - MODOT APPROVED CCTV ENCODER		
0980	9109902	1.000	EA
	MISC. PM WITH REPAIRS - MODOT APPROVED CCTV POLE ACCESS PANEL		
0990	9109902	1.000	EA
	MISC. PM WITH REPAIRS - MODOT APPROVED CCTV POWER SUPPLY		
1000	9109902	1.000	EA
	MISC. PM WITH REPAIRS - MODOT APPROVED CCTV SURGE PROTECTOR		
1010	9109902	1.000	EA
	MISC. PM WITH REPAIRS - MODOT APPROVED DMP, ASSEMBLY, POLE, FOUNDATION, and FIELD CABINET		
1020	9109902	1.000	EA
	MISC. PM WITH REPAIRS - MODOT APPROVED DMS CONTROLLER		
1030	9109902	1.000	EA
	MISC. PM WITH REPAIRS - MODOT APPROVED DMS DRIVER BOARD		
1040	9109902	1.000	EA
	MISC. PM WITH REPAIRS - MODOT APPROVED DMS FAN		
1050	9109902	1.000	EA
	MISC. PM WITH REPAIRS - MODOT APPROVED DMS LCA		
1060	9109902	1.000	EA
	MISC. PM WITH REPAIRS - MODOT APPROVED DMS PIXEL BOARD		
1070	9109902	1.000	EA
	MISC. PM WITH REPAIRS - MODOT APPROVED DMS POWER SUPPLY		
1080	9109902	1.000	EA
	MISC. PM WITH REPAIRS - MODOT APPROVED IP ADDRESSABLE POWER STRIP		
1090	9109902	1.000	EA
	MISC. PW WITH REPAIRS - MODOT SOLAR POWER SYSTEM		
1100	9109902	4.000	EA
	MISC. REMOVE AND REPLACE NODE CABINET AIR CONDITIONER SYSTEM		

Section 0003 Total

Item Total $10,000.00

DBE CERTIFICATION

(6) Trainees: (Applies to Federal Projects only) The number of trainee hours provided under this contract will be 0 slots at 1000 hours per slot or 0 hours.

(7) Bidder's Certificaton for DBE Program and Contract Goal

(Applies to Federal Projects only.)

(A) DBE Contract Goal: By submitting this bid, the bidder certifies that the bidder is familiar with the DBE Program Requirements in the General Provisions. The contract goal for the amount of work to be awarded is 0 % of the total federal project price. The bidder shall also complete the DBE Identification Submittal form in accordance with the General Provisions. This form is available on MoDOT's Website, www.modot.org on the Bid Opening Info page of the Contractor Resources site.

(B) DBE Participation: The bidder certifies that it will utilize DBE's as follows:

% OF TOTAL FEDERAL CONTRACT

NOTE: Bidder must fill in the above blank. If no percentage is specified, the bidder certifies that it agrees to and will comply with the contract goal. If a percentage below the contract goal is specified, then the bidder must submit complete documentation of good faith efforts to meet the DBE contract goal, immediately below.

The DBE Identification Submittal form will be submitted via

(C) Certification of Good Faith Efforts to Obtain DBE Participation: By submitting its signed bid, the bidder certifies under penalty of perjury and other provisions of law, that the bidder took each of the following steps to try to obtain sufficient DBE participation to achieve the Commission's proposed DBE Contract Goal:

CONTRACT PROVISIONS

(8a) ACCEPTANCE OF PROVISION FOR PRICE ADJUSTMENT FOR FUEL: Bidders have the option to accept the provision for Price Adjustment for Fuel in accordance with Sec. 109.14. The bidder must select "Yes" for those items of work in which they choose to accept the provision. No price adjustments will be made, due to fuel price changes, for bidders who do not accept this provision. This provision does not apply to Seal Coat.

EXCAVATION PRODUCTION

ASPHALT PAVING PRODUCTION AND HAULING

CONCRETE PAVING PRODUCTION AND HAULING

AGGREGATE BASE HAULING

(8b) ACCEPTANCE FOR PROVISION FOR ASPHALT CEMENT PRICE INDEX, SEAL COAT PRICE INDEX, ASPHALT UNDERSEAL PRICE INDEX, OR POLYMER MODIFIED EMULSION MEMBRANE PRICE INDEX: Bidders have the option to accept the provision for Asphalt Cement Price Index, Seal Coat Price Index, Asphalt Underseal Price Index, and/or Polymer Modified Emulsion Membrane Price Index (when used in conjunction with an Ultrathin Bonded Asphalt Wearing Surface treatment) in accordance with the General Provisions. The bidder must mark each box below if they choose to accept the provision. No price adjustments will be made, due to asphalt price changes, for bidders who do not accept this provision.

ASPHALT CEMENT

SEAL COAT

ASPHALT UNDERSEAL

POLYMER MODIFIED EMULSION MEMBRANE (UBAWS)

(9) MAXIMUM MONETARY VALUE OF AWARDS ACCEPTED THIS BID OPENING: Bidders have the option to specify the maximum monetary value of awards that they will accept for the total of all bids they have submitted in the bid opening, Sec 102.7.2. If the bidder is submitting only one bid, or if the bidder does not want to specify a maximum monetary value for submitted bids, this section should not be completed. If a submitted bid upon correction exceeds the indicated maximum monetary amount, the bid may be declared non-responsive. If a bidder's submitted bids show different values for the maximum monetary value, the lowest value will govern.

MAXIMUM MONETARY VALUE OF AWARDS ACCEPTED THIS BID OPENING

$

(Note: this amount should be entered in only one of the bids for this bid opening)

(10) COMBINATION BIDS: (Applies only if combination bids are specified. See cover and/or notice to contractor(s).) Combination bids will be in accordance with Sec 102.12. By selecting "All or None" the bidder desires to combine all projects in accordance with Sec 102.12.2.1.

(11a) CERTIFICATIONS FOR FEDERAL JOBS: (Applies to Federal Projects only.) By signing and submitting this bid, the bidder makes the certifications appearing in Sec. 102.18.1(regarding affirmative action and equal opportunity), Sec. 102.18.2 (regarding disbarment, eligibility, indictments, convictions, or civil judgments), Sec. 102.18.3 (regarding anti-collusion), and Sec. 102.18.4 (regarding lobbying activities). Any necessary documentation is to accompany the bid submission, as required by these sections. As provided in Sec. 108.13, the Commission may terminate the contract for acts of misconduct, which includes but is not limited to fraud, dishonesty and material misrepresentation or omission of fact within the bid submission.

(11b) CERTIFICATIONS FOR STATE JOBS: (Applies to State Projects only.) By signing and submitting this bid, the bidder makes the certifications appearing in Sec. 102.18.2 (regarding diseligibility, indictments, convictions, or civil judgments), Sec. 102.18.3 (regarding anti-collusion), and Sec. 102.18.5 (regarding Missouri Domestic Products Procurement Act).

Any necessary documentation is to accompany the bid submission, as required by these sections. As provided in Sec. 108.13, the Commission may terminate the contract for acts of misconduct, which includes but is not limited to fraud, dishonesty, and material misrepresentation or omission of fact within the bid submission.

Does the bidder make certification for the above items listed in 11(a) or 11 (b)? **Yes** ◯ **No** ◯

By selecting "No" the bidder REFUSES to make one or more certifications for the above items 11a or 11b. The bidder shall provide a statement of explanation for the refusal in the space below or by fax to the Design Division @ Fax no. 573-522-2281.

(12) ANTIDISCRIMINATION: The Commission hereby notifies all bidders that it will affirmatively ensure that in any contract entered into pursuant to this advertisement, businesses owned and controlled by socially and economically disadvantaged individuals will be afforded full opportunity to submit bids in response to this invitation and will not be discriminated against on the grounds of race, color, religion, creed, sex, age, ancestry, or national

origin in consideration for an award.

(13) PREFERENCE TO MISSOURI FIRMS IN AWARDING OF CONTRACTS: (Applies to State Projects only.) The bidder's attention is directed to Section 34.355 RSMo Supp 2000, et seq, which requires that preference be given in awarding contracts to firms, corporations, or individuals doing business as Missouri firms, corporations, or individuals, or which maintain Missouri offices or places of business, when the quality of performance promised is equal, or better, and the price quoted is the same, or less.

The law also requires that a contractor or bidder domiciled outside the State of Missouri shall be required, in order to be the successful bidder, to submit a bid which is the same percent less than the lowest bid submitted by a responsible contractor or bidder domiciled in Missouri as would be required for the Missouri domiciled contractor or bidder to succeed over the bidding contractor or bidder domiciled outside Missouri in a like contract or bid being let in his domiciliary state. A contractor or bidder domiciled outside Missouri shall also be required to submit an audited financial statement as would be required of a Missouri domiciled contractor or bidder on a like contract or bid being let in the domiciliary state of that contractor or bidder.

For firms, corporations or individuals domiciled outside the State of Missouri, it is requested they submit the following information:

List the state of domicile

List address of all Missouri offices or places of business

I acknowledge that I have read, understand and completed the above Contract Provisions.

SUBCONTRACTOR DISCLOSURE

(14) SUBCONTRACTOR DISCLOSURE The bidder shall submit with this bid any subcontracts that meet the requirements of Sec 102. List below the name of each subcontractor that will be furnishing labor, labor and materials, the category of work that the subcontractor will be performing (e.g. asphalt, concrete, earthwork, bridges...), and the dollar value of the subcontract. Select "NONE" if there are no subcontractors that need to be disclosed.

If the information is not available at the time of bid, the bidder shall submit the "Subcontractor Disclosure Form", located on MoDOT's website, on or before 4:00 p.m. of the third business day after the bid opening date, directly to the Design Division, Missouri Department of Transportation, 105 W. Capitol Avenue, P.O. Box 270, Jefferson City, Missouri 65102-0270. Telefax transmittal to MoDOT will be permitted at fax no. 573-522-2281 or emailed to subcontractor.disclosure@modot.mo.gov. The complete signed original documents do not need to be mailed to MoDOT, but the bidder shall have it available if requested by the Design Division or the engineer.

SUBCONTRACTOR NAME:

DOLLAR VALUE: $

CATEGORY OF WORK:

SUBCONTRACTOR NAME:

DOLLAR VALUE: $

CATEGORY OF WORK:

SUBCONTRACTOR NAME:

DOLLAR VALUE: $

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SUBCONTRACTOR NAME:

DOLLAR VALUE: $

CATEGORY OF WORK:

SUBCONTRACTOR NAME:

DOLLAR VALUE: $

CATEGORY OF WORK:

Submitted:

SIGNATURE AND IDENTITY OF BIDDER

(15) SIGNATURE AND IDENTITY OF BIDDER

BY SUBMITTING THIS BID ELECTRONICALLY, I HEREBY ACKNOWLEDGE THAT ALL REQUIREMENTS INCLUDED IN THE HARD COPY REQUEST FOR BID, AND AMENDMENTS ARE A PART OF THIS BID AND CONTRACT.

*** AN ELECTRONIC PROPOSAL SUBMITTED AND SIGNED WITH A DIGITAL ID, UNDER THE PROVISION OF THE MISSOURI DEPARTMENT OF TRANSPORTATION, WILL BE CONSIDERED VALID AND BINDING. ***

THE BIDDER CERTIFIES THAT THE BIDDER AND ITS OFFICIALS, AGENTS, AND EMPLOYEES HAVE NEITHER DIRECTLY NOR INDIRECTLY ENTERED INTO ANY AGREEMENT, PARTICIPATED IN ANY COLLUSION, OR OTHERWISE TAKEN ANY ACTION IN RESTRAINT OF FREE COMPETITIVE BIDDING IN CONNECTION WITH THIS BID, AND THAT THE BIDDER INTENDS TO PERFORM THE WORK WITH ITS OWN BONAFIDE EMPLOYEES AND SUBCONTRACTORS, AND DID NOT BID FOR THE BENEFIT OF ANOTHER CONTRACTOR.

THE BIDDER CERTIFIES THAT THE BIDDER'S COMPANY KNOWINGLY EMPLOYS ONLY INDIVIDUALS WHO ARE AUTHORIZED TO WORK IN THE UNITED STATES IN ACCORDANCE WITH APPLICABLE FEDERAL AND STATE LAWS AND ALL PROVISIONS OF MISSOURI EXECUTIVE ORDER NO. 07-13 FOR CONTRACTS WITH THE MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION, ACTING THROUGH THE MISSOURI DEPARTMENT OF TRANSPORTATION.

THE BIDDER ACKNOWLEDGES THAT THIS IS AN UNSWORN DECLARATION, EXECUTED UNDER PENALTY OF PERJURY UNDER THE LAWS OF THE UNITED STATES AND/OR FALSE DECLARATION UNDER THE LAWS OF MISSOURI, AND ANY OTHER APPLICABLE STATE OR FEDERAL LAWS. THE FAILURE TO PROVIDE THIS CERTIFICATION IN THIS BID MAY MAKE THIS BID NON-RESPONSIVE, AND CAUSE IT TO BE REJECTED.

◯ **Yes** ◯ **No**

Select "No" ONLY if the bidder REFUSES to make this certification. The bidder may provide an explanation for the refusal with this submittal in the space below or by fax to the Design Division @ fax no. 573-522-2281.

USE OF ANOTHER PERSON'S DIGITAL ID IN THIS BIDDING PROCESS VIOLATES THE LAWS OF MISSOURI.

I acknowledge that I have read, understood and completed the above Electronic Bid Submission Certification.

BID BOND

(16) BID GUARANTY: The bidder shall submit a Bid Guaranty meeting the requirements of Section 102 of the Missouri Standard Specifications for Highway Construction. MoDOT's bid bond forms are available on MoDOT's website.

Annual bid bonds shall be submitted to MoDOT by June 15th of each year. If utilizing a paper annual or project specific bid bond as a Bid Guaranty

for this project the bidder shall mark the box below.

**Pay by: ☐ Paper Annual or Project Specific Bid Bond.

If submitting a cashier's/certified check, the Bid Bond folder will not turn green.

ELECTRONIC BID BOND

The bidder shall complete the following bond verification process if utilizing an electronic project bid bond or electronic annual bid bond as a Bid Guaranty for this project.

**Bond ID: Verify Clear

**Surety Registry Agency:

**Bond Pct:

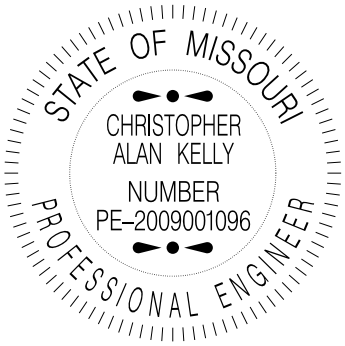
Surety State:

FIELDS WITH THE ** INDICATOR ARE REQUIRED FIELDS IF SUBMITTING YOUR BID VIA BID EXPRESS

Job No.: J6Q3171E
Route: Various
Counties: St. Louis, Jefferson, Franklin, St. Charles, St. Louis City

JOB SPECIAL PROVISIONS TABLE OF CONTENTS (ROADWAY)

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



THIS SHEET HAS BEEN SIGNED, SEALED AND DATED ELECTRONICALLY.

MISSOURI HIGHWAYS AND TRANSPORTATION COMMISSION
105 W. CAPITOL AVE.
JEFFERSON CITY, MO 65102
Phone 1-888-275-6636

If a seal is present on this sheet, JSP's have been electronically sealed and dated.

JOB NUMBER: J6Q3171E
ST. LOUIS CITY, ST. LOUIS, ST. CHARLES, JEFFERSON, FRANKLIN, MO
DATE PREPARED: 09-11-2018

ADDENDUM DATE:

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

Job No.: J6Q3171E
Route: Various
Counties: St. Louis, Jefferson, Franklin, St. Charles, St. Louis City

JOB
SPECIAL PROVISION

A. General - Federal JSP-09-02D

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 "Bidding". 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 "Business"; "Standards and Specifications". The effective version shall be determined by the letting date of the project.

General Provisions & Supplemental Specifications

Supplemental Plans to July 2018 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: January 1, 2019
Completion Date: December 31, 2019

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
J6Q3171E	N/A	N/A

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 **$**N/A 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.

5.0 Maintenance of the Gateway Guide System is critical to the operations, safety, and security of motorists using the project area roadways and related facilities. Any delay by the contractor in responding to calls or completing repairs represents a loss of system benefits, a hazard to the public, increases liability of the Commission and constitutes real and measurable damages. These damages shall be liquidated and borne by the contractor.

5.1 Response Time. Failure of the contractor to respond within the time limits specified in this contract shall result in the assessment of liquidated damages.

For each MoDOT MOMS work order that is not responded to within the time period allowed in this contract, for the required response time as identified on the MoDOT MOMS work order, the amount of **$200.00** will be deducted from the money due the contractor, not as a penalty, but as liquidated damages, **per each four (4) hour period** starting immediately after the initial required response time identified in this contract. Said amount shall apply separately to each specific identified MoDOT MOMS work order item with the exception that communications outages, or large scale service outages causing multiple field elements to operate improperly, or not at all, shall be considered a single occurrence. These damages shall be cumulative.

5.2 Repair Time. Failure of the contractor to complete repairs within the time limits specified shall result in the assessment of liquidated damages.

For each work order that is resolved through the use of standard pay items in this contract, but that resolution is not completed within the specific time period for that pay item, the amount of **$600.00** will be deducted from the money due the contractor, not as a penalty, but as liquidated damages, **per each twenty-four (24) hour period** starting immediately after the initial required completion time identified in this contract.

5.3 Exceptions to Liquidated Damages. Exceptions to these damages include repairs requiring Commission Furnished spare parts that are not available at the time of repair. In this case, the required completion time will begin upon the engineer notifying the contractor that the required spare parts are in stock and available for the completion of the work. The liquidated damages will then begin to accrue if the work is not completed in the time required starting after notification.

Additionally, exceptions will be made for completion of work being delayed by severe weather conditions, or for conditions requiring access to work areas that are not available to the contractor, such as for construction activities or an inability to perform necessary traffic control due to special traffic conditions or traffic accidents.

In all cases of exceptions to liquidated damages, the contractor must document the reasons for the exception in a request for exception to the engineer prior to an extension or exception being granted. The engineer shall have the final authority over whether an extension or exception will be granted.

C. WORK ZONE TRAFFIC MANAGEMENT

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.

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 contractor shall request permission at least two working days prior to lane closures or shifting traffic onto detours, and 14 calendar days prior to the imposition of height, width or weight restrictions. This is to ensure closures do not conflict with other work within the zone of influence and the work zone information on the MoDOT's website can remain real-time.

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

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

2.5 Traffic Congestion. The contractor shall, upon approval of the engineer, take proactive measures to reduce traffic congestion in the work zone. The contractor shall immediately implement appropriate mitigation strategies whenever traffic congestion reaches an excess of 10 minutes to prevent congestion from escalating to 15 minute or above threshold. If disruption of the traffic flow occurs and traffic is backed up in queues of 15 minute delays or longer, then the contractor shall immediately review the construction operations which contributed directly to disruption of the traffic flow and make adjustments to the operations to prevent the queues from reoccurring. Traffic delays may be monitored by physical presence on site or by utilizing real-time travel data through the work zone that generate text and/or email notifications where available. The engineer monitoring the work zone may also notify the contractor of delays that require prompt mitigation. The contractor may work with the engineer to determine what other alternative solutions or time periods would be acceptable.

2.5.1 Traffic Safety.

2.5.1.1 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 When a traffic queue extends 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 due to non-recurring congestion, the contractor shall deploy a means of providing advance warning of the traffic congestion, as approved by the engineer. The warning location shall be no less than 1000 feet and no more than 0.5 mile in advance of the end of the traffic queue on divided highways and no less than 500 feet and no more than 0.5 mile in advance of the end of the traffic queue on undivided highways.

3.0 Work Hour Restrictions.

3.1 There are six major holiday periods shown below. All lanes shall be scheduled to be open to traffic during these holiday periods, from 12:00 noon on the last working day proceeding the holiday until 9:00 a.m. on the first working day subsequent to the holiday.

