BID FORM

MISSOURI DEPARTMENT OF TRANSPORTATION
GENERAL SERVICES
PO Box 270, Jefferson City, MO 65102(Mailing Address)
830 MoDOT Drive, Jefferson City, MO 65109 (Physical Address)

REQUEST NO.	2-140618RW
DATE	June 4, 2014

SEALED BIDS, SUBJECT TO THE ATTACHED CONDITIONS WILL BE RECEIVED AT THIS OFFICE UNTIL

2:00 p.m., Local Time, June 18, 2014

AND THEN PUBLICLY OPENED AND READ FOR FURNISHING THE FOLLOWING SUPPLIES OR SERVICES.

BIDS TO BE BASED F.O.B. MISSOURI DEPARTMENT OF TRANSPORTATION
Submit net bid as cash discount stipulations will not be considered

Various MoDOT Locations

BUYER: Robin Warren
BUYER EMAIL:
Robin.Warren@modot.mo.gov

BUYER TELEPHONE: 573-526-7929

SUPPLIES OR SERVICES

Traffic Controllers

To establish a contract to furnish **"Traffic Controllers"** with an effective date of Notice to Proceed and ending June 30, 2015 in accordance with the following pages.

*****NOTE: It is the responsibility of the Bidder to access MoDOT's website in order to obtain any and all addenda(s) issued during the course of this RFB process.**

All questions regarding this RFB shall be submitted to the RFB Coordinator/Contact.

(SEE ATTACHED FOR CONDITIONS AND INSTRUCTIONS)

In compliance with the above Request For Bid, and subject to all conditions thereof, the undersigned bidder agrees to furnish and deliver any or all the items on which prices were bid within the timeframe specified herein, after receipt of formal purchase order.

Date: _____
Telephone No.: _____
Fax No.: _____
Email Address: _____
Title:

Firm Name: _____
Address: _____
_____
By (Signature): _____
Type/Print Name _____
Title:

Is your firm MBE certified? ☐ Yes ☐ No

Is your firm WBE certified? ☐ Yes ☐ No

1. INTRODUCTION AND GENERAL INFORMATION

1.1 Introduction:

1.1.1 This Request for Bid seeks bids from qualified organizations to provide **traffic controllers**, with an effective contract period of Notice to Proceed through June 30, 2015, to the Missouri Highways and Transportation Commission (MHTC) and Missouri Department of Transportation (MoDOT). All questions regarding the RFB shall be submitted to Robin Warren. Bids must be returned to the office of General Services Procurement no later than 2:00 p.m., Local Time, June 18, 2014.

RFB Coordinator:

Robin Warren, Sr. General Services Specialist
Missouri Department of Transportation
General Services - Procurement

Phone: **573-526-7929**
E-mail: **Robin.Warren@modot.mo.gov**

1. SCOPE OF WORK

1.1 General Requirements:

1.1.1 The contractor shall provide *NEMA TS1 and TS2 and 170E Traffic Signal Controller Assemblies* (hereinafter referred to as "traffic controllers") on an as needed, if needed basis for the Missouri Highway and Transportation Commission (MHTC) and Missouri Department of Transportation (MoDOT), in accordance with the provisions and requirements stated herein.

1.1.2 The contractor shall provide all deliverables/services to the sole satisfaction of the MoDOT.

1.1.3 MoDOT estimates, but does not guarantee, the purchase of the estimated quantities stated herein.

1.1.4 MoDOT reserves the right to obtain "like or similar" products as specified herein from other manufacturers, exclusive of the contract, when use of such products is deemed in the best interest of the MoDOT.

1.1.5 Unless otherwise specified herein, the contractor shall furnish all material, labor, facilities, equipment, and supplies necessary to provide the deliverables/services required herein.

1.2 Specific Requirements:

1.2.1 The contractor shall insure all materials, equipment, and/or services comply with the attached MoDOT specifications, and as specified in any other provisions outlined in the solicitation document.

1.2.2 The contractor shall insure traffic controllers are built according to the attached specifications and wired according to the attached individual *Traffic Signal Controller Order Forms*.

1.2.3 The contractor shall provide traffic controllers in which all boxes required to complete the traffic controller assembly are packaged together as one.

1.2.4 The contractor shall agree and understand that only items on the latest revision of the MoDOT Approved Products List for Traffic Signals and Highway Lighting Equipment will be accepted.

1.3 Delivery Requirements:

1.3.1 The contractor shall deliver the specified traffic controllers to MoDOT Districts located throughout the State of Missouri specified in attached *Controller Replacement Master Database – District – Ship to Information*.

1.3.2 The contractor shall not deliver any traffic controllers to MoDOT until being notified by MoDOT by telephone or purchase order.

1.3.3 The contractor shall deliver traffic controllers at the specified location within 90 to 120 calendar days after the issue date of a purchase order.

1.3.4 The contractor shall agree and understand that MoDOT shall not receive any deliveries on a Saturday or Sunday.

1.4 Additional Requirements:

1.4.1 The contractor shall agree and understand that all traffic controllers shall be subject to a twenty (20) day acceptance period, which includes fifteen (15) days for testing the equipment and five (5) days for the contractor to repair or replace any defective equipment.

a. The test period shall begin no later than fifteen (15) days after the date the equipment is received. Any failure or malfunction of the equipment during the test period shall be corrected at the contractor's expense. The equipment shall then be tested for an additional fifteen (15) days. The procedure shall be repeated until the equipment has operated to the state's satisfaction for fifteen (15) consecutive days.