Memorial Day
Independence Day
Labor Day
Thanksgiving
Christmas
New Year's Day

3.2 The contractor shall not perform any construction operation on the roadway, 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 is advised that MoDOT has state holidays which may or may not have MoDOT staff on duty for the day. The contractor shall notify the SL ITS staff at least one business day in advance of the state holiday to see if there is staff available to verify the work being done. The contractor shall not perform any work that will impact the ITS network if there is no ITS staff available to verify the network's operation except during emergency work. The state holidays are listed as follows:

New Year's Day
Martin Luther King, Jr. Day: Third Monday in January
Lincoln's Birthday
Washington's Birthday: Third Monday in January
Truman's Birthday
Memorial Day: Last Monday in May
Independence Day
Labor Day: First Monday in September
Columbus Day: Second Monday in October
Veteran's Day
Thanksgiving Day: Fourth Thursday in November
Christmas Day

3.4 Any work requiring a reduction in the number of through lanes of traffic shall be completed during nighttime hours. Nighttime hours shall be considered to be 7:00 p.m. to 6:00 a.m. for this project.

4.0 Detours and Lane Closures.

4.1 Ramp closures between the hours of 10am and 2pm shall be allowed at the discretion of the engineer.

4.2 No lane closures shall be allowed during 6am-9am and 3pm-7pm Monday through Friday. Any shoulder or off-roadway work hours shall be approved by the engineer.

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

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

D. TEMPORARY TRAFFIC CONTROL

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, truck mounted attenuators and equipment, 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.

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

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 for through value engineering but will be covered under 616-99.01, Temporary Traffic Control, lump sum.

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 trim-line 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.

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.

E. CONTRACTOR REQUIREMENTS

1.0 Description. The contractor shall have a qualified and competent staff to coordinate, communicate, and perform this specialized work. The contractor shall furnish all equipment necessary to perform the work described in this contract.

2.0 Staffing Requirements. The contractor will submit a written list of key staff members to the engineer two (2) weeks prior to the preconstruction meeting for review. When approved, the contractor will be required to use staff as submitted. Key staff may only be substituted through a written request by the contractor and written approval by the engineer. In the event of staff turnover of key staff members, the contractor shall replace the respective staff with an individual with substantially equivalent experience and meeting the respective qualifications described below. The engineer will have final approval on the acceptability of all staff working on the project.

2.1 The contractor's staffing submittal shall include resumes of key staff that clearly provide supporting documentation in meeting the requirements described below and describe maintenance experience on specific projects. At a minimum, the resumes shall include:

- Educational background, including any degrees and/or certifications, and the institution and year for which they were received.
- A brief description of similar projects that the individual was involved with. The description should include: project name, agency, agency contact, contract cost, date(s) of services, and a short narrative of services provided.
- Availability of staff described as a percentage of working hours in a typical work week.

2.2.1 Key Staff submittal shall, as a minimum, list a project manager, lead field communication technician, lead electrician, and lead field hardware technician.

2.3 Minimum Requirements of Project Manager. As required to maintain the system properly, the contractor shall provide an on-site professional project manager for administration of the maintenance and remedial maintenance or repair services of the ITS hardware. The project manager shall provide technical expertise, direction, and strategies regarding all aspects of ITS hardware maintenance, operation, and/or improvements.

The project manager shall:

- Have a minimum of five (5) years of experience managing similar work.
- Be available (in person and via phone/email) to the engineer twenty-four (24) hours a day, seven (7) days a week
- Participate in bi-weekly coordination meetings with the Commission, and other contract personnel

2.4 Minimum Requirements of Lead Field Communications Technician. The individual, or individuals, assigned to this role will provide the Commission with technical communication repair services.

The lead field communications technician shall:

- Have experience in DWDM networks
- Have experience in wireless communication network maintenance
- Either show successful completion of one (1) three-day course in fiber optic splicing from a major manufacturer of fiber optic cable/equipment (such as Corning, AT&T, Lucent etc) Or be certified as a fiber optic technician by the Fiber Optic Association, Inc (Boston, MA)
- Have a minimum of two (2) years of experience in the installation of digital and analog data communication systems, within the last five (5) years.

2.5 Minimum Requirements of Lead Electrician. The individual, or individuals, assigned to this role will provide the Commission with field ITS hardware electrical repair services.

The lead electrician shall:

- Be a licensed electrician in the State of Missouri.

2.6 Minimum Requirements of Lead Field Hardware Technician. The individual, or individuals, assigned to this role will provide the Commission with field ITS hardware technical repair services.

The lead field hardware technician shall:

- Have experience in the installation and maintenance of Closed Circuit Television (CCTV) camera assemblies and video switches, including:
    - Controller cabinets
    - Camera housings, and
    - Camera pressurization systems
- Have experience in Dynamic Message Sign (DMS) installation and maintenance
- Have a minimum of two (2) years of experience in the installation, integration, maintenance, and operations of ITS equipment, within the last five (5) years.

- Have experience with the various vehicle detection systems (including microwave, radar, non-intrusive, and Bluetooth technologies)
- Have been certified by MoDOT's ITS device manufacturers.

3.0 Required Equipment. The contractor shall furnish all equipment and tools necessary to complete the work required in this contract, including equipment for field maintenance work and communications for the project. This equipment will remain the property of the contractor throughout the project and after its conclusion. The contractor will also be responsible for all maintenance, repairs, and calibration (including firmware updates) needed to keep the equipment in proper working condition.

3.1 Communication and Coordination Equipment. At least one member of the contractor work crew shall be available by telephone at all times while working on the project. The phone numbers shall be furnished to the engineer for use in the project communications

3.2 Maintenance Equipment. The contractor shall be required to possess, buy upon award, lease or rent any equipment or tools necessary for this project. While it is the contractor's responsibility to determine what equipment is necessary, a partial list of anticipated equipment includes:

- Fiber optic cable fusion splicers
- Fiber optic Optical Time Domain Reflectometer
- Fiber optic cable power meter
- Radar speed gun (or other speed measuring device)
- Bucket truck
- Backhoe
- Cable pulling tension meter
- Cable pulling pulleys
- Pole erection crane or truck

The contractor shall submit an equipment list to the engineer two (2) weeks prior to preconstruction meeting.

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

F. COORDINATION WITH MoDOT SL ITS STAFF

1.0 Description. Any work that will impact the existing communications network and devices must be coordinated with the St. Louis District's ITS staff. This includes removal and replacement of any existing communications equipment, 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.

2.0 Contact. Initial contact must be made at least seven (7) calendar days before work that may impact the existing communications network commences. Contact SL ITS staff utilizing the SL ITS Contact list given at pre-construction meeting or via email at **SLITS@modot.mo.gov**. The engineer shall be notified prior to making contact with ITS staff.

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

3.1 Prior to beginning work on any item, the contractor shall verify with the engineer that operations, such as cutting an existing cable or unplugging existing connectors, will not adversely impact the functionality of the other devices in the system. In the event that the work will disconnect other devices from the system, the engineer shall advise the contractor how to proceed. Mitigations efforts may include splicing the cable in an adjacent pull box prior to beginning the work or requiring the work to be done on an expedited schedule to minimize the impacts. Splicing or other mitigation efforts shall be compensated for using the standard pay items on this contract, unless considered **out of scope work** by the engineer.

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

G. COORDINATION WITH OTHER PROJECTS

1.0 Description. Other contracts (that increase or decrease field equipment quantities, expand the communication network, and/or develop/integrate software device drivers to control additional equipment) may be awarded, ongoing, and/or completed during the life of this maintenance contract. The contractor shall be responsible for coordinating with the engineer and other project representatives, efforts related to these other contracts to ensure that access to field devices is not the cause of construction delays or claims.

The coordination required under this section will consist primarily of ensuring that communications systems are adjusted to account for planned disruptions or existing communications infrastructure.

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

H. UTILITIES

1.0 The Contractor shall be aware there are numerous utilities present along the routes in this contract. It is the inherent risk of the work under this contract that the contractor may encounter these utilities above and/or below the ground or in the vicinity of any given job order which may interfere with their operations. The contractor expressly acknowledges and assumes this risk even though the nature and extent is unknown to both the contractor and the Commission at the time of bidding and award of the contract. The effect in cost or time of the presence of utilities above, below or in the vicinity of the contractor's work under this contract shall not be compensable. If a utility is determined to be in conflict with the proposed work the contractor shall contact the engineer to determine a course of action.

1.1 Missouri Standard Specification Book for Highway Construction, SECTION 105 CONTROL OF WORK, 105.7 COOPERATION WITH UTILITIES: Contractor shall adhere to all specifications.

I. PREVENTATIVE MAINTENANCE

1.0 Description. The contractor shall perform preventative maintenance on ITS devices, cabinets, communication equipment, and any additional ITS hardware identified within this section (including cleaning).

1.1 Schedule. The contractor shall develop a schedule detailing the dates for which each device will have its preventative maintenance performed. The engineer shall provide the contractor with the previous year's preventative maintenance schedule four (4) weeks prior to preconstruction meeting. The contractor shall develop a schedule that ensures the minimum frequency of preventative maintenance per device is maintained. The contractor shall submit the schedule to the engineer by the preconstruction meeting. Deviation from the proposed schedule of more than one (1) week may be allowed with prior approval from the engineer. The engineer reserves the right to alter the proposed schedule. The engineer also reserves the right to order additional maintenance visits of problematic ITS devices as needed by increasing the quantity paid for at the contract unit price.

1.2 The contractor shall provide all equipment and materials necessary to comply with the requirements of this provision.

1.3 Detailed preventative maintenance procedures, including checklist of tasks to be performed, per ITS device and cabinet shall be developed by the contractor. The contractor shall be responsible for performing all procedures in accordance with the manufacturer's recommendations. The contractor shall submit checklists per each device to the engineer by the preconstruction meeting for review and approval.

2.0 Items.

2.1 CCTV Cameras. All preventative maintenance shall be done in accordance with the manufacturer's recommended procedures. The contractor will need to provide a bucket truck in order to access the cameras. This item shall also include PM of its associated field cabinet, in accordance with Section 2.2 of this provision. For each camera assembly, the following items of work shall be performed:

2.1.1 General Cleaning. The contractor shall thoroughly clean the outside of each camera dome assembly. The contractor shall apply a rain repellent coating to the outside of the lower dome, per the coating manufacturer's instructions. The coating must be recommended by its manufacturer for clear acrylic. Upon completion, the camera assembly shall be neat and clean in appearance.

2.1.2 General Inspection. The contractor shall inspect each camera assembly for general condition, including cables and wires, connectors, cameras, pan-tilt units, power supplies, surge protectors, CCTV pole access panels and any other equipment contained within each enclosure. All bolts and screws in the cameras and controller will be checked and tightened.

Any access panel screws that are broken/stripped/missing shall be replaced or repaired by the contractor.

2.1.3 Operational Integrity Checks. The contractor shall, at a minimum, check the following functions during each preventative maintenance inspection:

- Check all local functions, such as pan, tilt, zoom, focus
- Check operation of auto-iris and adjust as necessary
- Check camera dome pressure and compare to manufacturer's specifications
- Recharge camera dome per manufacturer's recommendations
- Once the cameras are re-installed and prior to leaving the CCTV site, the contractor shall contact SL ITS or TMC Staff in order to verify proper operation (including pan/tilt/zoom, preset functions, and CCTV description).

2.1.4 Frequency. The contractor shall perform preventative maintenance on each CCTV camera once every calendar year.

2.2 Field Cabinets. All preventative maintenance shall be done in accordance with the manufacturer's recommended procedures. Care shall be taken to prevent damaging components or cabling within or near the cabinet. The contractor shall trim grass and brush back for a five (5) foot radius around each cabinet and remove and debris from around and on top of the cabinet base. The contractor shall, upon inspection of the field cabinet, lubricate the locking mechanism, hinges, and door locking arm mechanism in accordance with manufacturer specifications. If any lock covers are missing, the Contractor shall place tape over the keyhole.

2.2.1 General Cleaning. The contractor shall thoroughly clean each cabinet, including vacuuming loose dirt and debris. All enclosures will be cleared of any dirt or debris, and conduits shall be plugged with duct seal to prevent rodents and such from entering. The contractor shall wipe down all accessible equipment areas, racks, and shelves contained within the cabinet. Upon completion, the cabinet shall be free of all debris, rodents, pests, and animal waste, and shall be neat and clean in appearance.

2.2.2 Cabinet Filter Replacement. The contractor shall replace cabinet filters and vacuum out dust particles from the screens and filter holders. This includes cleaning of louvers and screens covering filter holder.

2.2.3 Pest Control and Damage Repair. The contractor shall remove any old ant bait containers and install a new bait container in each field cabinet after the General Inspection and cleaning.

2.2.4 General Inspection. The contractor shall inspect each cabinet for general condition, including condition of cables and wires, conduit duct seal integrity, heaters processors, power supplies, cabinet lights, fans, doors, locks, shelves, din rails, and communications panels or equipment contained within each cabinet. The contractor shall also inspect the integrity of the cabinet identification plaque. Any broken or damaged field cabinet components shall be documented in the Preventative Maintenance Report and repaired. If the repairs are deemed significant by the engineer, the repairs shall be dealt with as described for **out of scope work.** Preventative maintenance shall include the replacement of any burned-out or broken light bulbs found.

2.2.5 Operational Integrity Checks. The contractor shall check and record incoming power supply voltages, and verify landings of twisted-pair communication cable (where applicable). Any detectors not functioning shall be reported to the engineer.

2.2.6 Frequency. The contractor shall perform preventative maintenance on each field cabinet at the same time as its associated ITS device.

2.3 Communication Node Field Cabinets. All preventative maintenance shall be done in accordance with the manufacturer's recommended procedures. Care shall be taken to prevent damaging components or cabling within or near the cabinet. The contractor shall trim grass and brush back for a five (5) foot radius around each cabinet and remove any debris from around and on top of the cabinet base. The contractor shall, upon inspection of the field cabinet, lubricate the locking mechanism, hinges, and door locking arm mechanism in accordance with manufacturer specifications. If any lock covers are missing, the Contractor shall place tape over the keyhole.

2.3.1 General Cleaning. The contractor shall thoroughly clean each cabinet, including vacuuming loose dirt and debris. All enclosures will be cleared of any dirt or debris, and conduits shall be plugged with duct seal to prevent rodents and such from entering. The contractor shall wipe down all accessible equipment areas, racks, and shelves contained within the cabinet. Upon completion, the cabinet shall be free of all debris, rodents, pests, and animal waste, and shall be neat and clean in appearance.

2.3.2 Cabinet Filter Replacement. The contractor shall replace cabinet filters and vacuum out dust particles from the screens and filter holders. This includes cleaning of louvers and screens covering filter holder.

2.3.3 Pest Control and Damage Repair. The contractor shall remove any old ant bait containers and install a new bait container in each field cabinet after performing general cleaning.

2.3.4 General Inspection. The contractor shall inspect each cabinet for general condition, including condition of cables and wires, conduit duct seal integrity, heaters processors, power supplies, cabinet lights, fans, doors, locks, shelves, din rails, and communications panels or equipment contained within each cabinet. The contractor shall also inspect the integrity of the cabinet identification plaque. Any broken or damaged field cabinet components shall be documented in the Preventative Maintenance Report and repaired. If the repairs are deemed significant by the engineer, the repairs shall be dealt with as described for **out-of-scope work.** Preventative maintenance shall include the replacement of any burned-out or broken light bulbs found.

2.3.5 Operational Integrity Checks. The contractor shall check and record incoming power supply voltages, and verify landings of twisted-pair communication cable (where applicable). Any detectors not functioning shall be reported to the engineer.

2.3.6 Frequency. The contractor shall perform preventative maintenance on each Communication Node Cabinet once every calendar year.

2.4 Air Conditioning Units. Currently A/C units are only installed at Communication Node Field Cabinets. All preventative maintenance shall be done in accordance with the manufacturer's recommended procedures. Work under this item shall include removing the A/C unit and opening the unit to provide access to the interior. Preventative Maintenance of HVAC shall be performed twice per year: once between March 1st and May 15th, and another from July 1st to September 15th of each Calendar Year, unless otherwise directed by the engineer.

2.4.1 General Cleaning. The contractor shall thoroughly clean the internal components and external surface of each A/C unit, and all enclosures will be cleared of any dirt or debris. Any paint or graffiti markings on the exterior shall be cleaned off and/or remove. Upon completion, the a/c unit shall be free of all debris, rodents, pests, and animal waste, and shall be neat and clean in appearance.

2.4.2 Air Conditioning Filter Replacement. The contractor shall replace the A/C filter during each preventative maintenance visit.

2.4.3 General Inspection. The contractor shall inspect each A/C unit for general condition, including condition of the cables and wires, panels, or components contained within each cabinet.

2.4.4 Operational Integrity Checks. The contractor shall check and ensure operation of the A/C unit including a diagnostics check of the entire A/C unit. This shall include the checking for proper refrigerant levels and filling, if necessary.

2.4.5 Frequency. The contractor shall perform preventative maintenance on each Air Conditioning Unit twice every calendar year, within the time period stated above.

2.5 Dynamic Message Signs (DMS). All preventative maintenance shall be done in accordance with the manufacturer's recommended procedures. Care shall be taken to prevent damaging components or cabling within the enclosure. The contractor will need to provide a bucket truck in order to access the signs. This item shall also include PM of its associated field cabinet, in accordance with Section 2.2 of this provision. For each DMS, the following items of work shall be performed:

2.5.1 General Cleaning. The contractor shall thoroughly clean the DMS. The enclosures shall be cleared of any dirt and debris, any paint or graffiti markings on the exterior shall be cleaned off and or removed, and all accessible interior equipment areas, racks and shelves shall be wiped down. Upon completion, the enclosure shall be free of all debris, rodents, pets and animal waste, and shall be neat and clean in appearance. The plexi-glass display cover shall be cleaned, inside and outside, and a water repellant solution shall be applied in accordance with its manufacturer's specifications.

2.5.2 Filter Maintenance. If the DMS' manufacturer recommends replacing the filters, the contractor shall replace its filter. If the DMS' manufacturer recommends cleaning and re-using the filters, the contractor shall clean and reinstall the filters. The contractor shall also vacuum out dust and particles from louvers and screens covering filter holders and before reinstalling cleaned filters or installing new filters.

2.5.3 General Inspection. The contractor shall inspect each location for general condition, including condition of cables and wires, power supplies, connectors, and communication panels or equipment contained within each DMS enclosure. The contractor shall also inspect operation of doors and lights.

2.5.4 Structural Inspection. The contractor shall visually inspect the structure for apparent cracks or defects, including the DMS mounting hardware. Wherever readily accessible, the contractor shall check that nuts and bolts are not loose. Repair or replace damaged grout or rodent mesh at base of sign.

2.5.5 Operational Integrity Checks. The contractor shall check and record voltages on all power supplies, and verify that all equipment appears to be operating properly. Contractor shall also perform a diagnostic on sign display per manufacturer's specifications. Any equipment not functioning properly shall be reported to the engineer. All enclosures shall be checked at this time and air handling devices shall be tested.

2.5.6 Frequency. The contractor shall perform preventative maintenance on each DMS once every calendar year.

2.6 Wireless Communication Links. This work shall include the testing, adjusting/calibrating, and preventative maintenance of wireless communication links, both licensed and unlicensed. All preventative maintenance shall be done in accordance with the manufacturer's recommended procedures. Care shall be taken to prevent damaging components or cabling. The existing wireless links are in the 900MHz range, the 4.9 GHZ range and the 5 GHz range.

2.6.1 General Cleaning. The contractor shall inspect the general condition of the wireless equipment, including antenna and other external mounted equipment, paying particular attention to wiring harnesses and connectors.

2.6.2 Signal Testing. The contractor shall conduct path alignment tests and check antenna alignment from ends, measure antenna gain, measure link throughput, document background signals on similar frequencies, and measure the Voltage Standing Wave Radio. For all 4.9 gig links, the contractor shall report to engineer any links that do NOT provide 22 MB per second. The contractor shall perform site survey to determine if any foliage from trees or structure installations has encroached on the clear line of sight between radio links. If encroachment has occurred, the contractor shall document encroachment and either perform tree trimming remediation efforts or report to the engineer any structure installations.