1.5 Liquidated Damage Requirements:

1.5.1 The contractor shall agree and understand that providing traffic controllers in accordance with the requirements stated herein is considered critical to the efficient operations of the MoDOT. However, since the amount of actual damages would be difficult to establish in the event the contractor fails to comply with the contractual requirements, the contractor shall agree and understand that the amount identified below as liquidated damages shall be reasonable and fair under the circumstances.

a. In the event the contractor fails to provide traffic controllers in accordance with the contractual requirements specified herein, the contractor shall be assessed liquidated damages in the amount of $50.00 per controller, per day, for each such delinquent day after the twenty (20) day acceptance period. Assessed liquid damages are not to exceed 20% of the total purchase order amount

b. The contractor shall further agree and understand that such liquidated damages shall either be deducted from the total amount due the contractor or paid by the contractor as a direct payment to the MoDOT, at the sole discretion of the MoDOT.

c. The contractor shall understand that the liquidated damages described herein shall not be construed as a penalty.

d. The contractor shall understand and agree that all assessments of liquidated damages shall be within the discretion of each District as a separate entity, and shall be in addition to, not in lieu of, the rights of the State of Missouri to pursue other appropriate remedies. The contractor shall understand and agree that each District's decision shall be individual, final, and without recourse.

e. The contractor shall agree and understand that all assessments of liquidated damages shall be within the discretion of the State of Missouri and shall be in addition to, not in lieu of, the rights of the State of Missouri to pursue other appropriate remedies.

1.6 Invoicing and Payment Requirements:

1.6.1 The contractor shall submit an itemized invoice to the applicable requesting address, as specified herein.

1.6.2 The contractor shall be paid in accordance with the firm, fixed price(s) stated on the pricing page of this document, after completion of deliverables specified herein and acceptance by MoDOT.

1.6.3 Other than the payment specified above, no other payments or reimbursements shall be made to the contractor for any reason whatsoever.

1.6.4 Unless otherwise provided for in the solicitation documents, payment for all equipment, supplies, and/or services required herein shall be made in arrears. The Missouri Highways and Transportation Commission (MHTC) shall not make any advance deposits.

1.6.5 The MHTC assumes no obligation for equipment, supplies, and/or services shipped or provided in excess of the quantity ordered. Any authorized quantity is subject to the MHTC's rejection and shall be returned at the contractor's expense.

1.6.6 The MHTC reserves the right to purchase goods and services using the state-purchasing card.

1.7 Other Contractual Requirements:

1.7.1 Contract Period - The contract shall commence from the Notice to Proceed until June 30, 2015.

1.7.2 Inspection Specifications - MoDOT reserves the right to inspect the material at the point of manufacture, intermediate storage point, or at a destination which shall be at the discretion of MoDOT.

3. BID SUBMISSION

2.1 Bid Submission Information:

2.1.1 All bids must be received in a sealed envelope clearly marked "**Traffic Controllers**".

2.1.2 All bids must be received at the following address no later than June 18, 2014 at 2:00 p.m., Local time.

The Missouri Department of Transportation
General Services – Procurement Division
Attn: Robin Warren

PO Box 270 Mailing Address
Jefferson City, MO 65102

830 MoDOT Drive Physical Address
Jefferson City, MO 65109

2.1.3 The bidder must complete and submit a copy of *Equipment List for NEMA Traffic Signal Controller Assemblies and/or Type 170E Traffic Signal Controller* with the bid. Instructions are noted at the top of each equipment list page.

2.1.4 The bidder may withdraw, modify or correct his bid after it has been deposited with MoDOT provided such request is submitted in writing and received at the location designated for the bid opening prior to the time specified for opening bids. Such a request received as specified will be attached to the bid and the bid will be considered to have been modified accordingly.

2.1.5 Bids will be reviewed to determine if the bid complies with the mandatory requirements, and to determine the lowest and best bid.

2.1.6 *Cost Determination* – The low bid shall be determined by multiplying the estimated quantity with the unit price, to obtain a total price.

2.1.7 *Contract Award* – The contract will be awarded to the lowest responsive bidder determined as specified above.

a. Award of this bid will be made on a "Category-by-Category" basis using the "lowest and best" principle of award.

b. Bidder is not required to bid on Category I and Category II, but bidder is required to bid on all items within a given Category.

2.1.8 MHTC reserves the right to reject any or all bids, and no award is final until formally approved by the MHTC.

a. Notification of award shall be at the time the tabulation is posted to the Internet. It is the sole responsibility for all bidders to check the website for bid results.

3. PRICING PAGE

3.1 NEMA TS1 and TS2 Traffic Controllers - The bidder shall provide firm, fixed prices in the table below for providing the deliverables/services in accordance with the provisions and requirements of this RFB. All costs associated with providing the required deliverables/services shall be included in the prices stated below.

CATEGORY I

TRAFFIC CONTROLLERS – TS2				
Item #	**Description and C/S Code**	**Estimated Qty.**	**Firm, Fixed Price,** ***per unit***	**Extended Price**
001	NEMA TS2/Type 2 Traffic Signal Controller Assemblies with TS1 Cabinet – *Northeast District - Hannibal*	3	**$**_____ ***per unit***	**$**_____ ***total***
002	NEMA TS2/Type 2 Traffic Signal Controller Assemblies with TS2 Cabinet – *Northwest District*	6	**$**_____ ***per unit***	**$**_____ ***total***
003	NEMA TS2/Type 2 Traffic Signal Controller Assemblies with TS2 Cabinet – *Kansas City District*	4	**$**_____ ***per unit***	**$**_____ ***total***
TRAFFIC CONTROLLERS – CABINET ONLY – TS2				
006	NEMA TS2 Cabinet Only **NO CONTROLLER** – *Kansas City District*	5	**$**_____ ***per unit***	**$**_____ ***total***

_____ _____

Signature ***Date***

4. PRICING PAGE

4.1 **Type 170E Traffic Controllers** - The bidder shall provide firm, fixed prices in the table below for providing the deliverables/services in accordance with the provisions and requirements of this RFB. All costs associated with providing the required deliverables/services shall be included in the prices stated below.