2.6.3 Equipment Adjustments. The contractor shall perform the necessary adjustments, including adjustments to the antenna alignment to maximize available throughput and maintain the strongest possible signal.

2.6.4 Frequency. The contractor shall meet the requirements of Section 2.6 for all complete wireless communications links, including equipment at both ends of the link, a minimum of once calendar year.

2.7 Non-Intrusive Vehicle Detector Stations. This work shall include the inspection, preventative maintenance and minor remediation of each detector and assembly. All preventative maintenance shall be done in accordance with the manufacturer's recommended procedures. This item shall also include PM of its associated field cabinet, in accordance with Section 2.2 of this provision.

The contractor shall perform the following items of work for each detector and assembly:

- Check integrity of cables and connectors
- Check, test and calibrate the vehicle detectors using the testing method submitted to and approved by the engineer.
- Re-aim the detectors as needed
- Visually inspect electrical path to ground

2.7.1 Testing Procedure - Microwave Sensors. A detailed procedure and documentation template shall be prepared and submitted to the engineer for approval. At a minimum, the vehicle detector testing shall be conducted with a radar speed gun and a laptop computer connected to the remote traffic sensor unit. A five (5) minute sample of manually counted traffic volumes shall be taken for each lane and compared to the recorded volume detected by the unit. A variance exceeding five percent (5%) shall be considered a failure and require re-aiming and/or calibrating the detector and re-testing. Additionally, spot speeds shall be recorded from radar gun observations and compared to the observed speed detected by the detector and observed on the laptop. A variance exceeding ten percent (10%) shall be considered a failure and require re-aiming and/or calibrating the unit and retesting.

2.7.2 Testing Procedure - Bluetooth Sensors. A detailed procedure and documentation template shall be prepared and submitted to the engineer for approval.

2.7.3 Frequency. The contractor shall meet the requirements of Section 2.7 for all Non-intrusive Vehicle Detectors and their assemblies a minimum of once per 1-year period.

2.8 Uninterruptible Power Supplies (UPS). This work shall consist of the inspection and preventative maintenance for each UPS assembly located at Node Cabinets. All preventative maintenance shall be done in accordance with the manufacturer's recommended procedures. For each UPS assembly, the following items of work shall be performed:

2.8.1 General Cleaning. The contractor shall thoroughly vacuum any dust and debris from the UPS cabinet. Upon completion, the UPS cabinet shall be neat and clean in appearance.

2.8.2 General Inspection. The contractor shall visually inspect all components for damage, defects, corrosion or signs of abnormal wear.

2.8.3 Operational Integrity Checks. The contractor shall, at a minimum, check the following functions during each preventative maintenance inspection:

- Inverter is properly programmed and functioning correctly,
- Battery condition is operating properly and within manufacturer's specifications,
- All line and load terminals are snug on switch panel,
- All applicable control wiring connectors are properly terminated in UPS cabinet,
- Battery harness connections are properly connected,
- Components are properly grounded and connections are snug,
- Batteries are properly labeled in numerical order,

- Software version is current,
- UPS cycles properly on power loss and power return field test,
- Fan is operational and vented louvers are clear of dust and debris,
- Tamper evident lock is installed on rear access door,
- Batteries checked for proper voltage according to the manufacturer,
- Address all active fault warnings,
- Conduit openings are properly sealed, and
- Warning label is affixed on the power supply.

2.8.4 Frequency. The contractor shall meet the requirements of Section 2.9 for all UPS assemblies a minimum of once per calendar year.

2.9 Solar Power System This work shall consist of inspecting and performing preventative maintenance of the solar power systems used to power some Non-Intrusive Vehicle Detection Stations (Microwave) locations.

2.9.1 Construction Methods. All preventative maintenance shall be done in accordance with the manufacturer's recommended procedures. For each Solar Power System assembly in the contract, the following items of work shall be performed:

2.9.2 General Cleaning. The Contractor shall thoroughly vacuum any dust and debris from the Solar Power System cabinet. Upon completion, the Solar Power System cabinet shall be neat and clean in appearance.

2.9.3 General Inspection. The Contractor shall visually inspect all components for damage, defects, corrosion, or signs of abnormal wear.

2.9.4 Operational Integrity Checks. The Contractor shall, at a minimum, check the following functions during each preventative maintenance inspection:

- Inverter is properly programmed and functioning correctly,
- Battery conditioner is operating properly,
- All line and Load terminals are snug on switch panel,
- All applicable control wiring connectors are properly terminated in Solar Power System cabinet,
- Battery harness connections are properly connected,
- Components are properly grounded and connections are snug,
- Batteries are properly labeled,
- Ensure there is plenty of ventilation in the battery enclosure,
- Each battery cells should be clean before removing any filter caps for maintenance. To clean the cells, use either a brush to remove dry materials and/or a rag dipped in a solution of baking soda and water and thoroughly squeezed out,
- Solar Power System cycles properly on power loss and power return field test,
- Fan is operational and vented louvers are clear of dust and debris,
- Tamper evident lock is installed on rear access door,
- Batteries checked for proper voltage according to the manufacturer,
- Address all active fault warnings,
- Conduit openings are properly sealed,

- Warning label is affixed on the power supply.

2.9.5 Frequency. The contractor shall meet the requirements of Section 2.10 for all Solar Power Systems a minimum of once per calendar year.

3.0 Structural Defects. The contractor shall visually inspect the ITS device's pole, concrete base, and mounting hardware for signs of abnormal wear, such as cracks, significant rust, missing or broken anchor bolts, or other signs of weakness. ***If a structural defect or abnormal wear is noticed through this work,*** the contractor shall submit documentation directly to the engineer to highlight the structural issues noted, **within 24 hours** of the inspection.

4.0 Verification and Modification of Communication Drawings. The engineer will provide the contractor with access to the as-built communication drawings for each device to be maintained on this contract. For each device the contractor performs preventative maintenance on, the contractor shall verify the accuracy of the current communication diagram. If a discrepancy is discovered, the contractor shall notify the SLITS Group with the as-is device names and fiber tube and strands colors in their daily reports and shall modify the electronic copy of the diagram for that device location and submit the revised electronic file to the engineer. This does not include the Node or the signal cabinets when the contractor does not perform a Preventative Maintenance check. Updated drawings shall be submitted electronically, in color, for both Visio and PDF formats, within fourteen (14) days of the inspection.

5.0 Documentation. The contractor shall use the location documentation, including inventory and wiring diagrams to verify that all equipment is documented and the correct models and serial numbers are recorded. All information gathered under this item shall be submitted to the engineer as outlined in **JSP – Documentation and Reporting**. This report shall document all items checked, verified and if repairs were made, including filters replaced. The make, model and serial number of the ITS devices, communication equipment, and other included hardware shall be noted.

5.0.1 CCTV cameras. The contractor shall note the initial and final camera dome pressures upon completion of a recharge, if necessary.

5.0.2 Vehicle Detectors. The documentation prepared and filed for this work shall also include a tabular summary comparing observed speeds and volumes with detected speeds and volumes.

5.0.3 Organization of Records. Reports for devices and cabinets inspected under this item shall be organized in an electronic format, sorted by location ID in ascending order, and delivered to the engineer as outlined in **JSP – Documentation and Reporting**.

6.0 Materials. The contractor shall procure and maintain an inventory of contractor furnished ITS spare parts necessary to complete the requirements of this job special provision. The contractor shall also maintain an inventory of Commission-furnished equipment necessary to complete the requirements of this job special provision. See **JSP – Out of Scope Work & Repairs** for more details.

7.0 Method of Measurement. Measurement for preventative maintenance of the devices listed above shall be per each.

8.0 Basis of Payment. Payment for furnishing the labor, materials, and equipment necessary to inspect, test, clean, perform minor repairs (calibrations, re-aim, etc.), and perform any other preventative maintenance to the devices/systems listed above, as recommended by the manufacturer, shall be paid for by the contract unit price for:

Item Number	Item Description	Unit
910-99.02	PM DMP, Assembly, Poles, Foundation, and Cabinet	EA
910-99.02	PM CCTV Camera, Assembly, Pole, & Field Cabinet	EA
910-99.02	PM Communication Node Field Cabinet	EA
910-99.02	PM Air Conditioning Units for Node Cabinets	EA
910-99.02	PM DMS, Assembly, Pole, Foundation & Field Cabinet	EA
910-99.02	PM Solar Power System	EA
910-99.02	PM Communication Link and Assembly	EA
910-99.02	PM Uninterruptible Power Supply (UPS) for Node Cabinets	EA
910-99.02	PM Non-Intrusive Vehicle Detector Stations (Microwave)	EA
910-99.02	PM Non-Intrusive Vehicle Detector Stations (Bluetooth)	EA

J. PREVENTATIVE MAINTENANCE WITH REPAIRS

1.0 Description. The contractor shall perform preventative maintenance as outlined in the **JSP – Preventative Maintenance** for any needed repairs on ITS devices, cabinets, communication equipment, and any additional ITS hardware listed below:

- CCTV Camera, Assembly, Pole, and Field Cabinet
- DMS, Assembly, Pole, Foundation, and Field Cabinet
- DMP, Assembly, Pole, Foundation, and Field Cabinet
- UPS for Node Cabinets
- Solar Power Systems

2.0 Materials. The contractor shall procure and maintain an inventory of contractor furnished ITS spare parts necessary to complete the requirements of this job special provision. The contractor shall also maintain an inventory of Commission-furnished equipment necessary to complete the requirements of this job special provision. See **JSP O - Out of Scope Work & Repairs** for more details.

3.0 Method of Measurement. Measurement for preventative maintenance and repairs of the devices listed above shall be per each.

4.0 Basis of Payment. Payment for furnishing the labor, materials, and equipment necessary to inspect, test, clean, perform minor repairs (calibrations, re-aim, etc.), and perform any other preventative maintenance and repairs to the devices/systems listed above, as recommended by the manufacturer, shall be paid for by the contract unit price for:

Item Number	Item Description	Unit
910-99-02	PM with Repairs – MoDOT approved DMP, Assembly,	EA

	Pole, Foundation, & Field Cabinet	
910-99-02	PM with Repairs – MoDOT approved CCTV Camera, Assembly, Pole, & Field Cabinet	EA
910-99-02	PM with Repairs – MoDOT approved CCTV	EA
910-99-02	PM with Repairs – MoDOT approved CCTV Device Server	EA
910-99-02	PM with Repairs – MoDOT approved CCTV Encoder	EA
910-99-02	PM with Repairs – MoDOT approved CCTV cables and wires	EA
910-99-02	PM with Repairs – MoDOT approved CCTV connectors	EA
910-99-02	PM with Repairs – MoDOT approved CCTV surge protector	EA
910-99-02	PM with Repairs – MoDOT approved CCTV power supply	EA
910-99-02	PM with Repairs – MoDOT approved CCTV pole access panel	EA
910-99-02	PM with Repairs – MoDOT approved IP addressable power strip	EA
910-99-02	PM with Repairs – MoDOT approved DMS Pixel board	EA
910-99-02	PM with Repairs – MoDOT approved DMS Driver board	EA
910-99-02	PM with Repairs – MoDOT approved DMS power supply	EA
910-99-02	PM with Repairs – MoDOT approved DMS fan	EA
910-99-02	PM with Repairs – MoDOT approved DMS controller	EA
910-99-02	PM with Repairs – MoDOT approved DMS LCA	EA
910-99.02	PM with Repairs – MoDOT Solar Power System	EA

K. REMEDIAL MAINTENANCE

1.0 Description. This work should include the repair of field components that have been damaged by storms, vehicle collisions, construction activities, or other unanticipated events. Major relocations or system upgrades shall not be considered part of this work. All work under this provision shall be done in accordance with the current Missouri Standard Specifications for Highway Construction.

1.1 The process for repairs shall be initiated when the engineer or the engineer's representative, issues the contractor a MoDOT MOMS work order. The contractor shall conduct an initial diagnosis, report to the engineer the diagnosis and recommend a solution with associated costs. With the engineer's approval, the contractor shall implement an appropriate repair. The contractor shall check for new MoDOT MOMS work orders on a daily basis.

1.1.1 The contractor shall inform the engineer when the work has been completed for each MoDOT MOMS work order. However, the MoDOT MOMS work order shall not be closed or considered complete, until the engineer or engineer's representative has verified that the malfunction has been corrected. If the engineer does not concur that the problem has been resolved, the MoDOT MOMS work order shall be so noted and returned to the contractor.

1.1.2 MoDOT MOMS work orders, location histories, and inventory information shall be maintained in electronic format by the contractor. These records and logs shall be provided to the engineer as requested.

1.2 The contractor shall furnish all equipment and materials necessary to comply with the requirements of this provision unless stated otherwise.

2.0 Response Time. The engineer, or the engineer's representative, shall determine whether or not a malfunction is critical to the operation of the St. Louis District's ITS system.

2.1 Critical System Repairs. The contractor shall be available to respond, diagnose, and repair critical system failures/malfunctions on a twenty-four (24) hours per day, seven (7) days per week, three hundred sixty five (365) days per year schedule. The engineer may notify the contractor of critical system failures/malfunctions during and outside normal business hours and on holidays. The contractor shall provide a 24/7 central telephone number to be used by the engineer to notify and report critical system failures/malfunctions. *The contractor shall be required to respond onsite with the appropriate crew, equipment and material; make the site safe; and perform an initial diagnosis within 4 hours of notification.* The contractor shall recommend an appropriate repair to the engineer. If approved by the engineer, the contractor shall make the necessary repair to the system within the timeframe as described in the provision below as maximum allowable time for completion or as approved by the engineer.

2.1.1 Types of system malfunctions that would be considered critical may include, but shall not be limited to:

- Loss of communication with a node cabinet
- Fiber Optic Cable break in MoDOT's network backbone
- Device malfunctions during critical operations.

2.2 Non-Critical System Repairs. The engineer shall notify the contractor of non-critical system failures/malfunctions during normal business hours. *The contractor shall be required to respond onsite with the appropriate crew, equipment and material; make the site safe; and perform an initial diagnosis within 24 hours of notification.* The contractor shall recommend an appropriate repair to the engineer. If approved by the engineer, the contractor shall make the necessary repair to the system within the timeframe as described in the provision below as maximum allowable time for completion or as approved by the engineer.

2.3 Notification shall be defined as when the contractor receives a call or email with MoDOT MOMS work order from the engineer, or the engineer's representative The contractor is required to immediately reply to the engineer's phone calls or emails to verify receipt of notification.

3.0 Standard Repair Items.

3.1 Remove CCTV Camera & Assembly. The contractor shall remove the existing camera, camera dome, pan/tilt unit, device server, and all cables and connectors from the pole. The existing camera controller assembly in the cabinet shall be disconnected from the camera communication/power cables and the cables shall be removed from the cabinet. The contractor shall only remove the camera controller or CODEC from the cabinet if directed by the engineer. All items, removed by the contractor, shall remain the property of the Commission and shall be put into storage by the contractor for use as maintenance spare parts, reinstalled or disposed of as directed by the engineer.

3.1.1 Once removal has begun, the contractor shall be responsible for the condition of all equipment. Compensation for equipment damaged shall be deducted from the contract. The contractor may request of field meeting with the engineer, or the engineer's representative, at the site to inspect the equipment prior to removal.

3.1.2 The contractor shall have a maximum of four (4) hours to complete the requirements of this provision.

3.2 Install CCTV Camera & Assembly. This work shall consist of installing a Commission-furnished closed circuit television (CCTV) camera and assembly, or salvaged camera and assembly, on a metal pole and install a Commission-furnished power supply and surge protection in a nearby cabinet. The pole and cabinet will be existing or shall be paid for separately. This work also requires the contractor to provide cables connecting the camera to the equipment in the cabinet and to ground, provide an air terminal, set up the camera assembly and test for proper operation.

3.2.1 Qualified Personnel. The Commission's agreement with the camera assembly 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 camera and assembly. 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 camera and assembly installation, setup and testing. The engineer or the engineer's representative shall be present to observe the training.

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

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

3.2.3 Materials. Camera assembly, mounting bracket, power supply and surge suppressors will be provided by the Commission or salvaged and refurbished from a previous installation.

The contractor shall acquire cables for power, video, and camera control from the camera's manufacturer or shall use salvaged and refurbished cables from a previous installation.

The contractor shall provide stainless steel bands to affix the mounting bracket to the new or existing pole. The banding shall be 1-inch wide and 0.044-inch thick stainless steel.

The contractor shall provide an air terminal that is solid copper at least 5/8 inch in diameter. The top of the rod shall be tapered to a point. The bottom of the rod shall be flattened and bolted to the pole using at least three stainless steel bolts

3.2.4 Construction Requirements. The dome shall be installed so that the pole does not block the camera's view of traffic.

The air terminal shall be installed on the opposite side of the pole from the dome. The contractor shall position the rod to project a minimum of five feet above the highest point of the pole, and attach it to the pole with bolts passing through the wall of the pole and bond the air terminal to the top of the pole. The contractor shall apply a copper-based conductive sealant between the rod and the pole before tightening the bolts. The pole itself shall be the ground conductor.

The bottom of the pole shall be connected to one or more ground rods using a bare, solid AWG # 6 copper wire. The contractor shall use exothermic welding for all ground wire connections, except the connection to the pole, which shall use the pole's grounding lug. The contractor shall use a device that measures resistance to ground using the three-point fall-of-potential method and shall test the resistance from the air terminal to ground. If the resistance between the air terminal and ground exceeds 8 ohms, the contractor shall add more ground rods to achieve this requirement. The contractor shall perform all work related to the installation of the air terminal in accordance with NFPA 780.

The contractor shall terminate all the cables on surge protectors, install the Commission-furnished power supply in the cabinet, and connect the camera power circuit to the power supply.

The contractor shall be responsible for restricting the camera's field of view, if necessary, so that a user cannot use the cameras to look in the windows of dwellings or view residential property, as long as the restriction does not interfere with the use of the camera for traffic management purposes. Prior to creating these restrictions, the contractor shall submit to the engineer a written description of the proposed restrictions to be installed at each camera, and the proposed method of achieving them. The restrictions shall be constructed such that it shall not be possible for an operator to override them 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. If there are situations in which there is a conflict between the need to protect privacy and the need to manage traffic, the contractor shall advise the engineer. The contractor shall revise the field of view restrictions as directed by the engineer.

The contractor shall apply a rain repellent coating to the outside of the lower dome, following the coating manufacturer's instructions. The coating must be recommended by its manufacturer for clear acrylic.

The contractor shall configure the CCTV camera and CODEC, including appropriate IP addresses, as directed by the engineer to function properly within the existing communications scheme.

3.2.5 Acceptance Testing. Upon delivery of a shipment of new or refurbished camera assemblies, the manufacturer's representative 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 manufacturer shall be responsible for replacing all defective units uncovered by this testing.

After installing the camera assembly, the contractor shall test it using the same procedures as the manufacturer's representative used when the camera assemblies were delivered. In addition, demonstrate that the agreed upon viewing restrictions have been implemented. 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.

3.2.6 The contractor shall have a maximum of four (4) hours to complete the requirements of this provision.

3.3 Remove Camera Pole. The work shall consist of removing an existing camera pole, after the existing camera and assembly, including cabinet, is removed from pole. The poles may be mounted and bolted to a concrete foundation or previously damaged to an extent that it has been knocked over and is laying adjacent to the foundation. Each pole, removed by the contractor, shall remain the property of the Commission and shall be put into storage by the contractor for use as maintenance spare parts, reinstalled or disposed of as directed by the engineer.

3.3.1 Once removal has begun, the contractor shall be responsible for the condition of all equipment. Compensation for equipment damaged shall be deducted from the contract. In lieu of a field meeting to determine the condition of the pole prior to its removal, the contractor may photograph the pole to document pre-existing damage prior to beginning work. Any damage, without sufficient documentation, shall be assumed to be caused by the contractor and the contractor will be responsible for the damages.

3.3.2 The contractor shall have a maximum of four (4) hours to complete the requirements of this provision.

3.4 Install Salvaged Camera Pole. The work shall consist of installing a salvaged camera pole on an existing of new concrete foundation.

The contractor shall perform the following:

- Install the camera pole on a new or existing foundation as directed by the engineer.
- Check the plumb of the pole and adjust as necessary.
- Tighten the anchor bolts to the torque specified by the manufacturer of the pole.

3.4.1 Installation or repair of a concrete foundation shall be considered out of scope work and shall be compensated for through methods described in other articles of this contract.

3.4.2 The contractor shall have a maximum of four (4) hours to complete the requirements of this provision.

3.5 Install New CCTV Pole (60 feet) and Lowering System.

3.5.1 Description. The camera lowering system shall be designed to support and lower a standard closed circuit television camera, lens, housing, PTZ mechanism, cabling, connectors and other supporting field components without damage or causing degradation of camera operations. The camera lowering system device and the pole are interdependent; and thus, must be considered a single unit or system. The lowering system shall consist of a pole, suspension contact unit, divided support arm, and a pole adapter for attachment to a pole top tenon, pole top junction box, conduit mount adapter and camera connection box. The divided support arm and receiver brackets shall be designed to self-align the contact unit with the pole center line during installation and insure the contact unit cannot twist under high wind

conditions. Round support arms are not acceptable. The camera-lowering device shall withstand wind forces of 100 mph with a 30 percent gust factor using a 1.65 safety factor. The lowering device manufacturer, upon request, shall furnish independent laboratory testing documents certifying adherence to the stated wind force criteria utilizing, as a minimum effective projected area, the actual EPA or an EPA greater than that of the camera system to be attached. The camera-lowering device to be furnished shall be the product of manufacturers with a minimum of 3 years of experience in the successful manufacturing of camera lowering systems. The lowering device provider shall be able to identify a minimum of 3 previous projects where the purposed system has been installed successfully for over a one-year period of time each.

The lowering device manufacturer shall furnish a factory representative to assist the electrical contractor with the assembly and testing of the first lowering system onto the pole assembly. The manufacturer shall furnish the applicable DOT engineer documentation certifying that the electrical contractor has been instructed on the installation, operation and safety features of the lowering device. The contractor shall be responsible for providing applicable maintenance personnel “on site" operational instructions.

3.5.2 Suspension Contact Unit. The suspension contact unit shall have a load capacity 200 lbs. with a 4 to 1 safety factor. There shall be a locking mechanism between the fixed and moveable components of the lowering device. The movable assembly shall have a minimum of 2 latches. This latching mechanism shall securely hold the device and its mounted equipment. The latching mechanism shall operate by alternately raising and lowering the assembly using the winch and lowering cable. When latched, all weight shall be removed from the lowering cable. The fixed unit shall have a heavy duty cast tracking guide and means to allow latching in the same position each time. The contact unit housing shall be weatherproof with a gasket provided to seal the interior from dust and moisture.

The prefabricated components of the lift unit support system shall be designed to preclude the lifting cable from contacting the power or video cabling. The lowering device manufacturer shall provide a conduit mount adapter for housing the lowering cable. This adapter shall have an interface to allow the connection of a contractor provided conduit and be located just below the cable stop block at the back of the lowering device. The Contractor shall supply internal conduit in the pole as required by the Engineer. The only cable permitted to move within the pole or lowering device during lowering or raising shall be the stainless steel lowering cable. All other cables must remain stable and secure during lowering and raising operations.

The female and male socket contact halves of the connector block shall be made of thermosetting synthetic rubber known as Hypalon. The female brass socket contacts and the male high conductivity brass pin contacts shall be permanently molded into the Hypalon body.

The current carrying male contacts shall be 1/8 inches in diameter. There shall be two male contacts that are longer than the rest which will make first and break last providing optimum grounding performance. The number of contacts shall be 14 and the camera mounted thereto, shall be capable of performing all of its necessary functions on 14 contacts or less.

The current carrying female contacts shall be 1/8 inches I.D. All of the contacts shall be recessed 0.125” from the face of the connector. Cored holes in the rubber measuring 0.25” in diameter and 0.125” deep molded into the connector body are centered on each contact on the face of the connector to create rain-tight seals when mated with the male connector.

The wire leads from both the male and female contacts shall be permanently and integrally molded in the Hypalon body. The current carrying and signal wires molded to the connector body shall be constructed of #18/1 AWG Hypalon jacketed wire.

The contacts shall be self-wiping with a shoulder at the base of each male contact so that it will recess into the female block, thereby giving a rain-tight seal when mated. The electrical contact connector must meet Mil Spec Q-9858 and Mil Spec I-45208.

3.5.3 Lowering Tool. The camera-lowering device shall be operated by use of a portable lowering tool. The tool shall consist of a lightweight metal frame and winch assembly with cable as described herein, a quick release cable connector, an adjustable safety clutch and a variable speed industrial duty electric drill motor. This tool shall be compatible with accessing the support cable through the hand hole of the pole. The lowering tool shall attach to the pole with one single bolt. The tool will support itself and the load assuring lowering operations and provide a means to prevent freewheeling when loaded. The lowering tool shall be delivered to the applicable DOT engineer upon project completion. The lowering tool shall have a reduction gear to reduce the manual effort required to operate the lifting handle to raise and lower a capacity load. The lowering tool shall be provided with an adapter for operating the lowering device by a portable drill using a clutch mechanism. The lowering tool shall be equipped with a positive breaking mechanism to secure the cable reel during raising and lowering operations and prevent freewheeling. The manufacturer shall provide a variable speed, heavy-duty reversible drill motor and a minimum of one lowering tool plus any additional tools required by plan notes. The lowering tool shall be made of durable and corrosion resistant materials, powder coated, galvanized, or otherwise protected from the environment by industry-accepted coatings to withstand exposure to a corrosive environment.

3.5.4 Materials. All pulleys for the camera lowering device and portable lowering tool shall have sealed, self-lubricated bearings, oil tight bronze bearings, or sintered- oil impregnated, bronze bushings. The lowering cable shall be a minimum 1/8-inch diameter stainless steel aircraft cable with a minimum breaking strength of 1740 pounds with (7) strands of 19 wire each.

All electrical and video coaxial connections between the fixed and lowerable portion of the contact block shall be protected from exposure to the weather by a waterproof seal to prevent degradation of the electrical contacts. The electrical connections between the fixed and movable lowering device components shall be designed to conduct high frequency data bits and one (1) volt peak-to-peak video signals as well as the power requirements for operation of dome environmental controls.

The interface and locking components shall be made of stainless steel and or aluminum. All external components of the lowering device shall be made of corrosion resistant materials, powder coated, galvanized, or otherwise protected from the environment by industry-accepted coatings to withstand exposure to a corrosive environment.

The camera junction box shall be cast ZA-12 (12% aluminum and 88% zinc) and weigh a minimum of 50 LBS to insure stability of camera during the raising and lowering operation. The camera junction box shall have 2 fully gasketed doors to prevent water intrusion. The bottom of the camera junction box shall be equipped with a condensation/moisture exit system.

The Camera Manufacturer shall provide weights and /or counterweights as necessary to assure that the alignment of pins and connectors are proper for the camera support to be raised into position without binding. The lowering unit will have sufficient weight to disengage the camera and its control components in order that it can be lowered properly.

The Camera Manufacturer shall provide the power and signal connectors for attachment to the bare leads in the pole top and/or camera junction boxes.

Either the Camera Manufacturer or the Lowering Device Provider shall provide a mounting flange sufficient for mounting the respective camera assembly to the bottom of the Camera connection box.

3.5.5 Camera Lowering System Steel Pole

Design. Design shall be in accordance with the 2001 AASHTO "Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals." Minimum Loading requirements shall be based on an isotach wind velocity for the area of installation according to 2001 AASHTO isotach wind chart with a 1.3 gust factor.

Shop Drawings are required and shall include details of the hand holes, cable inlets, and pole cap, as well as fasteners and hardware required for the lowering device. Calculations showing that the pole meets the requirements of the AASHTO specifications shall be submitted with the shop drawings, and calculations shall be signed and sealed by a Professional Engineer registered in the State of Missouri.

Fabricator. The Fabricator shall be certified under Category I, "Conventional Steel Structures" as set forth by the American Institute of Steel Construction Quality Certification Program. Proof of this certification will be required to ensure that the fabricator has the personnel, organization, experience, procedures, knowledge, equipment, capability and commitment to fabricate quality pole structures.

Welding. All welding shall be in accordance with Sections 1 through 8 of the American Welding Society (AWS) D1.1 Structural Welding Code. Tackers and welders shall be qualified in accordance with the code. Tube longitudinal seam welds shall be free of cracks and excessive undercut, performed with automatic processes, and be visually inspected. Longitudinal welds suspected to contain defects shall be magnetic particle inspected. All circumferential butt-welded pole and arm splices shall be ultrasonically or radiographically inspected.

Material Certifications. All materials and products shall be manufactured in the United States of America, and comply with ASTM or AASHTO specifications. Mill certifications shall be supplied as proof of compliance with the specifications.

Performance Calculations. The pole shall be designed to support the specified camera and accessories. Close consideration must be given to the effective projected area of the complete lowering system and camera equipment to be mounted on the pole along with the weight when designing the pole to meet the specified deflection performance criteria. The pole top deflection shall not exceed one inch in a 30-mph (non-gust) wind. The calculations shall include a pole, base plate, and anchor bolt analysis. The pole calculations shall be analyzed at the pole base,

at 5-ft. pole intervals/segments and at any other critical pole section. At each of these locations, the following information shall be given:

The pole's diameter, thickness, section modulus, moment of inertia, and cross sectional area.

The centroid, weight, projected area, drag coefficient, velocity pressure, and wind force of each pole segment.

The axial force, shear force, primary moment, total moment, axial stress, bending stress, allowable axial stress, allowable bending stress, and combined stress ratio (CSR).

The pole's angular and linear deflection.

Pole Shaft. The pole shaft shall conform to ASTM A595 Grade A with a minimum yield strength of 55 ksi or ASTM A572 with a minimum yield strength of 65 ksi. The shaft shall be round, 12-sided or 16 sided with a four inch corner radius, have a constant linear taper of 0.14 in/ft, and contain only one longitudinal seam weld. Circumferential welded tube butt splices and laminated tubes are not permitted. Longitudinal seam welds within 6 inches of complete penetration pole to base plate welds shall be complete penetration welds. The shaft shall be hot dip galvanized per the requirements of the contract documents.

Winch Hand Hole. The hand hole opening shall be reinforced with a minimum 2-inch wide hot rolled steel rim. The minimum outside dimension shall be 6 inches x 27 inches. The handhole shall have a tapped hole for mounting the portable winch thereto as shown on the drawings. Unless otherwise required, the bottom lip of this handhole shall be a minimum of 30 inches from the pole base.

Pole Top Tenon. The pole shall have a custom plate mounted tenon that allows the field modification of the arm/camera orientation up to 360 degrees. With this design the DOT engineer can make slight orientation modifications to the camera mount to allow optimum viewing in case of future road development, change in terrain or a change in the viewing needs priority. The tenon shall have mounting holes and slot as required for the mounting of the camera-lowering system. The tenon shall be of dimensions necessary to facilitate camera lowering device component installation. For details, see applicable drawings.

Cable Supports / Electrical Cable Guides and Parking Stand (Eyebolts). Top and bottom electrical cable guides shall be located within the pole aligned with each other as referenced in the drawings. One cable guide shall be positioned 2 inches below the handhole and the other shall be positioned 1 inch directly below the top of tenon. Two parking stands shall be positioned a maximum of 2.75 inches below the top of the handhole and located at 90 and 270 degrees from the handhole.

Base Plate. Base plates shall conform to ASTM A36 or A572 Grade 42. Plates shall be integrally welded to the tubes with a telescopic welded joint or a full penetration butt weld with backup bar. Plates shall be hot dip galvanized per the requirements of the contract documents.

Anchor Bolts. Anchor bolts shall conform to the requirements of ASTM F1554 Grade 55. The upper 12 inches of the bolts shall be hot dip galvanized per ASTM A153. Each anchor bolt shall be supplied with two hex nuts and two flat washers. The strength of the nuts shall equal or exceed the proof load of the bolts.

3.5.6 The contractor shall have a maximum of four (4) hours to complete the requirements of this provision.

3.6 Dynamic Message Sign (DMS)

3.6.1 Qualified Personnel. The Commission's agreement with the DMS manufacturers obligates the manufacturers to train the Commission's installation contractors in the unpacking, assembling, mounting, positioning, connecting to the communication network, set up and testing of the DMS. 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 DMS assembly repair and testing. The engineer or the engineer's representative shall be present to observe the training.

Contractors certified under a previous Commission contract shall not need to be trained a second time, but only personnel who received the training shall participate in the DMS assembly repair and testing.

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

3.6.3 Materials. DMS parts, including but not limited to fans, logic control assemblies, LED matrix modules, temperature sensor assembly, power supply assembly, photo sensor assembly, power surge protectors, and driver boards will be provided by the Commission or salvaged and refurbished from a previous installation.

The contractor shall acquire cables for power from the DMS's manufacturer or shall use salvaged and refurbished cables from a previous installation.

3.6.4 Construction Requirements. Once repairs are completed, the contractor shall inspect each location for general condition, including condition of cables and wires, power supplies, connectors, and communication panels or equipment contained within each DMS enclosure, check and record voltages on all power supplies, and verify that all equipment appears to be operating properly. Contractor shall also perform a diagnostic on sign display per manufacturer's specifications. Any equipment not functioning properly shall be immediately repaired and reported to the engineer.

3.6.5 Acceptance Testing. Upon completion, contractor shall contact the TMC staff to post test-messages onto the DMS. Contractor shall verify readability of the messages and report the findings to the engineer.

3.6.6 The contractor shall have a maximum of four (4) hours to complete the requirements of this provision.

3.7 Remove Field Cabinet (Single or Dual). This work shall consist of removing a controller cabinet, and internal component assembles. The cabinet may be single or dual size cabinets used for various ITS devices, including detector stations, DMS, CCTV control and communications, and communication nodes.

The contractor shall remove existing equipment and evaluate components to determine what may be salvaged for immediate reuse or placement into the spare parts inventory. This evaluation may include functional testing of the equipment. Whenever possible, the original cabinet and communications equipment shall be salvaged for reuse at the location or for placement into the spare parts inventory.

3.7.1 The removal of the concrete base foundation, if necessary, shall be considered **out of scope work** and shall be compensated for through methods described in another provision of this contract.

3.7.2 The contractor shall have a maximum of forty-eight (48) hours to complete the requirements of this provision.

3.8 Install Salvaged Field Cabinet (Single or Dual). This work shall consist of installing a salvaged controller cabinet on a new or existing concrete foundation (or a new or existing pole). This item shall be paid for two separate pay items: 1) Single cabinets used for detector stations, DMS, and CCTVs; and 2) Double cabinets used for communications nodes.

The contractor shall be responsible for all connectors and terminators, communication/power cables, cable management, equipment necessary to move the populated field cabinet, bolts and washers. All connectors, wire, terminators, bolts, and washers shall be new. Installation shall include connecting internal component assemblies and power connections and integrating the assemblies into the existing communications system.

3.8.1 Installation or repair of a concrete foundation shall be considered **out of scope work** and shall be compensated for through methods described in another provision of this contract.

Furnishing and installing cable outside of the cabinet shall NOT be considered part of this work. It may be paid for under another pay item or it may be considered **out of scope work**. Again, out of scope work shall be compensated for through methods described in another provision of this contract.

3.8.2 Construction Methods. The contractor shall install a salvaged cabinet on a new, existing, or modified concrete foundation (or a new or existing pole). Installation shall include making all power connections between the cabinet and local utility connections; and furnishing, installing and connecting all cables between devices within the cabinet.

The contractor shall make all power connections to the cabinet in accordance with requirements of the local power utility and any applicable state codes.

The contractor shall make all detector cable and communications cable connections in the cabinet to provide the required operation. The engineer shall provide the existing wiring diagrams to the contractor. The contractor shall make all traffic signal cable connections and electrical wire connections to the processor assembly cabinet.

All signal current carrying neutral conductors shall terminate on a neutral strip mounted in the cabinet. The neutral bus shall be isolated from the cabinet and equipment ground. It shall terminate at the neutral lug ultimately attached in the meter pedestal.

The equipment grounding strip shall be isolated from the cabinet and current carrying neutral. The cabinet current carrying neutral shall terminate at the current carrying neutral ground lug in the meter pedestal or breaker pedestal.

Existing wiring to the existing, modified, or new concrete control cabinet base shall be reused, if possible, unless directed otherwise by the engineer. Wiring includes bonding wires, conductors, and detector lead-in cable.

The contractor shall make all connections between the field cabinet, the devices within, and among the devices.

The contractor shall demonstrate the functionality and accuracy of the vehicle detector, CCTV, DMS, and/or wireless communication equipment connected to the salvaged field cabinet. For CCTVs and DMS's, the contractor shall coordinate with the Gateway Guide operators to test the CCTV's pan-tilt, iris, and video functionality and the DMS' display functionality capabilities through the Advanced Transportation Management System (ATMS) software.

3.8.3 The contractor shall have a maximum of forty-eight (48) hours to complete the requirements of this provision.

3.9 Install new ITS Cabinets (Type 1, 2, 5 or 7). This work shall consist of furnishing and installing new cabinets and base adapters.

3.9.1 Materials.

3.9.1.1 All cabinets shall include a grounding system. Connection to ground must be bare, solid AWG # 6 copper wire or equivalent bonding strap.

3.9.1.2 All powered cabinets shall be wired for three-wire 240/120 volt AC service. Provide a lightning arrestor designed to protect 120/240 VAC split phase breaker panels. The protector shall use metal oxide varistors as the protective elements. The response time shall be under five nanoseconds and the maximum surge current shall be at least 40,000 amps. The clamping voltage shall not exceed 400 volts. The device shall protect line-to-line and line-to-neutral.

3.9.1.3 Provide an additional surge protector just for the circuits powering the communication and traffic management equipment (excluding the dynamic message sign, which has its own surge protectors). This shall be a filtering, two-stage surge protector. Install it on the load side of the appropriate breaker. The protector shall provide radio frequency noise filtering and be capable of protecting equipment drawing a total of at least 10 amps. If the maximum load on the circuit exceeds 10 amps, the contractor shall split the load among multiple circuits, each with a surge protector. The protector shall clamp both the main line and the main neutral at 250 volts, both relative to each other and relative to the cabinet ground. The response time shall be such that the voltage never exceeds 250 volts. The surge protector shall suppress surges of up to 20,000 amps.

3.9.1.4 All circuit breakers shall be molded case units with quick-make, quick-break, trip-free mechanism, and with a minimum interrupting capacity of 10,000A (RMS Symmetrical). The circuit breakers shall be of fixed trip type and UL listed. Circuit breakers shall be listed on the latest Qualified Products List QPL-W-C-375 maintained by the Defense Supply Center.

3.9.1.5 All doors shall have cabinet identification labels displaying the cabinet identifier. The engineer will provide a list of the identifiers for each location, as well as the format for the labels.

3.9.1.6 All seams shall be continuously welded and ground smooth.

3.9.1.7 All fasteners must be stainless steel.

3.9.1.8 All cabinets shall have a natural aluminum finish, free from blemishes.

3.9.1.9 Provide terminal blocks for all conductors entering the cabinet. Except for blocks used for coaxial cable, the blocks shall be the barrier type with nickel-plated brass screw terminals and solid backs. Terminal blocks for conductors carrying more than 60 volts must be covered by a clear acrylic shield.