CATEGORY II

Type 170E Traffic Controllers				
Item #	**Description and C/S Code**	**Estimated Qty.**	**Firm, Fixed Price,** ***Per Unit***	**Extended Price**
001	Type 170E Traffic Signal Controller Assemblies (Cabinet & Plug Ins) **NO CONTROLLER** - Southwest District - Springfield	1	**$**_____ ***per unit***	**$**_____ ***total***

_____ _____

Signature ***Date***

VENDOR INFORMATION & PREFERENCE CERTIFICATION FORM

Vendor Information
All bidders must furnish ALL applicable information requested below

Vendor Name/Mailing Address:	**Vendor Contact Information (including area codes):**
Email Address:	Phone #: Cellular #: Fax #:
Printed Name of Responsible Officer or Employee:	**Signature:**
For Corporations - State in which incorporated:	**For Others -** State of domicile:

If the address listed in the Vendor Name/Mailing Address block above is not located in the State of Missouri, list the address of Missouri offices or places of business:

If additional space is required, please attach an additional sheet and identify it as ***Addresses of Missouri Offices or Places of Business.***

M/WBE INFORMATION: List all certified Minority or Women Business Enterprises (**M/WBE**) utilized in the fulfillment of this bid. Include percentages for subcontractors and identify the M/WBE certifying agency:

M/WBE Name	Percentage of Contract	M/WBE Certifying Agency

If additional space is required, please attach an additional sheet and identify it as ***M/WBE Information***

Preference Certification
All bidders must furnish ALL applicable information requested below

GOODS/PRODUCTS MANUFACTURED OR PRODUCED IN USA: If any or all of the goods or products offered in the attached bid which the bidder proposes to supply to the MHTC are **not** manufactured or produced in the "United States", or imported in accordance with a qualifying treaty, law, agreement, or regulation, list below, by item or item number, the country other than the United States where each good or product is manufactured or produced.

Item (or item number)	Location Where Item is Manufactured or Produced

If additional space is required, please attach an additional sheet and identify it as ***Location Products are Manufactured or Produced****.*

MISSOURI SERVICE-DISABLED VETERAN BUSINESS: Please complete the following if applicable. Additional information may be requested if preference is applicable. See below definitions for qualification criteria:

Service-Disabled Veteran is defined as any individual who is disabled as certified by the appropriate federal agency responsible for the administration of veterans' affairs.

Service-Disabled Veteran Business is defined as a business concern:

a. Not less than fifty-one (51) percent of which is owned by one or more service-disabled veterans or, in the case of any publicly owned business, not less than fifty-one (51) percent of the stock of which is owned by one or more service-disabled veterans; and
b. The management and daily business operations of which are controlled by one or more service-disabled veterans.

Veteran Information	Business Information
Service-Disabled Veteran's Name (Please Print)	Service-Disabled Veteran Business Name
Service-Disabled Veteran's Signature	Missouri Address of Service Disabled Veteran Business

COOPERATIVE AGREEMENT NOTICE

The Department is interested in assisting Missouri governmental entities, etc. in purchasing equipment, various materials, and supplies that meet the MoDOT specifications.

Each bidder is asked to indicate below whether they would be willing to offer **Traffic Controllers** listed in the attached "Request for Bid" for sale to these local political entities at the same bid price offered to this Department.

It is understood the Department will not issue purchase orders, accept delivery nor make payment for these items ordered by any of these agencies. It is further understood the price is based on the **Traffic Controllers** meeting the Department specifications. Any added options, deletions, or extra freight costs would be negotiated between the local agency and the successful vendor.

Indicate below whether your company is willing to offer such cooperative purchasing for Missouri counties, cities or other political entities.

YES _____ NO _____

If the price varies throughout the state on Department bids because of different delivery destinations, please indicate the price f.o.b. your location that would be offered as described.

F.O.B. Location _____

Indicate the deadline date that orders will be accepted. _____

COMPANY NAME _____

ADDRESS _____

PHONE NUMBER _____

SIGNATURE _____

TITLE _____

DATE _____

(Each vendor should complete the appropriate sections of form and submit with bid.)

Missouri Highways and Transportation Commission
Standard Bid/Proposal Provisions, General Terms and Conditions and Special Terms and Conditions

STANDARD SOLICITATION PROVISIONS

a. The solicitation for the procurement of the supplies referenced therein, to which these "Standard Bid Provisions, General Terms and Conditions and Special Terms and Conditions" are attached, is being issued under, and governed by, the provisions of Title 7 – Missouri Department of Transportation, Division 10 – Missouri Highways and Transportation Commission, Chapter 11 – Procurement of Supplies, of the Code of State Regulations. The Missouri Highways and Transportation Commission (**MHTC**), acting by and through its operating arm, the Missouri Department of Transportation (**MoDOT**), draws the Bidder's attention to said 7 CSR 10-11 for all the provisions governing solicitation and receipt of bids/quotes and the award of the contract pursuant to this solicitation.

b. All bids/quotes must be signed with the firm name and by a responsible officer or employee. Obligations assumed by such signature must be fulfilled.

GENERAL TERMS AND CONDITIONS

Definitions

Capitalized terms as well as other terms used but not defined herein shall have the meaning assigned to them in section 7 CSR 10-11.010 Definition of Terms.

Nondiscrimination

a. The Contractor shall comply with all state and federal statutes applicable to the Contractor relating to nondiscrimination, including, but not limited to, Chapter 213, RSMo; Title VI and Title VII of Civil Rights Act of 1964 as amended (42 U.S.C. Sections 2000d and 2000e, *et seq.*); and with any provision of the "Americans with Disabilities Act" (42 U.S.C. Section 12101, *et seq*).
b. Sanctions for Noncompliance: In the event of the Contractor's noncompliance with the nondiscrimination provisions of this contract, MHTC shall impose such contract sanctions as it or the Federal Highway Administration may determine to be appropriate, including, but not limited to:
    i. withholding of payments to the Contractor under the contract until the Contractor complies, and/or,
    ii. cancellation, termination or suspension of the contract, in whole or in part.