3.9.1.10 All cabinet doors shall have locks keyed to match MoDOT's other Gateway Guide cabinets.

3.9.2 Type 7 Cabinet.

3.9.2.1 Provide a single door, NEMA 3R, aluminum cabinet. The aluminum shall be at least 0.188 inches thick, except that the door and top need be only 0.125 inches thick. The cabinet shall be approximately 36 inches high, 20 inches wide, and 17 inches deep. The cabinets shall be designed for pole mounting (with the back against the pole). The cabinet shall have a three-point door latch. It shall also have provision for padlocking. The door hinge shall be continuous and shall be affixed by nuts and bolts that are concealed when the door is closed

3.9.2.2 The cabinet shall be equipped with the following:

- **Rack:** For mounting 19-inch equipment. The mounting rails must have holes of the EIA standard size and spacing for the entire height of the cabinet.
- **Mounting panels:** For terminal blocks, breakers, surge protectors, and other small items on the back and side walls.
- **Terminal blocks:** For all conductors entering the cabinet. Except for blocks used for coaxial cable, the blocks shall be the barrier type with nickel-plated brass screw terminals and solid backs. Each terminal shall be clearly and permanently labeled on a contiguous surface using silk screening or other approved method. Terminal blocks for conductors carrying more than 60 volts must be covered by a clear acrylic shield.
- **Fluorescent light:** Controlled by a door switch.
- **Duplex ground fault interrupt outlet:** For use by technicians.
- **Thermostatically controlled fan and heater:** The fan shall move 100 CFM through vents at the top of the cabinet. The air intake shall be through louvers in the door, and the air shall pass through a replaceable filter as it enters the cabinet. The heater shall

use at least 250 watts and shall be designed to prevent accidental contact with dangerous heat or voltage.

- **Electrical distribution system:** Consisting of two 15 amp main circuit breakers, one for each side of the split phase service. One of the main breakers shall serve the communication and traffic management equipment in the cabinet. Provide at least four outlets on this circuit. The second main breaker shall power auxiliary devices in the cabinet, such as the fan, heater, light, and GFI outlet.

  If the cabinet feeds power to other cabinets, the contractor shall provide two separate branch circuits for each of the other cabinets (one circuit for communication and traffic management equipment and the other circuit for the remaining devices). The contractor shall equip those branch circuits with 15 amp breakers.

  If the cabinet feeds power to a DMS, the contractor shall provide a pair of breakers connected in parallel with the 15 amp main breakers. The capacity of the breakers shall be as recommended by the manufacturer of the sign, but no larger. The arrangement shall provide three-wire, 240/120 service to the sign and shall allow a technician to disconnect power to the sign while leaving the cabinet operational, and vice versa. The contractor shall clearly label the cabinet breakers as “CABINET ONLY” and the sign breakers as “SIGN ONLY.”

- **Sunshield:** On the top.
- **Mounting brackets:** Stainless steel U-bolts and any other mounting hardware needed.

3.9.3 Type 2 Cabinet.

3.9.3.1 Provide a cabinet meeting the requirements for a Model 334 cabinet in the latest edition of *Transportation Electrical Equipment Specifications* published by Caltrans, except as specified in these special provisions. The manufacturer must be on the Missouri Department of Transportation’s Traffic Operations Approved Products List for Type 170 controller cabinets and racks.

3.9.3.2 Components described in Chapter 6 Section 4 of *Transportation Electrical Equipment Specifications* are not required, nor are police panels. The following components are required:

- **Sunshields:** On all four sides and the top.
- **Housing 1a or 1b, Mounting Cage 1, and Service Panel #1.**
- **Rack-mounted, slide out shelf with storage tray:** Mounted immediately above the fiber optic patch panel enclosure.
- **Mounting panel:** For terminal blocks, surge protectors, and other small items on a sidewall.
- **Terminal blocks:** For all conductors entering the cabinet. Except for blocks used for coaxial cable, the blocks shall be the barrier type with nickel-plated brass screw terminals and solid backs. Each terminal shall be clearly and permanently labeled on a contiguous surface using silk screening or other approved method. Terminal blocks for conductors carrying more than 60 volts must be covered by a clear acrylic shield.
- **Two interior fluorescent lights:** One above each door switch. Each door shall have a door switch. When either door is opened, both lights shall light.

- **Door switch:** On each door, permitting the door status to be monitored remotely. If this is the same switch used to control the lights, then there must be separate, electrically isolated contacts for detecting an open door.
- **Duplex ground fault interrupt outlet:** For use by technicians.
- **Thermostatically controlled fan and heater:** The fan shall move 100 CFM through vents at the top of the cabinet. The air intake shall be through louvers in the door, and the air shall pass through a replaceable filter as it enters the cabinet. The heater shall use at least 400 watts.
- **Base adapter:** The base adapter has three functions. It raises the cabinet a foot above the foundation, making it easier for a technician to work in the lower part of the cabinet. Also, it provides a place where a little slack cable can be stored, so that slack is not taking up space in the equipment rack. Most of the slack at a cabinet should be stored in the adjacent pull boxes. In addition, it provides a raceway between adjacent cabinets on the same foundation.

  The base adapter shall be a hollow aluminum box one foot high, 30 inches wide, and 30.25 inches deep (the same depth as the cabinet). It shall have a cutout opening centered in the top 15 inches wide and 21 inches deep, matching the opening in the bottom of the cabinet. It shall have a similar cutout on the bottom, directly below the top cutout.

  Around the top cutout shall be four punched holes that match the anchor bolt holes in the cabinet. Provide bolts, nuts, washers, and lock washers to bolt the cabinet to the base adapter through these holes. Around the bottom cut out shall be four punched holes that also match the anchor bolt holes in the cabinet.

  Construct the adapter so that it does not sag under the weight of the fully loaded cabinet. Any internal members must not obstruct cables going from the cabinet to adjacent cabinets, nor to the conduits below. Construct the adapter of the same material used for the cabinet and give it a matching finish. All seams shall be continuously welded and ground smooth.

  When multiple cabinets are installed on the same foundation, provide two close nipple four-inch galvanized rigid metallic conduit fittings and four sealing lock washers for the fittings.
- **Anchor bolts, nuts, and washers:** For installation in a concrete foundation.
- **Electrical distribution system:** Type 1 and Type 2 cabinets may be installed singularly, or in groups of two on a common foundation, or adjacent to an existing cabinet. Provide breaker panels for all single Type 1 or Type 2 cabinets and for one cabinet of a group of new cabinets that share a common foundation. The circuit breaker panel shall be 120/240 volt, split phase, equipped with a solid neutral. The panel shall be UL listed.

  Equip the panel with 50 amp main breakers and branch circuit breakers. Branch circuits shall have 15 amp breakers unless the load requires a larger breaker. One or more branch circuits shall serve the communication and traffic management equipment in the cabinet. Connect that circuit to the second stage of the surge suppressor and to at least eight outlets for the equipment. A second branch circuit shall power auxiliary devices in the cabinet, such as the fan, heater, light, and GFI outlet. If the cabinet feeds power to

other cabinets not on the same foundation, the contractor shall provide two 15 amp branch circuits for each of the other cabinets.

Type 1 and Type 2 cabinets without breaker panels shall be powered from the breaker panel in another cabinet on the same foundation. The power wiring shall pass from one cabinet to the other through the base adapters.

3.9.4 Type 1 Cabinet.

3.9.4.1 A Type 1 cabinet shall be the same as a Type 2 cabinet, except that it is not ventilated, insulated, nor air-conditioned. There shall be no sun shield on the side on which the air conditioner is mounted.

3.9.4.2 Insulate the cabinet on all four sides, top and doors with a double layer of polyethylene air-bubble sheet, laminated on both sides with aluminum foil. Use aluminum tape on all edges of the insulation for protection from damage and to improve adhesion to the surface. The insulation shall have a thermal resistance of greater than R-7, a vapor resistance permeability of 0.006 or better, and a NFPA Class A, UBC Class 1 fire resistance or better.

3.9.4.3 Mount an air conditioner on the cabinet, on the sidewall next to the door hinges. It shall use a closed loop cooling system that does not exchange air with the outside. It shall have the following features:

- **Maximum dimensions:** The unit shall not exceed the dimensions of the sidewall. The unit shall not add more than 12 inches to the cabinet width.
- **Minimum cool capacity:** 6000 BTU/hour.
- **Hot gas bypass valve:** To regulate cooling and prevent evaporator coil freezing during periods of low heat load and low ambient air temperature.
- **Intake location:** Top
- **Solid-state electronic noise suppressor:** To minimize EMI/RFI interference.
- **Thermostat:** Adjustable in the range of 70 degrees F (20 degrees C) to 140 degrees F (60 degrees C) to activate cooling. Unit turn-off shall be 7 degrees F (4 degrees C) below the turn-on temperature. Mounting of the unit shall be such that setting changes can be made from one of the door openings.

3.9.4.4 Provide a separate circuit and breaker for the air conditioner, and provide a delay-on relay or other protection to ensure that, if a short power outage occurs while the unit is running, the breaker is not tripped when the power is restores and the unit tries to restart while pressurized.

3.9.4.5 Provide two contact closure temperature alarms. The high temperature sensor shall be adjustable in the range of 20 degrees C to 60 degrees C. The low temperature sensor shall be adjustable in the range of 5 degrees F (-15 degrees C) to 40 degrees F (5 degrees C).

3.9.5 Type 5 Cabinet.

3.9.5.1 The contractor shall provide a single door, NEMA 4 X aluminum cabinet, complete with mounting panel, patch panel, terminal block, and hardware for pole mounting. The walls, sides, top and bottom shall be at least 0.08 inch thick. The door shall be at least 0.1 inch thick. The cabinet shall be approximately 24 inches high, 20 inches wide, and 8 inches deep.

3.9.5.2 The patch panel shall have one position for every out of pavement vehicle detector assembly connected to the cabinet. The panel shall permit connecting a notebook computer to the detector for setup and troubleshooting. The panel shall be designed for shielded Category 5E cables, and shall include provision for grounding the shields of the connected cables.

3.9.5.2 The terminal block shall connect the power cable coming from underground to the power cable coming from the detector. It shall be a barrier block with a nickel-plated brass screw terminal and a solid back.

3.9.6 Construction Requirements.

3.9.6.1 Raceway between Cabinets. Where multiple Type 1, Type 2, and existing cabinets share a foundation, install the base adapters snugly against one another and flush. Between each pair of adjacent base adapters (including base adapters on existing cabinets), punch two holes in the base adapter walls, each just big enough for a four-inch close nipple. Install close nipples in the holes and secure them with a sealing lock washer one each side. These two nipples shall be used to run power and communication cables from one base adapter to the next. After all the cables have been installed, stuff fiberglass insulation material into the nipples that connect to the air conditioned cabinets, so as to minimize the leakage of chilled air.

3.9.6.2 Base Adapter and Cabinet Installation. Prior to bolting the base adapter to the foundation, apply silicone sealant to the mating surface of the adapter to prevent water from seeping between the adapter and foundation. Likewise, prior to bolting the cabinet to the base adapter, apply silicone sealant to the mating surface of the cabinet to prevent water entry. **Sealant shall be applied on both the inside and outside joints between the foundation, base, and cabinet.** Ensure that the cabinet is plumb, using shims if necessary, and ensure that it is properly aligned with the front edge of the base adapter.

3.9.6.3 Pole Mounted Cabinets. Securely fasten pole-mounted cabinets to their poles using mounting brackets as indicated in the plans.

3.9.6.4 Bonding and Grounding. Bond pole-mounted cabinets to the pole and ensure that the pole is connected to a ground rod. Connect base-mounted cabinets directly to a ground rod.

3.9.6.5 Wire Management. Use spiral wrap to guide and protect bundles of wires and cables. Affix the spiral wrap to the wall of the cabinet or vertical member of the rack, and keep power and signal cables separated.

3.9.7 Acceptance Testing.

Develop a proposed test procedure for the cabinets and submit it to the engineer for approval. It shall include visual inspection, testing of lights, fan, heater, power outlets and alarm sensors. It shall also include a test in which each branch circuit is shorted to the cabinet wall to confirm that the breaker trips. 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, and give the engineer a report documenting the result of every visual inspection and test. Include a summary indicating whether the cabinet passed every test. The cabinet must pass every test to be accepted.

If the cabinet fails, correct the problems and arrange for a new test. If the test of the breakers reveals breakers that do not trip, the resistance to ground is too high; lower the resistance by adding more ground rods and improving the connections in the ground system.

3.9.8 Documentation. Prior to purchasing the cabinets, provide five sets of complete shop drawings, layout drawings, catalog cuts, and schematics. For the air conditioner, provide an operations/maintenance/ manual that includes a complete parts listing. The layout drawings shall be dimensioned drawings showing the proposed location of all equipment for each cabinet. The drawings shall demonstrate that all the equipment will fit, and that all controls, connections, and other service points are readily accessible. It should also demonstrate that incoming conductors reach surge suppressors as soon as they enter the cabinet. Lay out all cabinets that have the same equipment in the same way and submit a single drawing for all like cabinets. Revise the layout as instructed by the engineer and resubmit the drawings until they are accepted.

After installation, provide one reproducible 24 inch X 36 inch and two prints of the cabinet wiring diagram for each cabinet. The diagrams shall be nonproprietary. They shall reflect as-built conditions and shall identify all circuits in such a manner as to be readily interpreted. The diagrams shall be placed in a heavy duty, clear plastic pouch and attached to the inside of the front cabinet door. The pouch shall be of such design and material that it provides adequate storage and access to the wiring diagram.

3.9.9 Guarantee. All items covered by this specification shall carry a two-year guarantee from the date of acceptance against any imperfections in workmanship or materials.

3.9.10 The contractor shall have a maximum of forty-eight (48) hours to complete the requirements of this provision.

3.10 Remove Wireless Communication Equipment. This work shall consist of removing wireless communication equipment, including radio, antenna cable, antenna, and any mounting hardware dedicated to the wireless communication system. The wireless communication equipment may consist of 900 MHz unlicensed spread spectrum radios or 4.9 GHz licensed Ethernet bridges.

This item shall be paid per each (radio, antenna and cable) removed. Removal of both half ends of a wireless communication link shall considered 2 units of “Remove Wireless Communication Equipment.”

3.10.1 The contractor shall carefully remove and salvage the transmitter/receiver from the controller cabinet for re-use/reinstallation, remove the antenna cable and antennae, and deliver to the Traffic Management Center (TMC). The contractor shall give the Gateway Guide staff twenty-four (24) hours notification prior to the delivery. Prior to removing each assembly, the contractor may request, in writing to the engineer, that the equipment be tested for functionality and inspected to determine condition. Once removal has started, the contractor shall be responsible for any damage to the equipment including in this provision or adjacent equipment that is damaged during the removal process.

3.10.2 The contractor shall have a maximum of forty-eight (48) hours to complete the requirements of this provision.

3.11 Install Spread Spectrum Wireless Communication Equipment. This work shall consist of installing new Commission-Furnished or salvaged 900 MHz spread spectrum radios and their assembly in new or existing ITS cabinets, including traffic signal cabinets.

The Commission shall furnish the radios and antennas, including power supplies and cables.

The contractor shall install Commission-Furnished spread spectrum radios on structures as directed by the engineer. The installations shall be considered complete after the contactor has successful tested the system and notifies the engineer. The contractor shall furnish and install the following, as required:

- Communication cables (Category 5E patch cords, coax patch cords, and short serial cables). Provide outdoor cabling to the pole or structure-mounted radios.
- Coaxial antenna cable up to one hundred (100) feet in length.
- Stainless steel bands to affix the radio mounting bracket to the pole. The banding shall be 1-inch wide and 0.044-inch thick stainless steel.
- Surge protection for all copper communication cables entering from other cabinets (excluding cabinets on the same foundation as the one in which the surge protector would be installed). The protector shall be UL certified as Category 5 and UL497B listed.
- Proper ground for the shields of the cables coming from other cabinets.

3.11.1 The contractor shall have a maximum of twenty-four (24) hours to complete the requirements of this provision.

3.12 Install Wireless Ethernet Bridge Communication Equipment. This work shall consist of installing new Commission-Furnished or salvaged wireless Ethernet bridge communication equipment in new or existing ITS cabinets, including existing traffic signal cabinets.

The Commission shall furnish the wireless Ethernet bridges and power injectors, including power cables.

The contractor shall install Commission-furnished wireless Ethernet bridges on structures as directed by the engineer and connect the devices to power communications and ground. The installations shall be considered complete after the contactor has successful tested the system and notifies the engineer. The contractor shall furnish and install the following, as required:

- Communication cables (Category 5E patch cords, coax patch cords, and short serial cables). Provide outdoor cabling to the pole or structure-mounted radios.
- Coaxial antenna cable up to one hundred (100) feet in length.
- Stainless steel bands to affix the radio mounting bracket to the pole. The banding shall be 1-inch wide and 0.044-inch thick stainless steel.
- Surge protection for all copper communication cables entering from other cabinets (excluding cabinets on the same foundation as the one in which the surge protector would be installed). The protector shall be UL certified as Category 5 and UL497B listed.
- Proper ground for the shields of the cables coming from other cabinets.

3.12.1 Any work to acquire or modify a license for operation of the wireless Ethernet bridge shall be considered **out of scope work** and shall be done by others or by the contractor. If done by the contractor, this **out of scope work** shall be compensated for through methods described in another provision of this contract.

3.12.2 The contractor shall have a maximum of twenty-four (24) hours to complete the requirements of this provision.

3.13 Remove and Install Cable in Conduit. This work shall consist of removing old cables, installing new cables in an existing conduit network, and terminating the cable at the device. The contractor shall replace the existing cables with similar cables, or otherwise specified by the engineer.

3.13.1 Materials. All necessary cable shall be furnished and installed by the contractor. The contractor shall be responsible for providing all equipment and tools necessary to complete this item of work. The installation of a new pull rope for the purport of installing new cables in existing conduit shall be considered incidental to the work.

3.13.2 Construction Methods. All cables shall be installed per current MoDOT standards and specifications. All conductors shall be terminated or capped. Old cables and material shall be removed and disposed of by the contractor.

Splicing shall only be permitted underground only in pull boxes and only in proper and approved enclosures at locations approved by the engineer. The wire or cable ends shall not be left uncovered or submerged in water. Any such condition observed shall constitute grounds for rejection of an entire length of cable and/or wire. All electrical connections and splices shall be made with approved pressure or compression type fittings.

Tape shall be covered with a liberal coating of an electrical varnish or sealant providing flexible protection from oil, moisture, and corrosion. This electrical coating shall be approved by the engineer.

The contractor shall verify the number of conductors and the gauge of wire required in the cable runs and shall submit the cable arrangements to the engineer for approval. Conductor totals shall be verified by the engineer.

An extra six (6) ft of cable length shall be provided by the contractor for all cables entering each pull box. This loop of cable shall be in addition to the amount needed to reach from the entrance conduit raceway end to the opening in the existing conduit raceway.

3.13.3 Personnel. All electrical work shall be performed by a licensed electrician or under the onsite supervision of a licensed electrician. The contractor shall provide the engineer with documentation of the status as licensed electricians prior to the start of work.

3.13.4 Duration. The contractor shall have a maximum of twenty-four (24) hours to complete the requirements of this provision.

To complete the requirements of this provision, the contractor shall have a maximum of twenty-four (24) hours per MoDOT MOMS work order created, if the work doesn't exceed the following:

- 1000 LF of Cable, 8 awg
- 500 LF of Cable, 6 awg
- 100 LF of Cable, 4 awg
- 100 LF of Cable, 2 awg
- 500 LF of Cable, 1/0 awg

- 100 LF of Cable, 2/0 awg
- 250 LF of Cable, 14 awg
- 250 LF of Video Coaxial Cable
- 200 LF of CAT5E Outdoor Rated Cable

3.14 Install Fiber Optic Cable, Fusion Splices, Splice Enclosures, Terminations, Rack Mounted Interconnect Center. This work shall consist of installing, splicing and terminating fiber optic cables.

3.14.1 Materials.

3.14.1.1 Cable. Fiber optic cable shall be loose tube, single mode dielectric cable. The cable shall be listed in the latest edition of the Rural Utilities Service (RUS) *List of Materials Acceptable for Use on Telecommunications Systems of RUS Borrowers*, category oc-d-F, and shall have a short-term tensile rating of at least 600 lbs. The cable sheath shall have length markings in feet, and shall indicate that the unit of measure is feet. The cable shall have an operating temperature range of -40º C to 70º C.