Contract/Purchase Order

a. By submitting a bid/quote, the Bidder agrees to furnish any and all equipment, supplies and/or services specified in the solicitation documents, at the prices quoted, pursuant to all requirements and specifications contained therein.
b. A binding contract shall consist of: (1) the solicitation documents, amendments thereto, and/or Best and Final Offer (BAFO) request(s) with any changes/additions, (2) the Contractor's bid response, and (3) the MHTC's acceptance of the bid by post-award contract or purchase order.
c. A notice of award does not constitute an authorization for shipment of equipment or supplies or a directive to proceed with services. Before providing equipment, supplies and/or services, the Contractor must receive a properly authorized notice to proceed and/or purchase order.

Applicable Laws and Regulations

a. The contract shall be construed according to the laws of the State of Missouri. The Contractor shall comply with all local, state, and federal laws and regulations related to the performance of the contract. The exclusive venue for any legal proceeding relating to or arising, out of the contract shall be in the Circuit Court of Cole County, Missouri.
b. The Contractor must be registered and maintain good standing with the Secretary of State of the State of Missouri, Missouri Department of Revenue, and other regulatory agencies, as may be required by law or regulations. Prior to the issuance of a purchase order and/or notice to proceed, the Contractor may be required to submit to MHTC a copy of their current Authority Certificate from the Secretary of State of the State of Missouri and/or a copy of their Certificate of No Tax Due from the Missouri Department of Revenue.
c. Prior to the issuance of a purchase order and/or notice to proceed, all **out-of-state** Contractors **providing services** within the state of Missouri must submit to MHTC a copy of their current Transient Employer Certificate from the Missouri Department of Revenue, in addition to a copy of their current Authority Certificate from the Secretary of State of the State of Missouri.

Executive Order:

The Contractor shall comply with all the provisions of Executive Order 07-13, issued by the Honorable Matt Blunt, Governor of Missouri, on the sixth (6^{th}) day of March, 2007. This Executive Order, which promulgates the State of Missouri's position to not tolerate persons who contract with the state engaging in or supporting illegal activities of employing individuals who are not eligible to work in the United States, is incorporated herein by reference and made a part of this Agreement.

1) "By signing this Agreement, the Contractor hereby certifies that any employee of the Contractor assigned to perform services under the contract is eligible and authorized to work in the United States in compliance with federal law."
2) In the event the Contractor fails to comply with the provisions of the Executive Order 07-13, or in the event the Commission has reasonable cause to believe that the contractor has knowingly employed individuals who are not eligible to work in the United States in violation of federal law, the Commission reserves the right to impose such contract sanctions as it may determine to be appropriate, including but not limited to contract cancellation, termination or suspension in whole or in part or both.
3) The Contractor shall include the provisions of this paragraph in every subcontract. The Contractor shall take such action with respect to any subcontract as the Commission may direct as a means of enforcing such provisions, including sanctions for noncompliance.

Preferences

a. In the evaluation of bids/quotes, preferences shall be applied in accordance with 7 CSR 10-11.020(7). Contractors should apply the same preferences in selecting subcontractors. The attached document entitled **"VENDOR INFORMATION AND PREFERENCE CERTIFICATION FORM"** must be completed and returned with the solicitation documents.

b. Bidders are encouraged to obtain minority business enterprise (MBE) and women business enterprise (WBE) participation in this work through the use of subcontractors, suppliers, joint ventures, or other arrangements that afford meaningful participation for M/WBEs. Bidders are encouraged to obtain 10% MBE and 5% WBE participation.

Cancellation of Contract

The MHTC may cancel the Contract at any time for a material breach of contractual obligations or for convenience by providing Contractor with written notice of cancellation. Should the MHTC exercise its right to cancel the contract for such reasons, cancellation will become effective upon the date specified in the notice of cancellation sent to the Contractor.

Bankruptcy or Insolvency

Upon filing for any bankruptcy or insolvency proceeding by or against the Contractor, whether voluntarily, or upon the appointment of a receiver, trustee, or assignee, for the benefit of creditors, the Commission reserves the right and sole discretion to either cancel the Agreement or affirm the Agreement and hold the Contractor responsible for damages.

Warranty

The Contractor expressly warrants that all equipment, supplies, and/or services provided shall: (1) conform to each and every specification, drawing, sample or other description which was furnished to or adopted by the MHTC, (2) be fit and sufficient for the purpose expressed in the solicitation documents, (3) be merchantable, (4) be of good materials and workmanship, and (5) be free from defect.

Status of Independent Contractor

The Contractor represents itself to be an independent Contractor offering such services to the general public and shall not represent itself or its employees to be an employee of the MHTC. Therefore, the Contractor shall assume all legal and financial responsibility for taxes, FICA, employee fringe benefits, workers' compensation, employee insurance, minimum wage requirements, overtime, etc., and agrees to indemnify, save and hold the MHTC, its officers, agents and employees harmless from and against any and all losses (including attorney fees) and damage of any kind related to such matters.

Non-Waiver

If one of the parties agrees to waive its right to enforce any term of this Contract, that party does not waive its right to enforce such term at any other time or to enforce any or all other terms of this Contract.

Indemnification

The Contractor shall defend, indemnify and hold harmless MHTC, including its members and department employees, from any claim or liability whether based on a claim for damages to real or personal property or to a person for any matter relating to or arising out of the Contractor's performance of its obligations under the contract awarded pursuant to this solicitation.

SPECIAL TERMS AND CONDITIONS

Delivery – Holiday Information

a. The following days shall be construed as **official holidays** under the terms of the contract:

January 1	New Year's Day
Third Monday in January	Martin Luther King, Jr.'s Birthday
February 12	Lincoln's Birthday
Third Monday in February	Washington's Birthday
May 8	Truman's Birthday
Last Monday in May	Memorial Day
July 4	Independence Day
First Monday in September	Labor Day
Second Monday in October	Columbus Day
November 11	Veteran's Day
Fourth Thursday in November	Thanksgiving Day
December 25	Christmas Day

b. When any of the above **holidays falls** on a **Sunday,** the holiday will be observed on the following **Monday**; when any of the above **holidays falls** on a **Saturday**, the **holiday** will be observed on the immediately preceding **Friday.**

SPECIAL NOTE:

Verify all information selected/entered for each category is correct prior to submitting your bid.
Incorrect entries will result in your bid being considered nonresponsive for the category.

TRAFFIC CONTROLLER ASSEMBLY EQUIPMENT LIST
NEMA TS2 Traffic Signal Controller Assemblies

The following list shall be completed and returned with the bid. Equipment shall meet Missouri's Standard Specifications and Standard Plans for Highway Construction and Approved Products List. Equipment shall be agreed to and approved prior to the contract award. All delivered equipment shall be the products circled or listed below.

New Controllers shall be fully assembled and furnished WITH J-Bolts.
Replacement Controllers shall be fully assembled and furnished WITHOUT J-Bolts.

Circle the product(s) you will provide for each item:

NEMA TS2 Controller:

Manufacturer	Model/Catalog Number
Econolite	ASC/2S-1000
Econolite	ASC/2S-2100
Econolite	ASC/3-2100
Naztec	980
Siemens	EPAC M42
Siemens	EPAC M52
Peek Traffic	ATC 1000

List the Manufacturer and Model/Catalog Number you will provide for each item:

Item	Manufacturer	Catalog Number
Cabinet and Back Panel Assembly	_____	_____
Conflict Monitor	_____	_____
Flasher	_____	_____
Flash Transfer Relay	_____	_____
Load Switch	_____	_____
Surge Protector	_____	_____
Power Supply Card Rack Detectors	_____	_____

Signed: _____ Title: _____ Date: _____

SPECIAL NOTE:

Verify all information selected/entered for each category is correct prior to submitting your bid.
Incorrect entries will result in your bid being considered nonresponsive for the category.

TRAFFIC CONTROLLER ASSEMBLY EQUIPMENT LIST
NEMA TS2 Traffic Signal Controller Assemblies

The following list shall be completed and returned with the bid. Equipment shall meet Missouri's Standard Specifications and Standard Plans for Highway Construction and Approved Products List. Equipment shall be agreed to and approved prior to the contract award. All delivered equipment shall be the products circled or listed below.

New Controllers shall be fully assembled and furnished WITH J-Bolts.
Replacement Controllers shall be fully assembled and furnished WITHOUT J-Bolts.

List the Manufacturer and Model/Catalog Number you will provide for each item:

Item	Manufacturer	Catalog Number
2-Channel Card Rack Mounted Detector, Induction Loop	_____	_____
	_____	_____
Auxiliary Breaker (15 amps)	_____	_____
Controller Breaker	_____	_____

Signed: _____ Title: _____ Date: _____

MISSOURI DEPARTMENT OF TRANSPORTATION
NEMA TS2 TRAFFIC CONTROLLER ASSEMBLIES

The equipment shall conform to the latest revision of Section 1092 of the Missouri Standard Specifications for Highway Construction and the following:

1. Controller operation shall comply with the phasing shown on the attached controller order form.

2. Time-delay-to-call shall be integral with detectors so indicated. Calling detectors shall be supplied where indicated.

3. Cabinets indicated for side of pole mounting shall be furnished with the bottom undrilled or with a plate of the same cabinet material, covering 85 percent of the bottom area, attached to the bottom with four, 1/4 inch diameter bolts.

4. Furnish three complete operation manuals for all equipment, including but not limited to controllers, conflict monitors, detectors and auxiliary equipment. Furnish four complete cabinet wiring diagrams with each controller. The cabinet wiring diagrams shall include labeling for all field terminal connections and shall provide an orientation of the terminal layout that conforms with the intersection information supplied.

5. TS2 Controller Assembly Requirements:

A. Traffic Controller Assemblies. Traffic controller assemblies are defined as the complete assembly of all required equipment and components for control of traffic signal indications. Traffic controller assemblies shall conform to the requirements of the latest revision of NEMA Standards Publications No. TS 2, hereafter called NEMA. Each assembly shall consist of a controller cabinet, controller unit, back panel, malfunction management unit, all required wiring, switches and connectors and all other equipment as defined in these specifications and as shown on the plans. Double controller assemblies to control two intersections shall consist of a controller cabinet, two controller units, two back panels, two malfunction management units all required wiring, switches and connectors and all other equipment as defined in these specifications and as shown on the plans.

1. General.

a. Voltage and Temperature Variations. Variations in the voltage of the power supply from 89 to 135 volts or sustained temperatures inside the cabinet between –30 F(-34 C) and +165 F (+74 C) shall not change the timing of any functions or cause electrical or mechanical damage. Heater elements shall not be used to attain compliance with these requirements.

b. Fuse Protection. All controllers and other specified auxiliary equipment shall be properly protected with fuses on each applicable unit. Fuses shall be installed in ¼ twist or screw-in type fuse holders or shall be automotive blade-type fuses. Pop-out fuse holders shall not be used. There shall be no exposed high voltage contacts on the outside of any unit.

c. Warranty. All controller units, on-street system masters, malfunction management units, terminals and facilities, detectors and any other auxiliary unit(s) provided as specified shall be warranted by the manufacturer to be free from defects in workmanship and material for at least one year from the date of project acceptance. Any components found to be defective during the warranty period shall be replaced free of charge. All warranties provided shall be transferred to the Commission upon project acceptance. No direct payment will be made for warranties.

2. Controller Units (CU). This section supplements NEMA in describing the general specifications for actuated solid-state controller units. If requested by the engineer, the contractor shall provide a prototype controller for testing and evaluation.

a. CU Configuration.

(i) CU shall be NEMA Actuated Type 2 with the following connectors:

Port 1
Port 2
Port 3
Connector A
Connector B
Connector C
Connector D

(ii) Cus shall be capable of operation of a minimum of 12 vehicle and pedestrian phases and 8 overlaps.