All fibers shall be suitable for transmission using both 1310 nm and 1550 nm wavelengths. Attenuation shall not exceed 0.35 dB/km and 0.25 dB/km for 1310 nm and 1550 nm signals, respectively.

The cables shall be constructed with twelve fibers per tube.

3.14.1.2 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.

3.14.1.3 Connector. Connectors shall be ST compatible, with ceramic ferrules. They shall be suitable for use in traffic cabinets and shall be designed for single mode fibers.

3.14.1.4 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.

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

The enclosure shall include splice trays as specified in Sec 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.

3.14.1.4 Rack-Mounted 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, unterminated.

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 be made of powder-coated aluminum.

The enclosure shall hold at least four splice trays meeting the requirements of Sec 2.2 of this provision. Provide enough trays for all splices made in the interconnect center. The enclosure's patch panel shall have at least 24 positions, compatible with the connectors specified in Sec 2.3 of this provision. It shall have provisions for cable strain relief and for connector labeling.

3.14.2 Construction Requirements.

3.14.2.1 Cable Installation. Prior to installation, perform such tests as indicated in Sec 4.0 of this provision to confirm that the cable is in good condition and complies with the specifications. Any defects found after installation will be deemed the fault of the contractor.

Install the 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.

Before any cable installation is performed, provide the engineer with four copies 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.

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.

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.

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.

In every intermediate pull box, store 30 feet of slack fiber optic cable for every cable that passes through the pull box. 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. 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. Store slack cable neatly on the walls of the pull box using racking hardware acceptable to the engineer.
Seal the fiber optic cable ends to prevent the escape of the filling compound and the entry of water.

3.14.2.2 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.

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

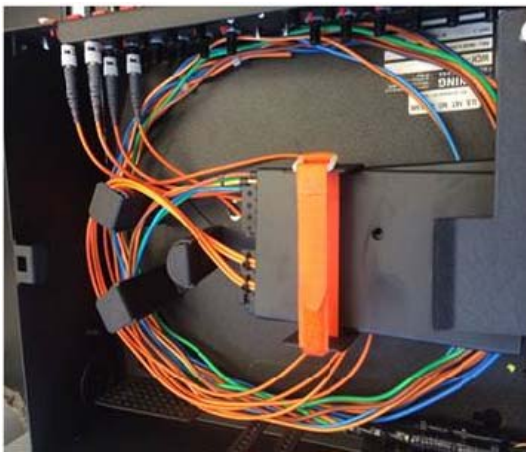
Secure each spliced fiber in a protective groove. Completely re-coat bare fibers with a protective room temperature vulcanizing (RTV) coating, gel or similar substance, prior to insertion in the groove, so as to protect the fiber from scoring, dirt or microbending.

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

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.

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

Unacceptable



Acceptable

3.14.3 Acceptance Testing

3.14.3.1 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.

3.14.3.2 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.

3.14.3.3 Test Result Documentation. Prepare a diagram showing all of the links tested in this project. For the portions installed in this project, show the equipment cabinets, splices, and pigtails. On each line representing a link, show the maximum allowable loss and the actual loss. The actual loss shall be the one measured after all corrective actions have been taken. Submit 5 copies of this diagram to the engineer, along with the calculations for the maximum allowable loss. Submit the diagrams and calculations in an electronic format acceptable to the engineer.

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

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

3.14.6 Guarantee. All items covered by this specification shall carry a two-year guarantee from the date of acceptance against any defects in workmanship or materials.

3.14.7 To complete the requirements of this provision, the contractor shall have a maximum of twenty-four (24) hours per MoDOT MOMS work order created, if the work doesn't exceed the following:

- 1000 LF of 24-Strand Single Mode Fiber Optic Cable
- 1000 LF of 72-Strand Single Mode Fiber Optic Cable
- 250 LF of 6-Strand Multi Mode Fiber Optic Cable
- 500 LF of 18 SM / 6 MM Fiber Optic Cable
- 96 EA of Fiber Optic Fusion Splice, Single Mode
- 18 EA of Fiber Optic Fusion Splice, Multi-Mode
- 2 EA of Fiber Optic Splice Enclosure
- 96 EA of Fiber Optic Termination
- 1 EA of Rack Mounted Interconnect Center

3.15 Conduit. This work shall consist of furnishing and installing conduit, either as a replacement for a damaged section of conduit, as a new installation, or for re-routing the conduit run. The same size and type of conduit shall be replaced or repaired, unless otherwise directed by the engineer.

3.15.1 Materials. All materials shall be furnished by the contractor for this time. All electrical conduits shall have a U.L. label on each length being delivered and/or used at the project construction site.

Nonmetallic conduit and fittings shall be HDPE SDRII electrical conduit conforming to the requirements of the Underwritters' Laboratories Standard for Rigid Nonmetallic Conduit, UL 651, for Schedule 40 heavy wall type or Schedule 80 extra-heavy wall type.

All nonmetallic conduits, which will be installed in an exposed location when in place and completed, shall be Schedule 80 conduit.

3.15.2 Construction Methods. The conduit shall match the size and type of conduit being repaired or replaced, unless otherwise directed by the engineer. Conduit repairs or replacements shall be performed in such a way as to avoid interruption to the operation of the Gateway Guide system. This may mean rerouting data or video temporarily or repairing conduit with a "split duct" to avoid the need to remove an existing live cable. Each run of conduit shall be of one size for its entire length from access point to access point. Access points shall be considered a pull box, junction box, and/or base of cabinet.

The contractor may elect to substitute a larger diameter conduit than the existing conduit run, if approved by the engineer. However, any additional cost shall be at the contractor's expense and no adjustment in compensation shall be allowed.

Standard electrical conduit fittings shall be used. All nonmetallic conduit shall be capped or plugged immediately after installation and shall remain capped or plugged until installation of wire or cable.

End bells shall be installed on all nonmetallic raceway points before installation of wire and/or cable. Nonmetallic conduits shall be reamed to eliminate internal sharp edges before installation of end bells.

3.15.3 The contractor shall have a maximum of seventy-two (72) hours to complete the requirements of this provision for *trenched* conduit, if the MoDOT MOMS work order does not exceed the following:

- 50 LF of 1-in Conduit, Trenched
- 500 LF of 2-in Conduit, Trenched
- 100 LF of 3-in Conduit, Trenched
- 100 LF of 4-in Conduit, Trenched

The contractor shall have a maximum of fourteen (14) days to complete the requirements of this provision for *pushed* conduit, if the MoDOT MOMS work order does not exceed the following:

- 50 LF of 1-in Conduit, Pushed
- 1000 LF of 2-in Conduit, Pushed
- 50 LF of 3-in Conduit, Pushed
- 50 LF of 4-in Conduit, Pushed

Maximum time to complete the work described in Section 3.14 shall include the time necessary to locate utilities (**maximum 48 hours**). In the event a utility is in conflict with the proposed work, the engineer shall extend the maximum time for completion for the contractor for the amount of time necessary for the utility conflict to be resolved.

3.16 Twisted Pair Splice. The contractor shall perform mechanical splices as directed by the engineer. This work shall consist of splicing together 25-pair cable, 12-pair cable, 6-pair cable, 3-pair cable, or 2-pair data communication cable end-to-end.

3.16.1 Materials. The contractor shall provide all equipment and materials necessary to perform data communication cable splices. Twisted-pair splice enclosures shall be 3M Epoxy Splice kits.

3.16.2 Construction Methods. Splices shall only be made at approved locations, such as new or existing underground pull boxes, as directed by the engineer.

Prior to performing the twisted-pair splices, the contractor shall test the twisted-pair cable from break point to the nearest cabinets upstream and downstream from the break point. This test shall be conducted to ensure that no damage to the cable exists as a result of the break. If test indicates the cable is damaged beyond the break point, the contractor shall notify the engineer prior to performing the splice.

The contractor shall obtain adequate cable necessary to perform the splice from nearby pull boxes. Upon completion of the splice, the cable slack required to perform the splice shall be pulled back to the nearby pull boxes.

End-to-end splicing shall be performed as per manufacturer instructions for the supplied twisted-pair splice enclosure units. The contractor shall splice together the applicable size twisted-pair cables pair-for-pair between the two cables. The connection shall be soldered. Solder shall be electrical multi-flux core. The solder connections shall be half loop taped with an approved rubber high voltage tape. Each connection shall than be half loop taped with an approved vinyl electrical tape and insulated from each other before placement in the splice kit. Each connection shall then be coated with an approved electrical varnish approved by the engineer and allowed to dry. After drying, the splice kit shall be installed in accordance with the manufacturer's instructions.

The contractor shall conduct tests on the spliced cables. The test results shall be documented and provided to the engineer for approval. The contractor shall furnish all equipment, appliances, and labor necessary to test the spliced communications cable between the processor assembly cabinets. The following tests shall be successfully performed following terminations:

- The continuity of each pair shall be measured. Each pair shall show a resistance of not more than 8 ohms per 1,000 feet of conductor. The resistance shall be measured with a meter having a minimum input resistance of 20,000 ohms per volt.
- The insulation resistance between conductors, and between each conductor; ground and shielding shall be measured using a megger. The resistance shall be infinity.

Should any cable fail to meet the test parameters or should any testing reveal defects in the splice, the cable shall be re-spliced at the contractor's expense. The new cable shall then be re-tested as specified above.

The contractor shall also submit documentation to the engineer indicating location of splice, type of repair performed, and footages to determine field location to the nearest pull box / communications vault or other landmark as approved by the engineer.

3.16.3 The contractor shall have a maximum of twenty-four (24) hours to complete the requirements of this provision.

3.17 Furnish and Install Pullboxes. This work shall consist of the contractor furnishing and installing preformed pull boxes (Class 1-5) and preformed ITS pull box (Type 1, 2 or 5) with concrete aprons as shown in plans at locations as directed by the engineer.

3.17.1 The contractor shall have a maximum of seventy-two (72) hours to complete the requirements of this provision per MoDOT MOMS work order.

Maximum time to complete the work described in Section 3.16 shall include the time necessary to locate utilities (**maximum 48 hours**). In the event a utility is in conflict with the proposed work, the engineer shall extend the maximum time for completion for the contractor for the amount of time necessary for the utility conflict to be resolved.

3.18 Remove Non-Intrusive Vehicle Detector Pole. This work shall consist of removing an existing non-intrusive traffic detector pole from an existing foundation. The existing poles may have also fallen off their foundations or have been knocked over. The contractor shall salvage and store the existing pole, unless otherwise directed by the engineer. If the detector pole is not to be replaced, the contractor shall also be required to remove the foundation to below ground level.

The existing remote traffic detector, mounting bracket, field cabinet, and all cables and connectors shall be removed from the pole and compensated for under a separate pay item. The pole shall be unbolted from the foundation and lowered, if necessary. The existing remote traffic detector power and communication cables shall be disconnected and removed. All items, removed by the contractor, shall remain the property of the Commission and shall be put into storage by the contractor for use as maintenance spare parts, reinstalled or disposed of as directed by the engineer.

3.18.1 Once removal has begun, the contractor shall be responsible for the condition of all equipment. Compensation for equipment damaged shall be deducted from the contract. The contractor may request of field meeting with the engineer, or the engineer's representative, at the site to inspect the equipment prior to removal.

3.18.2 The contractor shall have a maximum of four (4) hours to complete the requirements of this provision.

3.19 Install Salvaged Non-Intrusive Vehicle Detector Pole. The work shall consist of installing a salvaged non-intrusive detector pole on an existing of new concrete foundation. The contractor shall be responsible for anchor bolts, nuts and washers.

The contractor shall perform the following:

- Install the camera pole on a new or existing foundation as directed by the engineer.
- Check the plumb of the pole and adjust as necessary.
- Tighten the anchor bolds to the toque specified by the manufacturer of the pole.

3.19.1 Installation or repair of a concrete foundation shall be considered **out of scope work** and shall be compensated for through methods described in other articles of this contract.

3.19.2 The contractor shall have a maximum of four (4) hours to complete the requirements of this provision.

3.20 Furnish & Install Non-Intrusive Vehicle Detector Pole. The work shall consist of installing a new non-intrusive detector pole on an existing of new concrete foundation. The contractor shall be responsible for anchor bolts, nuts and washers.

The contractor shall perform the following:

- Install the camera pole on a new or existing foundation as directed by the engineer.
- Check the plumb of the pole and adjust as necessary.
- Tighten the anchor bolds to the toque specified by the manufacturer of the pole.

3.20.1 Installation or repair of a concrete foundation shall be considered **out of scope work** and shall be compensated for through methods described in other articles of this contract.

3.20.2 The contractor shall have a maximum of four (4) hours to complete the requirements of this provision.

3.21 Remove Non-Intrusive Vehicle Detector Assembly. The work shall consist of removing a non-intrusive vehicle detector and assembly from an existing pole. Non-intrusive vehicle detector assemblies shall be existing on existing poles. The existing pole may be erect and in use, fallen, or knocked over. The existing detector controller assembly in the cabinet shall be disconnected from the detector communication/power cables and the cables shall be removed from the cabinet. All items, removed by the contractor, shall remain the property of the Commission and shall be put into storage by the contractor for use as maintenance spare parts, reinstalled or disposed of as directed by the engineer.

3.21.1 Once removal has begun, the contractor shall be responsible for the condition of all equipment. Compensation for equipment damaged shall be deducted from the contract. The contractor may request of field meeting with the engineer, or the engineer's representative, at the site to inspect the equipment prior to removal.

3.21.2 The contractor shall have a maximum of four (4) hours to complete the requirements of this provision.

3.22 Install New or Salvaged Non-Intrusive Vehicle Detector Assembly. This work shall consist of installing a Commission-furnished non-intrusive vehicle detector and assembly, or salvaged non-intrusive vehicle detector and assembly, on a metal pole and install a Commission-furnished power supply and surge protection in a nearby cabinet. The pole and cabinet will be existing or shall be paid for separately. This work also requires the contractor to provide cables connecting the detector to the equipment in the cabinet and to ground, provide an air terminal, set up the detector assembly and test for proper operation.

3.22.1 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.

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.

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

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

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.

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.

3.22.4 Construction Requirements. 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.

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.

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

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.

3.22.5 Acceptance Testing. 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.

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.

3.22.6 The contractor shall have a maximum of four (4) hours to complete the requirements of this provision.

3.23 Remove In-Pavement Wireless Sensors. This work shall consist of removing an in-pavement sensor from the pavement. The sensor shall be reinstalled, relocated, salvaged or disposed as directed by the engineer. This work shall also include repairing the pavement surface.

The contractor shall remove each in-pavement wireless sensor in accordance with the manufacturer's specifications. The contractor shall exercise reasonable care in the handling of the equipment during removal. Should any of the equipment be damaged by the contractor's negligence, it shall be replaced at the contractor's expense.

3.23.1 Repair of Pavement Surface. For concrete surfaces, the hole shall be completely filled with an approved rapid set concrete patching material. The rapid set concrete patching material shall be shall be from the qualified listing of approval products list available from the engineer or as approved by the engineer. For asphaltic surfaces, the hole shall be patched with an approved commercial mix in accordance with the current Missouri Standard Specifications for Highway Construction or as approved by the engineer.

3.23.2 The contractor shall have a maximum of four (4) hours to remove a maximum of five (5) sensors and complete the requirements of this provision.

3.24 Install In-Pavement Wireless Sensors. This work shall consist of installing a Commission-furnished or salvaged in-pavement wireless vehicle detector into the pavement.

The contractor shall install each in-pavement wireless sensor in accordance with the manufacturer specifications. The sensor unit shall not extend above the top of the pavement. A factory-certified representative from the manufacturer shall be available for on-site assistance during installation.

3.24.1 The contractor shall have a maximum of four (4) hours to install each sensor and complete the requirements of this provision.

3.25 Remove Access Point or Wireless Repeater. This work shall consist of removing an access point or wireless repeater and mounting hardware. For access point removals only, this work may also require removing the communication cable and sealing any cable access holes as directed by the engineer.

The contractor shall remove each access point or wireless repeater according to the manufacturer's specifications. The contractor shall exercise reasonable care in the handling of the equipment during removal. Should any of the equipment be damaged by the contractor's negligence, it shall be replaced at the contractor's expense.

3.25.1 The contractor shall have a maximum of four (4) hours to remove each access point or wireless repeater and complete the requirements of this provision.

3.26 Install Access Point or Wireless Repeater. This work shall consist of installing a Commission-furnished or salvaged access point or a wireless repeater, including mounting hardware. For access point installations only, this work shall also include the installation of communication cable from access point to field cabinet (Ethernet switch) which may include drilling cable access holes as directed by the engineer.

The contractor shall install each access point or wireless repeater in accordance with the manufacturer's specifications. A factory certified representative from the manufacturer shall be available for on-site assistance during installation

3.26.1 The contractor shall have a maximum of four (4) hours to install each access point or repeater and complete the requirements of this provision.

3.27 Install Trace Wire. This work shall consist of installing trace wire inside existing conduits that may either be empty spares or include other cables. The trace wire allows for an alternate method of locating facilities where magnetic locate tape has been damaged or destroyed.

3.27.1 Materials. The contractor shall provide a No. 12 AWG, XLP insulated stranded copper, 600 VAC, blue tracer wire. Installation of new pull rope for the purpose of installing the new cables in existing conduit shall be considered incidental to construction.

3.27.2 Construction Methods. The contractor shall install the trace wire in conduits as directed by the engineer. Separate runs of tracer wire shall be connected at each pull box, as approved by the engineer, so that the locator is able to energize the wire at one pull box and locate all conduits in that location.

3.27.3 The contractor shall have a maximum of five (5) days to install each sensor and complete the requirements of this provision.

3.28 Removal of Solar Power System. This work shall consist of removal of Solar Power System components. The Contractor shall tag each part with the location and date of removal and test the removed components for any salvageable parts, which all parts shall remain the property of the Commission and delivered and put into storage by the Contractor, or used as maintenance spare parts, reinstalled, or disposed of as directed by the engineer.

3.28.1 Once removal has begun, the Contractor shall be responsible for the condition of all equipment. Compensation for damaged equipment shall be deducted from the contract. The Contractor may request a field meeting with the engineer, or the engineer's representative, at the site to inspect the equipment prior to removal.

3.29 Install of Solar Power System. This work shall consist of installing a Contractor-furnished Solar Power System and all of its components on an existing metal pole and/or nearby ITS device cabinet. The pole and cabinet will be existing structures or shall be paid for separately.

3.29.1 The installed Solar Power System and all of its components shall be tested for proper functionality. After a successful test of newly installed Solar Power System, the Contractor shall check for and confirm proper operation and network connectivity of the ITS device using the installed power system.

3.29.2 The Contractor shall have a maximum of forty eight (48) hours to complete the work described in this provision.

3.30 Remove Uninterruptible Power Supply (UPS) System. This work shall consist of the removal of the Node UPS systems and all of their components. The Contractor shall tag each part with the location and date of removal and test the removed components for any salvageable parts, which all parts shall remain the property of the Commission and delivered and put into storage by the Contractor, or used as maintenance spare parts, reinstalled, or disposed of as directed by the engineer.

3.30.1 Once removal has begun, the Contractor shall be responsible for the condition of all equipment. Compensation for damaged equipment shall be deducted from the contract. The Contractor may request a field meeting with the engineer, or the engineer's representative, at the site to inspect the equipment prior to removal.

3.30.2 Install Uninterruptible Power Supply (UPS) System. This work shall consist of installing Commission furnished components that are part of the existing Node UPS systems. These components may include but are not limited to 120 V Inverter with Ethernet port, Universal Automatic Transfer Switch with Bypass, Universal Automatic Generator Switch, 48V Battery charge management system, gel cell batteries, and any other additional hardware necessary to bring the UPS unit to its intended operation.

3.30.3 The contractor shall have a maximum of twenty four (24) hours to complete the work described in this provision once the equipment is made available.