(iii) All phases and overlaps shall be activated or inactivated by program entry.

b. Actuated Coordination. Actuated coordination shall conform to NEMA and the following:

(i) Signal phases controlling the movements on which signal progression is desired (coordinated phases) shall be

serviced during a guaranteed period as specified by programming. While under coordination, the designated coordinated phase(s) shall be capable of releasing from a hold status and operating in the actuated mode. The CU shall operate in actuated mode from a designated hold release point to the corresponding force off point(s) of the coordinated phase(s). If the coordinated phase(s) gaps out or reaches the force off point and there is a conflicting phase with a call or recall, the CU shall terminate the coordinated phase(s) and service the next phase in the sequence with a call or recall.

(ii) For non-coordinated actuated phases, vehicle and pedestrian detectors shall remain active. The non-coordinated actuated phases may gap out prior to the force off point or shall be forced off at the force-off point and the next phase in the sequence with a call or recall shall be serviced. The coordinator shall provide selectable recall by signal plan for non-coordinated phases. The coordinator shall be capable of fixed time operation for any and all active phases by timing plan.

(iii) The coordinator shall be capable of generating individual force-off points for each available phase in each timing plan even though it may not be necessary to use all of phases. The position of the force-off points shall be settable at any percentage point or seconds in any selected timing plan. The coordinator shall be capable of placing force-off points at fixed points in the cycle or floating points as selected by programming. With floating force-offs split times govern the force-off point in each cycle regardless of the starting point of the phase.

(iv) The coordinator shall have all of the following methods of synchronizing to the master sync pulse:

(1) Dwell. The coordinator shall establish a new offset by stopping the cycle timer in the coordinated phase(s) green, until the new offset value is reached.

(2) Dwell with Interrupt. The coordinator shall establish a new offset by stopping the cycle timer in the coordinated phase(s) green. The maximum time the coordinator can dwell shall be adjustable from 1 to 99 seconds.

(3) Shortway. The coordinator shall establish a new offset by the shortest route possible.

(v) For hardwire systems, if the sync monitor detects a fault the controller shall revert to internal time based control unless no time based control is programmed. In that case, the CU shall revert to free mode.

(vi) A MoDOT D-plug shall be provided between the D-plug on the controller and the interconnect panel on the cabinet. In the absence of the sync signal, the coordination interface shall be configured to cause the controller to default to free operation. Configuration of the MoDOT D-plug shall be as follows:

Pin	**Assignment**	**Pin**	**Assignment**	**Pin**	**Assignment**
D1	Cycle 1	D10	Split 4	D19	Future (Pre-empt 4)
D2	Cycle 2	D11	Offset 1	D20	Flash
D3	Cycle 3	D12	Offset 2	D21	Hardwire Interconnect[a]
D4	Cycle 4	D13	Offset 3	D22	Future
D5	Future (Cycle 5)	D14	Future (Offset 4)	D23	Future
D6	Future (Cycle 6)	D15	Future (Offset 5)	D24	Future
D7	Split 1	D16	Pre-empt 1	D25	Future
D8	Split 2	D17	Pre-empt 2		
D9	Split 3	D18	Pre-empt 3		

(vi) The MoDOT D-plug shall be a Cinch TRW Super D Connection as follows:

1 – Part #TB 25P	Plug	1 – Part #SHD-25GL	Hood with Latch
1 – Part #TB 25SLB-1	Socket	1 – Part #SHD-25GFCS	Hood with Filler Ends

c. Time Base Control. Time Base Control shall conform to NEMA and the following:

(i) The CU shall be zero time based, settable to the second, programmable for 52 weeks, accommodate at least 3 weekly programs, 12 day programs and not less than 12 exception day programs. Total event changes shall not be less than 160. It shall be possible to interrogate the CU to determine the year, month, day, hour, minute, second, a.m. and p.m., as well as program information programmed in the unit. Indicators shall show the condition of all outputs.

(ii) The first program of the day shall be implemented at the beginning of the minute selected. When changing from one cycle length to another while in the coordination mode, the change to the new cycle length shall not occur until the present cycle length has terminated. If the controller is operated in the free mode between cycle lengths, the next cycle length programmed shall begin at the beginning of the minute selected.

(iii) The CU shall be capable of generating a daily reference point at which time all coordinated cycles are resynchronized. This daily reference point shall be either 12:00 midnight or a selectable time of which 12:00 midnight could be selected. The resynchronization reference time is an arbitrary point in time that marks the beginning of all cycles on a daily basis.

(iv) The CU shall be capable of generating an absolute reference point at which time all coordinated cycles are resynchronized. This absolute reference point shall be a selectable time by date and hour and minute that marks the beginning of all cycles.

(v) Timing base shall be the 60 hertz power line frequency. Timing error shall not exceed plus or minus one second per month from any adjacent CU operating from the same power company substation. Timing error due to power failure or low voltage shall not exceed plus or minus 0.005 percent.

d. Detector Functions. The CU shall allow vehicle and pedestrian detector inputs to be programmed to any available phase. In addition to normal detector operation, the CU shall have the following programmable functions for vehicle detector inputs.

(i) Call Detector. A mode of operation where the detection of a vehicle places a locking call into the assigned phase when the assigned phase is not green.

(ii) Detector Switching. Besides the normal assigned phase, the detector input can be programmed to switch to a secondary phase while the secondary phase is green and the assigned phase is not green. In all other conditions the detector input acts as a normal detector input for the assigned phase.

(iii) Extend Function. While the assigned phase is green, each detector actuation input is extended a programmed amount of time with a range of at least 0 to 99 seconds.

(iv) Delay Function. While the assigned phase is not green each detector actuation input is delayed a programmed amount of time with a range of at least 0 to 99 seconds.

e. Special Functions. Any special functions, special sequences, or modes of operation specified in the plans or required to operate the specified signal phasing and timing shall be included in the programming capability of the CU.

3. Malfunction Management Unit (MMU). Each controller assembly shall contain a malfunction management unit external to the controller circuitry conforming to NEMA. When the MMU actuates flashing operation, the controller shall freeze or stop timing with the stop time switch in Normal position in the condition causing the actuation until manually reset.

a. Phases or overlaps with only one signal head shall have load resistors installed across the outputs to prevent a single lamp failure from actuating the MMU.

4. Terminals and Facilities. All terminals and facilities in the controller assembly shall conform to NEMA TS2 Type 1 and the following requirements. For double controller assemblies, two complete sets of all terminals and facilities shall be provided with all items contained in the same compartment as the associated CU.

a. Wiring and Terminations

(i) Back Panel Wiring. All wiring carrying 120 volts AC shall be discrete insulated wires and shall be soldered directly to lugs on the back of terminal blocks or sockets. All discrete wiring on the backside of the back panel shall be neatly bundled and secured with plastic cable ties.

(ii) Any multi-conductor cable shall be contained in an expandable braided sleeving.

(iii) Input/output terminals shall be configured according to the following NEMA configurations:

Specified Operation		NEMA Configuration (NEMA Table 5.3.1-1)
2 through 8 Phases		Configuration 3 (12 Load Switch Positions)
9 through 12 Phases or		Configuration 4

more than		(16 Load Switch Positions)
4 Overlaps or Ped Phases		

(iv) In addition to the minimum NEMA requirements, four pedestrian call input terminals shall be provided.

(v) If hardwire interconnection is specified, the following input/output terminals shall be provided:

Timing Plan A Output
Timing Plan B Output
Timing Plan C Output
Timing Plan D Output
Offset 1 Output
Offset 2 Output
Offset 3 Output
Timing Plan A Input
Timing Plan B Input
Timing Plan C Input
Timing Plan D Input
Offset 1 Input
Offset 2 Input
Offset 3 Input
Interconnect Common

(vi) Buss Interface Units (BIU) and BIU racks shall be provided for all required terminals and facilities.

(vii) All Port 1 cable connectors shall have positive strain relief latches such that tension on the cable will not disconnect the connector from the unit they are connected to.

b. Switches and Controls. Each controller cabinet shall be furnished with the following switches and controls. For double controller cabinets, two sets of switches and controls are provided, one set for each controller installed in each compartment.

(i) Power Interrupt Switch – A switch located inside the main cabinet shall interrupt electrical power to the controller during maintenance on the controller. Operation of this switch shall not affect the flash operation. This switch shall not be accessible via the police panel.

(ii) Flash Switches – The following switches shall place the signal on flash. Operation of these switches shall not affect the

electrical power supply to the controller. When the signals are returned to normal operation the external start shall be activated causing the controller to revert to the programmed initialization phase(s).

(1) Each controller cabinet shall be furnished with a clearly labeled flash switch mounted in the access or police panel.

(2) Each controller cabinet shall be furnished with a clearly labeled flash switch mounted on the cabinet door in the inside of the cabinet.

(iii) Stop Time Switch – A three position switch mounted inside the main cabinet shall provide the following functions:

(1) Stop Time – Causes the controller to stop time.

(2) Normal – Allows the controller to cycle all phases, but during MMU flash causes the controller to stop time.

(3) Run – Allows the controller to cycle all phases and during any flashing operation allows the controller to continue cycling all phases without displaying them on the signal heads.

(iv) Switches or relays which completely interrupt power to the signal heads other than the protective circuit breaker shall not be installed in the cabinet.

(v) If specified, a manual operation push button shall be installed in the police panel. The push button shall be wired for manual operation of the signals. The push button shall be water resistant and designed to protect the user against electrical shock and shall be supplied with a coiled cord with a nominal 6-foot (2-m) stretched length. A clearly labeled switch shall also be installed in the police panel to switch between manual or automatic operation of the controller.

c. Detector Facilities.

(i) At a minimum, one NEMA Configuration 2 detector rack shall be provided with the associated BIU. If more than 16 detector channels are specified, additional NEMA Configuration 1 or 2 detector racks and associated BIU(s) shall be provided for the required number of detectors. Each

detector channel shall be assigned to a separate detector input into the CU.

(ii) Detector loop connections shall be provided for the total number of detector channels available in the detector racks supplied as specified above.

(iii) Two terminals shall be provided for each detector as follows.

(1) Screw terminal strips mounted vertically on the left side of the cabinet approximately 6 inches (150 mm) from the bottom of the cabinet.

(2) All inductive loop detector inputs shall be protected with two 30-volt metal oxide varistors (MOV) with a 30 Joule rating. An MOV shall be connected between each field terminal and cabinet ground.

(iv) The detector rack shall be attached to the controller cabinet shelf by an easily removable attachment. Sufficient wire lengths shall be provided for access to the back of the rack. The rack shall not block the back panel or other termination panels.

(v) Unless shown differently on the controller order form, each detector field input into the card rack shall be associated with the appropriate card position as follows:

Channel	*Card Position*							
	1	2	3	4	5	6	7	8
1	Phase 1	1 or 6	6	6	3	3 or 8	8	8
2	Phase 5	5 or 2	2	2	7	7 or 4	4	4

(vi) Each detector channel shall be clearly labeled with detector number, phase and direction.

d. Power Distribution.

(i) Each assembly shall contain a separate aluminum power panel located in the lower right portion of the cabinet containing the following equipment:

(1) Main breaker – one type B circuit breaker conforming to Sec 1091 that shall interrupt power to the controller and

signals. The frame size and trip rating is shown on the traffic signal plans or designated in the contract.

(2) Auxiliary breaker – one type B circuit breaker conforming to Sec 1091 that interrupts power to cabinet lamp and receptacle. The frame size and trip rating shall be 15 amperes.

(3) One mercury contactor that controls power to the signal bus.

(4) One radio frequency interference suppresser.

(5) One AC service transient suppression device.

(6) One terminal block for AC power input.

(7) One earth ground bus terminal block.

(8) One isolated AC neutral bus terminal block.