4.0 Modification of Network/Communication Drawings. The engineer will provide the contractor with access to the as-built communication drawings for each device to be maintained on this contract. For each device the contractor repairs or modifies, the contractor shall verify the accuracy of the current communication diagram. If there is a discrepancy, the contractor shall modify the electronic copy of the diagram for that device location and submit the revised electronic file to the engineer. Updated drawings, in color, for both Visio and PDF formats, shall be submitted electronically within fourteen (14) days of the repair.

5.0 Basis of Payment. Payment for furnishing the labor, materials, and equipment necessary to install (including any testing necessary to ensure functionality and accuracy) or to remove (including the costs necessary to salvage, store and refurbish or dispose of as directed by the engineer) the devices/systems listed above, including modification to communication drawings, shall be paid for by the contract unit price for:

Item Number	Item Description	Unit
910-99.02	Install Solar Power System	EA
910-99.02	TB1-17 Aluminum Base for RTMS Pole	EA
910-99.02	Sensys Repeater Pole Base Aluminum Square	EA
910-99.02	Pedestal Base for Sensys Repeater Pole	EA
910-99.02	TB3-17 Aluminum Base for RTMS Pole	EA
910-99.02	Remove Solar Power System	EA
910-99.03	Conduit, High-Density Polyethylene, 2 in., Pushed	LF
910-99.03	Conduit, High-Density Polyethylene, 2 in., In Trench	LF
910-37.00	CCTV Camera Assembly, Installed	EA
910-52.00	Conduit, 2-in, Rigid, In Trench	LF
910-52.01	Conduit, 3-in, Rigid, In Trench	LF
910-52.02	Conduit, 4-in, Rigid, In Trench	LF
910-72.01	Conduit, 3-in, Rigid, Pushed	LF
910-72.02	Conduit, 4-in, Rigid, Pushed	LF
910-83.52	Fiber Optic Cable, 24-Strand, 18 SM, 6 MM	LF
910-99.02	MoDOT Buried Cable Drivable Delineator Post	EA
910-99.02	F&I Camera Pole (60ft) and Lowering System	EA
910-99.02	F&I Fiber Optic Fusion Splice, SM	EA
910-99.02	F&I Fiber Optic Fusion Splice, MM	EA

910-99.02	F&I ITS Pull Box, Class 1	EA
910-99.02	F&I ITS Pull Box, Class 2	EA
910-99.02	F&I ITS Pull Box, Class 5	EA
910-99.02	F&I Non-Intrusive Vehicle Detector Pole	EA
910-99.02	F&I Type 1 ITS Cabinet	EA
910-99.02	F&I Type 2 ITS Cabinet	EA
910-99.02	F&I Type 5 ITS Cabinet	EA
910-99.02	F&I Type 7 ITS Cabinet	EA
910-99.02	Fiber Optic Splice Enclosure	EA
910-99.02	Fiber Optic Termination	EA
910-99.02	Install In-Pavement Wireless Sensors	EA
910-99.02	Install Non-Intrusive Access Point & Assembly	EA
910-99.02	Install Non-Intrusive Vehicle Detector Assembly	EA
910-99.02	Install Non-Intrusive Wireless Repeater	EA
910-99.02	Install Salvaged Field Cabinet (Single)	EA
910-99.02	Install Salvaged Field Cabinet (Dual)	EA
910-99.02	Install Salvaged Camera Pole	EA
910-99.02	Install Salvaged Non-Intrusive Vehicle Detector Pole	EA
910-99.02	Install Spread Spectrum Wireless Communication Equipment	EA
910-99.02	Install Wireless Ethernet Bridge Communication Equipment	EA
910-99.02	Rack Mounted Interconnect Center	EA
910-99.02	Remove Camera Pole	EA
910-99.02	Remove CCTV Camera & Assembly	EA
910-99.02	Remove Communication Node Field Cabinet (Single Cabinet)	EA
910-99.02	Remove Communication Node Field Cabinet (Double Cabinet)	EA
910-99.02	Remove In-Pavement Wireless Sensors	EA
910-99.02	Remove Non-Intrusive Access Point & Assembly	EA
910-99.02	Remove Non-Intrusive Vehicle Detector Assembly	EA
910-99.02	Remove Non-Intrusive Vehicle Detector Pole	EA
910-99.02	Remove Non-Intrusive Wireless Repeater	EA
910-99.02	Remove Wireless Communication Equipment	EA
910-99.03	Conduit, 2 in., Rigid, Pushed	LF
910-99.03	F&I Cable in Conduit, #14 wire, variable conductors	LF
910-99.03	F&I Cable in Conduit, #8 wire, variable conductors	LF
910-99.03	F&I Cable in Conduit, #6 wire, variable conductors	LF
910-99.03	F&I Cable in Conduit, #4 wire, variable conductors	LF
910-99.03	F&I Cable in Conduit, #2 wire, variable conductors	LF
910-99.03	F&I Cable in Conduit, #1/0 wire, variable conductors	LF
910-99.03	F&I Cable in Conduit, #2/0 wire, variable conductors	LF
910-99.03	F&I Cable in Conduit, CAT5e Outdoor Rated Cable	LF
910-99.03	F&I Cable in Conduit, Video Coaxial Cable	LF
910-99.03	F&I Fiber Optic Cable, 24-Strand SM	LF
910-99.03	F&I Fiber Optic Cable, 72-Strand SM	LF
910-99.03	F&I Trace Wire	LF
910-99.02	Remove UPS system assembly	EA
910-99.02	Install UPS system assembly	EA

910-99.02	Remove UPS power inverter	EA
910-99.02	Install UPS power inverter	EA
910-99.02	Remove UPS battery monitor	EA
910-99.02	Install UPS battery monitor	EA
910-99.02	Remove UPS battery	EA
910-99.02	Install UPS battery	EA
910-99.02	Remove UPS Automatic Transfer Switch	EA
910-99.02	Install UPS Automatic Transfer Switch	EA
910-99.02	Remove UPS Automatic Generator Switch	EA
910-99.02	Install UPS Automatic Generator Switch	EA

5.1 When a call-out or MoDOT MOMS work order requires specific detailed analytical or investigative measures in the field, or necessitates advanced diagnostics in excess of those typically needed for an ITS repair and in excess of those described in section 5.2, specialized equipment or evaluations may be needed at the location prior to completing the repair or installation. Payment for Advanced Diagnostics will be made under:

Item Number	Item Description	Unit
910-99.02	Advanced Diagnostics	EA

This shall be considered full payment for furnishing the labor, materials, and equipment necessary to install and/or perform the work necessary to complete the above mentioned work. If payment is made for Advanced Diagnostics, no payment will be made for Troubleshooting as it pertains to the call-out or MoDOT MOMS work order that was issued.

5.2 In the event that the malfunction is repairable by a simple resolution, such as re-setting or re-booting a device, or re-setting a tripped electrical breaker, the repair work shall be considered complete. Payment for furnishing the labor necessary to inspect and diagnosis the malfunction shall be paid for the **fixed unit price** for:

Item Number	Item Description	Unit	Unit Price
910-99.02	Troubleshooting	EA	$200.00

L. DEVICE CABINET PLAN VERIFICATION

1.0 Description. The contractor shall verify and correct the fiber optic cable and device connection plans inside the existing MoDOT ITS device cabinets as part of any Preventative Maintenance tasks.

2.0 Requirements. While performing any Preventative Maintenance task, the contractor shall use Commission furnished as-built plans to verify and/or correct the plans for each ITS device cabinet (other than node cabinets).

Items to check and correct on the plans shall include, but not be limited to, fiber optics (type, splice, termination, pigtails, etc.), communication devices (make, model and serial number), power outlets, and end devices (make, model and serial number) visible inside the cabinet, and all connections and cable types between cabinet devices. Any variances to these plans are to

be clearly marked and returned to the engineer, in color, for both Visio and PDF formats. The scan must clearly show the ITS device name, location and each needed correction. Locations with accurate plans requiring no adjustments shall be noted in the MoDOT MOMS work order comments.

The contractor shall exercise reasonable care in the inspection of the existing ITS facilities during this task. Should any of the equipment be damaged by the contractor's negligence, it shall be replaced at the contractor's expense immediately.

3.0 Basis of Payment. No direct payment. Payment is to be included as part of yearly ITS PM-Preventative Maintenance task.

M. SPLIT DUCT CONDUIT REPAIR

1.0 Description. At locations noted on MoDOT MOMS Work order, the contractor shall repair a damaged conduit using "Split Duct Conduit" method per conduit manufacturer and MoDOT specifications.

2.0 Requirements. The contractor shall use MoDOT approved conduit materials to repair the damaged conduit. Using the conduit manufacturer requirements, when snapping the two piece conduits together, the interlocking design of Split Duct Conduit shall provide watertight connection and smooth tight seal protecting the cable or fiber optics from weathering. No tape, plastic, or any strap materials shall be used to seal or provide extra strength to the Split Duct Conduit repair.

The Split Duct Conduit Repair method and materials shall be inspected and approved by the engineer prior to filling the area.

3.0. Construction Requirements. Construction requirements shall conform to Sec 902.16.

4.0 Basis of Payment. No direct payment will be made to provide conformance to this section. Payment is to be included as part of Conduit, 2", 3", or 4" (depending on the repaired conduit size), in trench, for any conduit repair task.

N. SITE RESTORATION

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

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

O. OUT OF SCOPE WORK AND REPAIRS

1.0 Description. The contractor shall be aware that there may be additional work or repairs required outside of the scope of routine maintenance or common repairs as identified within the job special provisions above (Preventative Maintenance & Remedial Maintenance). This work may include emergency relocations of ITS devices or fiber to avoid construction conflicts, catastrophic damage to major devices such as Dynamic Message Signs, or essential upgrades to ITS and/or network devices.

2.0 Basis of Payment. When such work is necessary, the engineer shall notify and request a bid for the additional work from the contractor. If appropriate, the contractor and engineer shall meet in the field to discuss and clarify the scope of work. The contractor shall submit a bid price(s) for the work item(s) to the engineer for approval. If a mutually agreed upon bid price cannot be determined, the work item(s) shall be compensated as outlined in Missouri Standard Specifications for Highway Construction under Sec 109.

P. SPARE PARTS (CONTRACTOR-FURNISHED, CONTRACTOR-SALVAGED, OR COMMISSION-FURNISHED)

1.0 Description. The contractor shall maintain and store an inventory of spare parts in order to fulfill the requirements of this contract. The spare parts may be Commission-furnished, Contractor-furnished, or Contractor-salvage. The contractor shall also manage and verify repair work on existing ITS devices and equipment removed from the field.

2.0 Storage Facility. The spare parts storage area for this contract must be in a secure location and either be in a building dedicated to the spare parts of this contractor, or be physically separated and secured from areas of the building used for other purposes. Equipment larger than 20-feet long and weatherproof may be stored in a secure location adjacent to the building used to store the smaller equipment. The physical warehouse space must be sized adequately to store all parts and equipment necessary to complete the requirements of this contract.

3.0 Size of Inventory.

3.1 Commission-furnished Equipment. The engineer will provide a sufficient inventory of Commission-furnished spare parts to the contractor in order to prevent delays to the preventative or remedial repairs. The contractor shall advise the engineer if spare parts are getting low or provide recommendations on size of Commission-furnished inventory.

3.1.1 The Commission will procure the following equipment for use with this project:

- CCTV cameras and assemblies
- Non-intrusive vehicle detectors and assemblies (Bluetooth and radar)
- Intrusive vehicle detectors and assemblies (In-pavement vehicle sensors, wireless repeaters and access points)
- Ethernet switches
- Video Encoders/Decoders
- Fiber Optic Data Modems
- Device Servers
- DMS pixel board, driver board, power supply, fan, controller, and LCA

- IP-addressable Power Strip

3.2 Contractor-furnished Equipment. The contractor shall provide and maintain a sufficient inventory of spare parts and equipment in order to complete the requirements of this contract. No extension in maximum time of completion per MoDOT MOMS work order shall be given for insufficient inventory, unless approved by the engineer. It shall be the sole responsibility of the contractor to determine the size of the inventory of Contractor-furnished equipment.

3.2.1 Contractor furnished equipment shall include, but not be limited to the following:

- DMS enclosure filters
- Jumper wires and connectors
- Field cabinet air filters
- Any and all wiring within a single field cabinet or between two cabinets on the same base/pole.
- Cleaning solutions and chemicals
- Lubricating solutions, lubricants, oils or greases
- Light bulbs (incandescent, fluorescent, and LED)
- CCTV camera cable
- CCTV Camera Poles
- Vehicle Detector Poles
- Pull boxes
- All necessary mounting hardware
- Solar Panel Battery replacements

4.0 Record of Inventory. In addition to storing the spare and salvaged parts, the contractor shall be responsible for tracking and reporting on this inventory, including quantities, model numbers and serial numbers of all equipment. The contractor shall also be required to track warrantee information for all equipment within the inventory.

The contractor shall provide the engineer a *monthly report* of all the equipment by storage location. The report shall summarize, at a minimum, the quantity of units ready for deployment, units under repair, units failed and waiting for parts, units failed with no action yet taken, and dates of unit status changes.

4.1 Commission-Furnished Equipment. The equipment furnished by the Commission shall remain Commission-owned and shall only be used to complete the requirements of this contract. These parts shall be neatly stored, separate from the other parts, and clearly labeled as owned by the Commission. *The cost of any of these parts missing or otherwise unaccounted for shall be reimbursed to the Commission at the end of this contract.*

4.2 Salvaged Equipment. The equipment removed from the field by the contractor shall remain Commission owned equipment and shall be stored, repaired or disposed of as directed by the engineer. *The cost of any of these parts missing or otherwise unaccounted for shall be reimbursed to the Commission at the end of this contract.*

4.3 Audits. The contractor shall provide the engineer, or engineer's representative access to the spare part storage facility within twenty four (24) hours of being notified.

5.0 Repairing Salvaged Equipment. The contractor shall be responsibility for facilitating and verifying repairs made to existing equipment. This work shall include, but limited to:

- Package defective or damaged component(s) for shipping to the manufacturer for repair
- Ship packaged component(s) to approved repair facility for repair or replacement
- Track and report on parts in their repair cycle
- Receive repaired or replacement parts and add to inventory
- Test repaired parts to verify acceptable completion of repairs
- Negotiate repair rates or maintenance agreements with vendors or other qualified companies
- Meet with engineer, or engineer's representative, in order to determine policies on the diagnosis repair, or disposal of damaged equipment.

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

Q. DOCUMENTATION AND REPORTING

1.0 Description. The contractor shall prepare a series of documents and reports for the engineer throughout the project. These reports shall, in general, track the frequency and type of work performed and the costs necessary for maintaining the ITS system. All reports shall be provided to the engineer in electronic format (MS Word or as approved by the engineer) through email.

2.0 Annual, Monthly, and Daily Progress Reports.

2.1 Annual Maintenance Report. The contractor shall provide a report at the end of the year (or end of this contract), which includes a simple summary of all maintenance activities for every field element, including the communication system, in the contract. This report may be in table format and shall include, at a minimum, the following information:

- Number of preventative maintenance visits to each site
- Scheduled date and actual date of preventative maintenance visits to each site
- Number of problem call visits to each site
- Average duration of each problem call visit for each site (actual time on site)
- Average time to resolve problems for each site (time from notification to resolution)
- Cost of spare parts used at each site (contractor & commission furnished)
- Total spare parts cost for the system for the year (contractor & commission furnished)
- Total compensation from the Commission to the contractor for this contract with **out-of-scope** work and component repairs broken out separately.

2.2 Progress Reports. The contractor shall provide the engineer with a progress report, via email, every two weeks. This report shall be clear and concise with only relevant information. This report shall include, at a minimum:

- Completed items for payment (separate standard pay items from **out-of-scope** work)
- Project work status
- Total cost per date
- Estimated cost for completion.

The report should also include any outstanding action and/or risk items, updated schedule, and a recovery plan if necessary.

2.3 Daily Work Report. Each staff member of the contractor, assigned to the project, shall maintain a bound daily log with name clearly indicated. The daily logs of all staff working on the project shall be delivered to the engineer by 10 A.M. the following work day. At a minimum, the information in the daily log reports, shall include:

- Date
- Weather and Road Conditions
- Problem(s) reported
- Cause of problem(s) discovered
- Work performed using traffic control and description of traffic control
- Motorized equipment utilized and duration
- Any traffic crashes within or adjacent to work zone or work area
- Any work-related accidents or injuries.

2.4 Preventative Maintenance Checklist/Inventory. The contractor shall submit to the engineer all preventative maintenance checklists, inspection sheets, and testing results per device within 48 hours of performing the work.

3.0 Schedule. The contractor shall develop and maintain a schedule for all maintenance activities. The engineer shall provide the contractor with the previous year's preventative maintenance visit/dates per site a minimum of four (4) weeks prior to preconstruction meeting. The contractor shall incorporate this information into the schedule to ensure that each ITS device is maintained at the frequency required in this provision and per manufacturer's guidelines. The first schedule shall be submitted by the pre-construction meeting.

The schedule shall include preventative maintenance and on-going repairs. The contractor shall update the schedule daily. After the initial schedule submittal and engineer's approval, an updated schedule shall be submitted to the engineer every two weeks or upon request by the engineer.

4.0 Maintenance Plan. The contractor shall create a document to describe in detail how all requirements in this project will be achieved and how repairs will be handled from notification to resolution.

It shall contain a process for efficiently expediting maintenance activities described within this proposal. The maintenance plan shall include, as a minimum:

- Date
- Preventative maintenance schedule for all field elements in the contract
- Description of the process that will be put into place to incorporate and expedite the resolution of unplanned field element service outages while maintaining the prescribed preventative maintenance schedule
- Process for ensuring consistent compliance with the required response times described in this contract.

An initial Maintenance Plan shall be submitted to the engineer prior to the preconstruction meeting. A revised Maintenance Plan based on comments from the engineer shall be submitted prior to the start of work.

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

R. MODOT BURIED CABLE DRIVABLE DELINEATOR POST

1.0 Description. The contractor shall install a MoDOT 'Buried Cable' delineator post next to existing fiber optic cables and fiber optic pull boxes as instructed. 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 near existing field cabinets. The posts shall be placed at a minimum spacing of 250 feet or as directed by the engineer. If line of sight to the adjacent post would be obstructed at the minimum spacing, 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. The contractor shall be responsible for all utility locates prior to installation.

3.0 Materials. The contractor shall provide all equipment and materials necessary to furnish and install delineator posts. 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.

4.0 Method of Measurement. Measurement of the drivable delineator posts shall be made per each.

5.0 Basis of Payment. Payment for furnishing the labor, materials, and equipment necessary to install Drivable Delineator Posts shall be paid for by the contract unit price for:

Item Number	Item Description	Unit
910-99.02	MoDOT Buried Cable Drivable Delineator Post	EA

S. MAINTENANCE ONLINE MANAGEMENT SYSTEM (MOMS)

1.0 Description. MoDOT St. Louis District is implementing a Maintenance Online Management System (MOMS) tool to monitor routine operation of all Intelligent Transportation System (ITS) devices in the District. It provides the ability to issue and track MoDOT MOMS work orders, plan preventive- and corrective- maintenance, and manage device inventories.

Use of MOMS will be required by the Contractor to manage MoDOT MOMS work orders issued by local district staff for both emergency and standard maintenance. Access to the system by the Contractor will be via office computers and portable computer devices capable of accessing the system from most every location in the plans.

The Contractor will be required to attend all available MOMS trainings provided by MoDOT and use this tool during the entire contract period. The contractor shall use the MOMS tool to report time and date of arrival, resolution details, and to close the MoDOT MOMS work order while still on-site if the work has been completed assuming full functionality of the MOMS system to the Contractor via a web interface without MoDOT VPN access.

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

T. Supplemental Revisions JSP-18-01D

Delete Sec 106.9 and substitute the following:

106.9 Buy America Requirement On all federal-aid projects, the contractor's attention is directed to Title 23 CFR 635.410 Buy America Requirements. Where steel or iron products are to be permanently incorporated into the contract work, steel and iron material shall be manufactured in the USA except for "minor usage" as described herein. Furthermore, any coating process of the steel or iron shall be performed in the USA. The use of pig iron and processed, pelletized and reduced iron ore manufactured outside of the USA will be permitted in the domestic manufacturing process for steel or iron material.

Delete Sec 106.9.3 and substitute the following:

106.9.3 Buy America requirements include a step certification for all fabrication processes of all steel or iron materials that are accepted per Sec 1000.

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

106.9.3.2 Items designated as Category 2 will include all other steel or iron products not in Category 1 and permanently incorporated in the project. Category 2 items shall consist of, but not be limited to items such as fencing, guardrail, signing, lighting and signal supports. The prime contractor is required to submit a material of origin form certification prior to incorporation into the project from the fabricator for each item that the product is domestic. The Certificate of Materials Origin form (link to certificate form) from the fabricator must show all steps of manufacturing, including coating, as being completed in the United States and in accordance with CFR Title 23 Section 635.410 Buy America Requirements and be signed by a fabricator

representative. The Engineer reserves the right to request additional information and documentation to verify that all Buy America requirements have been satisfied. These documents shall be submitted upon request by the Engineer and retained for a period of 3 years after the last reimbursement of the material.

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

***Delete Sec 106.9.4 and Renumber subsequent sections accordingly*:**

Delete Sec 616.5.1 and substitute the following:

616.5.1 Amber or Amber and White Warning Lights. All on-road construction-related vehicles and equipment shall operate with amber or amber and white warning lights having 360 degrees of total coverage and as follows:

(1) For daytime operations, SAE Class 1 or 2 lights shall be used.

(2) For dusk to dawn operations, SAE Class 2 lights shall be used, or SAE Class 1 lights with dimming capabilities to minimize glare experienced by travelers.

616.5.1.1 Red or Red and Blue Warning Lights. The contractor may elect to use red or red and blue warning lights in accordance with Missouri law and the following requirements:

(1) Use of red or red and blue lights shall be limited to use on a total of two vehicles per work zone and/or project.

(2) Use of red or red and blue warning lights shall be limited to areas in advance of tapers or lane shifts and at the active work location.

(3) Lights shall be SAE Class 2 or SAE Class 1 with dimming capabilities to minimize glare experienced by travelers.

The awarded contract will serve as a permit by the Commission, granting the prime contractor and approved sub-contractors to utilize red or red and blue lights as required by Missouri law.

U. PROJECT CONTACT FOR CONTRACTOR/BIDDER QUESTIONS

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

Christopher Kelly, Project Contact
St. Louis District
1590 Woodlake Dr.
Chesterfield, MO 63017

Telephone Number 314-453-5034
E-mail Christopher.Kelly@modot.mo.gov

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

V. STORMWATER COMPLIANCE REQUIREMENTS NJSP-15-38

1.0 The land disturbance necessary to complete this project is not anticipated to exceed one (1) acre. Should the contractor disturb more than one (1) acre to complete the work, or for any other reason, all terms of this Job Special Provision will apply.

1.1 Description. The Contractor shall comply with the terms of the United States of America v. Missouri Highways and Transportation Commission Consent Decree (Consent Decree) that are identified as the responsibility of the Contractor or subcontractor, and with the terms of this provision. Viewing of the Consent Decree is available on the MoDOT Land Disturbance webpage under Contractor Resources, or by going to the web address www.modot.org/LD.

1.2 Applicability. The Consent Decree and this provision apply to any project that includes land disturbance of areas totaling greater than one (1) acre on the project site. The project site consists of all areas designated on the plans, including temporary and permanent easements. The Consent Decree and this provision do not apply to Contractor staging, plant, or borrow areas that are not located on MoDOT right of way (Off-site). The Contractor is responsible for obtaining its own separate land disturbance permit for Off-site areas. This provision is in addition to any other stormwater, environmental, and land disturbance requirements specified elsewhere in the contract.

2.0 Stormwater Training for Contractor Employees. The Contractor's on-site project manager, designated Water Pollution Control Manager (WPCM), as defined in Section 3.0, and WPCM delegate, shall complete MoDOT Stormwater Training prior to serving in those roles. If someone other than the Contractor's project manager is given the authority to manage the grading or erosion control operations, the project manager(s) for those operations shall also complete MoDOT Stormwater Training. MoDOT Stormwater Training is also required for any other person who the Contractor gives authority to take measures to prevent or minimize the consequences of non-compliance with the Stormwater requirements, as defined in Section 3.1(a) of this provision.

2.1 The Commission will provide MoDOT Stormwater Training to the Contractor employees specified in Section 2.0 at a location and time determined by MoDOT. There will be no fee for attending the training; however, the Contractor shall be responsible for all other cost related to the training, such as travel expenses, if necessary, and wages for its employees. The time to complete the training is anticipated to be no more than 6 hours. As long as the Consent Decree is in effect, MoDOT will provide periodic trainings at various locations around the state, as

needed, to ensure contractors and bidders have the opportunity to maintain the number of WPCMs they need to comply with this provision.

2.2 Those who require MoDOT Stormwater Training per Section 2.0 shall complete the training prior to beginning any land disturbance work. Thereafter, training shall occur at least once every two (2) years. The training is not project-specific. Any Contractor employee who receives the training will be qualified to perform the WPCM duties on any MoDOT project for a period of two (2) years.

2.3 MoDOT will document the names and dates that contractor employees attend MoDOT Stormwater Training and will retain those records for the period of time specified in the Consent Decree. Duplicate record keeping by the contractor is not required.

3.0 Water Pollution Control Manager (WPCM). Prior to the Pre-Activity meeting for Grading/ Land Disturbance, the Contractor shall designate a Water Pollution Control Manager (WPCM) to fulfill the duties and responsibilities listed in Section 3.1 until final stabilization occurs. The Contractor's on-site project manager may also serve as the WPCM or that role may be assigned to another manager employed by the contractor or a subcontractor. The Contractor shall also maintain a WPCM delegate to temporarily fulfill the WPCM duties in the absence of the primary WPCM (e.g. illness, vacation, other leave).

3.1 Duties of the WPCM:

(a) Be familiar with Stormwater Requirements including the National Pollutant Discharge Elimination System (NPDES), the current MoDOT State Operating Permit for construction stormwater discharges/ land disturbance activities, the Project-specific Stormwater Pollution Prevention Plan (Project SWPPP), the Corps of Engineers Section 404 Permit, when applicable, the Consent Decree, and this provision. The Project SWPPP includes: a title page with project-specific information, the general SWPPP posted on the MoDOT land disturbance website, the Project Erosion & Sediment Control Plan, all applicable special provisions, and all applicable specifications and standard drawings;

(b) Complete the stormwater training set forth in Section 2.0;

(c) Attend the Pre-Activity for Grading/ Land Disturbance Meeting or, if hired after the meeting has occurred, be familiar with the conference decisions;

(d) Review and sign the Project-specific SWPPP and all updates thereto within time periods set out in the Consent Decree;

(e) Visit and review the project site for compliance with Stormwater Requirements at least once per week from the start of any grading operations until final stabilization is achieved and permit is closed;

(f) Be authorized by the Contractor to supervise all work performed by the Contractor and subcontractors that involves compliance with Stormwater Requirements, including the authority to order work be stopped on a Project, implement MoDOT-directed changes in work related to Stormwater Requirements, and order the taking of, measures to cease,

correct, prevent, or minimize the consequences of non-compliance with Stormwater Requirements;

(g) Review and certify electronically each MoDOT inspection report for the Project within three (3) days of receiving each report to ensure it conforms with report requirements in the National Pollution Discharge Elimination System Stormwater (NPDES SW) Permit, Project SWPPP and the Consent Decree and ensure that all Stormwater Deficiencies noted on the report are corrected within the time required;

(h) Recommend in writing within three (3) days of discovering any changes in site conditions and Best Management Practices (BMPs) that require an update to the Project-specific SWPPP; and

(i) Be the point of contact relating to Stormwater Requirements and the Consent Decree between the Contractor, Subcontractors and MoDOT.

4.0 Pre-Activity Meeting for Grading/Land Disturbance and Required Hold Point. At each Project, a Pre-Activity Meeting for Grading/Land Disturbance shall be held prior to the start of any land disturbance and shall include a physical visit and review of the project site. 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.

4.1 Contractor employees who shall attend the Pre-Activity Meeting for Grading/Land Disturbance include the WPCM for the Project and the person(s) designated the authority to manage the grading and erosion control operations.

4.2 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.

5.0 Compliance with the NPDES SW Permit and Project SWPPP. On all projects, the Contractor shall comply with all applicable Stormwater Requirements which are defined as, but are not limited to:

(a) Consulting with the engineer on recommended design revisions to the Project SWPPP to accommodate the Contractor's staging plan, implementation, managing, and maintaining BMPs or other control measures to prevent or minimize sediment and other pollutants in stormwater runoff in accordance with contract specifications or any relevant manufacturer specifications and good engineering practices, including but not limited to the manuals (*Note: two manuals cited in the MoDOT permit are "Developing your stormwater pollution prevention plan: A guide for construction activities" and "Protecting Water Quality: A Field Guide to erosion, sediment and stormwater best management practices for development sites in Missouri"*) and any other applicable standards for sedimentation basins, stabilization, rock dams, brush checks, construction entrances, and other BMPs;

(b) Installing all BMPs at the locations and relative times specified in the Project SWPPP; and

(c) Complying with the Missouri Water Quality Standards and with effluent limitations in Section E.1 of the NPDES SW Permit. Measurement of effluent is not required except as specified in E.2.

5.1 Stormwater Deficiency Corrections. Per terms of the Consent Decree, Stormwater Deficiencies identified on the MoDOT Land Disturbance Inspection Report shall be corrected within 7 days of the inspection date to avoid stipulated penalties, except that more time might be 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.

6.0 Inspection Protocol. The Contractor and all subcontractors shall review and adhere to MoDOT's written Stormwater Inspection Protocol, found on the MoDOT Land Disturbance webpage (www.modot.org/LD). The Inspection Protocol is applicable to all Projects under the consent decree. The MoDOT Resident Engineer will serve the role of Stormwater Resident Engineer, or a delegate will be named in their absence.

6.1 Inspection Reports. MoDOT will provide one or more Environmental Construction Inspectors (ECI) to perform the weekly and post run-off inspections and other duties described in paragraph 17 of the Consent Decree. The ECI will enter the inspection reports into a web-based Stormwater Compliance database. The WPCM will have access to this database to view all report information, including any noted deficiencies, and to certify the report as required in Section 3.1 (g.). Automated email reminders of pending reports that need to be certified and for deficiencies that need to be corrected will be sent to the WPCM. The Contractor may designate other employees or subcontractor employees to have viewing access to this database and to receive the email reminders. Completion of MoDOT Stormwater Training is necessary in order to receive the email reminders. The WPCM and other users shall be equipped with an electronic device (desktop computer, laptop, tablet, smartphone, etc.) with a browser and internet access to connect to the database. The contractor shall be responsible for providing the electronic devices.

7.0 Stipulated Penalties. If the Contractor fails to comply fully and timely with the requirements of the Consent Decree, stipulated penalties will be assessed to the Commission. For matters under the Contractor's responsibility and control the following stipulated penalties will be assessed to the Contractor and MoDOT will withhold payment pursuant to the following:

Violation	Stipulated Penalty Amount
Failure to Designate or Maintain WPCM at each Project in Accordance with Section 3.0.	$750 for the initial violation (each person not designated) and then $750 for each fourteen (14) day period that person is not designated.

Failure to complete MoDOT Stormwater Training by an Individual Required to be Trained in Accordance with Section 2.0, such as the WPCM or Project Manager.	$750 per person for each missed training. This $750.00 per person violation shall continue to accrue for each fourteen (14) day period that the person fails to timely receive the applicable training
Failure of WPCM to Review and Certify an Inspection Report in Accordance with Inspection Protocol as set forth in Section 6.	$250 per inspection report not reviewed or signed.
Failure to Comply with Any NPDES SW Permit or SWPPP Requirement.	$1000 per violation for the first ten (10) days of the violation; $2500 per violation for days 11-20; $3500 per violation for days 21 and beyond.
Failure to Correct a Stormwater Deficiency Identified in a MoDOT Inspection Report, or Otherwise Discovered by the WPCM, within the Time Required by the NPDES SW Permit or SWPPP.	$1000 per deficiency for the first ten (10) days after correction was required; $2500 per deficiency for days 11-20 after correction was required; $3500 per deficiency for days 21 and beyond after correction was required.

8.0 Information Collection and Retention. The EPA, its representatives and its agents shall have the right of entry into any facility covered by this Consent Decree, at all reasonable times, upon presentation of credential, to:

(a) monitor the progress of activities required under the Consent Decree;

(b) verify any data or information submitted to the United States in accordance with the terms of the Consent Decree;

(c) obtain samples and, upon request, splits of any samples taken by MoDOT or its representatives, contractors, or consultants;

(d) obtain documentary evidence, including photographs and similar data; and

(e) assess MoDOT's compliance with the Consent Decree.

8.1 Until three (3) years after the termination of the Consent Decree, Contractors and the agents of the Contractors shall preserve all non-identical copies of all documents, records, or other information (including documents, records, or other information in electronic form) in its or its Contractors' or agents' possession or control, or that come into the Contractor's or agent's possession or control, and that relate to MoDOT's performance of its obligations under the Consent Decree or to the Contractor's performance of its obligations under the Consent Decree. This information-retention requirement shall apply regardless of any contrary corporate or institutional policies or procedures.

9.0 Basis of Payment. Should the contractor disturb more than one (1) acre due to its method of operations, or for any other reason, no direct payment will be made for compliance with this provision, including the cost to provide a WPCM. Should the engineer direct the contractor to exceed one (1) acre of land disturbance, payment will be made only for the actual cost of the weekly duties of the WPCM. Separate payment will be made for erosion and sediment control devices, and for permanent and temporary seeding and mulching, when payment for those items are provided elsewhere in the contract.

W. INSTALL IP-ADDRESSABLE POWER STRIP

1.0 Description. The Commission will provide to the Contractor a list of all CCTV locations in need of IP-addressable power strips as directed by the engineer. The Commission will furnish the IP-addressable power strips to the Contractor to install during the preventative maintenance visits at the identified locations. The Contractor shall notify the MoDOT St. Louis ITS group at least 48 working hours prior to the field visit of such CCTV locations allowing for time to program the power strips.

2.0 Installation Requirements. Mounting shall be on the left side panel of the cabinet above the detector panel attached to 2 DIN rails, with the power cable facing away from the door. The hardwire interconnect panel, if present, may be removed to make room. A plastic wire tie shall secure any transformer packs plugged into this unit. The power source shall be hardwired to cabinet auxiliary breaker 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.

4.0 Basis of Payment. Payment will be made as follows:

Item Number	**Item Description**	**Unit**
910-99.02	Install IP-addressable Power Strip	EA

X. SIGNAL CABINET NETWORK COMMUNICATION AND DEVICE VERIFICATION

1.0 Description. The contractor shall field verify below noted traffic signal cabinets network devices and fiber splicing (tube and strands colors including the fiber cable that routed into the St Louis City's Cross-Connection Cabinet) and cross check it with MoDOT ITS As-Built Communication Plans. If a discrepancy is discovered, the contractor shall notify the SLITS Group with the As-Is information. If there is no ITS As-Built Communication Plans for a traffic signal cabinet, the contractor shall provide a list of network devices and fiber tube and strands colors to the SLITS Group. The contractor shall furnish MoDOT with a corrected as-built plan sheet in color, for both Visio and PDF formats, within fourteen days of the field check.

No	**Traffic Signal Location**
1	Route 30 @ 12th-Geyer-I-55 NB
2	Route 30 @ Russell- I-55 NB Off Ramp
3	Route 30 @ McNair-Shenandoah
4	Route 30 @ Jefferson-Sidney
5	Route 30 @ Ohio-Lynch
6	Route 30 @ California
7	Route 30 @ Nebraska
8	Route 30 @ Arsenal-Pennsylvania
9	Route 30 @ Compton-Wyoming
10	Route 30 @ Utah
11	Route 30 @ Cherokee-Tennessee
12	Route 30 @ Grand-Miami

13	Route 30 @ Spring
14	Route 30 @ Hydraulic
15	Route 30 @ Gustine
16	Route 30 @ MO 366-Chippewa
17	Route 30 @ Meramec
18	Route 30 @ Taft
19	Route 30 @ Morganford-Delor
20	Route 30 @ Duke
21	Route 30 @ Bates
22	Route 30 @ Christy
23	Route 30 @ Holly Hills
24	Route 30 @ Kingshighway
25	Route 30 @ Loughborough
26	Route 30 @ Hampton-Germania
27	Route 30 @ River Des Peres

2.0 Basis of Payment. Payment will be made as follows:

Item Number	Item Description	Unit
910-99.02	Signal Cabinet Network Communication and Device Verification	EA

Y. REMOVE AND REPLACE NODE CABINET AIR CONDITIONER SYSTEM

1.0 Description. The contractor shall remove the existing Node Cabinet Air Conditioner System, dispose it properly and install a new Air Conditioner System at the below noted locations. The Engineer has the right to change these locations during the term of this contract.

MoDOT Node Cabinet #	Node Cabinet Location	Node Cabinet Log Mile Identifier
Node 10	WB I-70 @ Cave Springs	IS070W225.2
Node 12	EB I-44 @ under I-64	IS044E290.7
Node 14	EB I-64 east of MO River	IS064E018.8
Node 25	EB I-270 @ Route 367	IS270E031.6

1.2 Qualified Personnel. This work shall be performed by licensed HVAC (Heating, Ventilation and Air Conditioning) staff. The contractor shall submit their HVAC contractor contact information and a copy of their license to the MoDOT Engineer for review and approval prior to any work.

2.0 Materials.

2.1 The contractor shall submit the new air conditioner specifications, operation and maintenance manuals to the MoDOT Engineer and SLITS Group via an email to SLITS@modot.mo.gov for review and approval.

3.0 Construction Requirements.

3.1 The contractor shall remove all existing Node Cabinet Air Conditioner parts and dispose of them properly.

3.2 There shall be no sun shield on the side on which the air conditioner is mounted.

3.3 Mount an air conditioner on the cabinet, on the sidewall next to the door hinges. It shall use a closed loop cooling system that does not exchange air with the outside. It shall have the following features:

- **Maximum dimensions:** The unit shall not exceed the dimensions of the sidewall. The unit shall not add more than 12 inches to the cabinet width.
- **Cooling capacity:** 6,000 BTU/hour.
- **Hot gas bypass valve:** To regulate cooling and prevent evaporator coil freezing during periods of low heat load and low ambient air temperature.
- **Intake location:** Top.
- **Solid-state electronic noise suppressor:** To minimize EMI/RFI interference.
- **Thermostat:** Adjustable in the range of 70 degrees F (20 degrees C) to 140 degrees F (60 degrees C) to activate cooling. Unit turn-off shall be 7 degrees F (4 degrees C) below the turn-on temperature. Mounting of the unit shall be such that setting changes can be made from one of the door openings.

3.4 Provide a separate circuit and breaker for the air conditioner, and provide a delay-on relay or other protection to ensure that, if a short power outage occurs while the unit is running, the breaker is not tripped when the power is restores and the unit tries to restart while pressurized.

3.5 Provide two contact closure temperature alarms. The high temperature sensor shall be adjustable in the rage of 20 degrees C to 60 degrees C. The low temperature sensor shall be adjustable in the range of 5 degrees F (-15 degrees C) to 40 degrees F (5 degrees C).

4.0 Acceptance Testing. The new Air Conditioner Unit shall run for 15 calendar days prior to acceptance. If for any reason any of the new A/C Unit fails or stops working, it shall be the contractor's responsibility to make necessary repairs or replace the entire A/C Unit and allow it to run another 15 days prior to final acceptance.

5.0 Basis of Payment. Measurement and payment for Remove and Replace Node Cabinet Air Conditioner System includes all labor, equipment and materials necessary to comply with the requirements of this provision. Payment will be made as follows:

Item No.	Type	Description
910-99.02	Each	Remove and Replace Node Cabinet Air Conditioner System