(ii) Each controller assembly shall have a fluorescent lighting fixture.

5. Auxiliary Interfaces for Controllers. Interface panels shall be aluminum panels with deburred edges and rounded corners installed in the controller cabinet containing the required terminals and equipment. Interface panels shall be neatly laid out, neatly wired and easily accessible. For double controller cabinets, the auxiliary interface shall be located in the same compartment as the associated CU.

a. Pre-emption Interface. The preemption operation and interface shall conform to NEMA. The pre-emption interface shall include any field wire termination panels, relays or isolators, wiring and connectors required for proper operation. Each preemption field input shall be protected with a metal oxide varistor (MOV). For 120-volt inputs, a 150-volt MOV with an 80-Joule rating shall be used and for 24-volt inputs, a 30-volt MOV with a 30-Joule rating shall be used.

b. Hardwire Master and Local Coordination Interface. The coordination interface shall consist of any field wire termination panels, wiring and connectors required for proper operation. The master coordination interface shall output commands to the local controllers in the system. Local coordination interfaces shall accept command inputs from the master coordination interface.

Coordination interfaces shall be connected to one another or to a telephone interconnection unit, by a multi-conductor cable.

The coordination interface shall provide a control terminal strip for 7 or 12 wire interconnect as specified in the plans, vertically or horizontally mounted, that shall be located 6 (150 mm) to 8 (200 mm) inches above the bottom of the cabinet. Control voltages applied to the terminals are associated with the following input/output functions:

7 – Wire	12 – Wire
Neutral	Neutral
Timing Plan A (Dial 2)	Timing Plan A (Dial 2)
Timing Plan B (Dial 3)	Timing Plan B (Dial 3)
Timing Plan C (Split 2)	Timing Plan C (Split 2)
Offset 1	Timing Plan D (Split 3)
Offset 2	Offset 1
Automatic Flash	Offset 2
	Offset 3
	Automatic Flash

All command voltages applied to these terminals shall be 120 volts AC. Terminals for interconnect cable shall be fused and provided with a 150-volt metal oxide varistor (MOV) with an 80 Joule rating. Interface circuitry between this terminal strip and the controller shall be by solid state or relay logic.

c. Closed Loop System Interface. If the controller assembly will be part of a closed loop system, all components required to interface with the system shall be in accordance with the plans.

d. Dial-Up Modem Interface. This panel shall provide for interfacing of a leased, unconditioned telephone drop to a Hayes compatible modem that connects to the on-street system master or local controller as specified in the plans. The panel shall be mounted on the inside of the cabinet on the right side. A telephone network interface, such as a Siecor CAL3000 or other approved interface acceptable to the local phone company shall be attached to the aluminum panel. The telephone interface shall also include the installation of the necessary cable, connectors, etc. to connect the interface to the telephone drop provided by the local telephone company.

6. *Auxiliary Devices.* Each auxiliary unit shall be enclosed in a suitably finished metal or molded plastic case. It shall be mounted in the controller cabinet unless otherwise specified. The function of each

auxiliary unit shall be indicated by an identification plate on the case. Auxiliary equipment cases shall be ventilated. Temperature, voltage and frequency shall meet the requirements of Sec 1a unless otherwise specified.

a. External Time Switches. External time switches shall be solid state, keyboard entry and contain filtering and shielding circuitry to protect the unit's operation against electrical interference. Timing shall be based on the 60 Hz power supply frequency. Each unit shall contain a programmable automatic central daylight time compensation feature. Each unit shall contain a back-up power source to maintain time and memory functions during loss of AC power. Each unit shall provide a weekly program with at least 20 event changes per week.

b. Dial-Up Modem. The unit shall be an auto-dial, auto-answer modem. The modem shall be Hayes compatible capable of responding to the standard "Hayes command set". The modem shall be self-contained. The unit shall be powered by a nominal 120 VAC from the duplex service outlet provided in the cabinet. The modem shall be capable of operating at all standard baud rates from 300 to 56K baud over a standard dial-up, unconditioned telephone line. Installation shall include the appropriate interface cable to connect to an RJ-11 telephone jack on the telephone interface panel, the RS-232 cable from the modem to the system master, all other cabling, connectors and incidental items necessary for operation.

7. Controller Cabinets. Controller cabinets shall be cast aluminum or 0.125 inch (3.2 mm) reinforced sheet aluminum alloy and be of clean-cut design and appearance. The cabinet shall provide ample space for housing all equipment and components. Controller cabinets housing solid state controllers shall be furnished with unused cabinet space measuring 18 inches (450 mm) wide by 12 inches (300 mm) high by 12 inches (300 mm) deep. Cabinet size shall be not less than 54 inches (1350 mm) high by 38 inches (950 mm) wide by 25 inches (625 mm) deep and support a 12 or 16 position backpanel. The cabinet shall contain rigid shelves of such construction that the CU and auxiliary equipment may be withdrawn from the cabinet without breaking any electrical connections or interrupting normal controller operation.

a. A hinged door or doors shall provide complete access to the interior of the cabinet. Door holds shall be furnished which shall hold the door in an open position at least 90 degrees from the closed position. The doors shall fit against a rain tight gasket. Each door shall be provided with a cabinet lock and shall have a stamped

or raised outside designation, “Traffic Control” or other approved identification. An auxiliary door, positioned on each main cabinet door, equipped with a rain tight gasket, shall allow access to a switch panel and shall be equipped with a lock whose key will not unlock the main door. Two keys shall be furnished for each type lock used. The door hinges and pins shall be of corrosion resistant metal. Pins shall be rolled or solid rod, at least 1/8 inch (3.18 mm) in diameter, except if continuous hinges are furnished, the pins shall be continuous the full length of the hinges and shall be not less than 1/16 inch (1.59 mm) in diameter.

b. The back panel in all controller cabinets shall be hinged at the bottom to permit the top of the panel to be rotated forward and down to an angle of not less than 45 degrees with all components, including load switches, attached for maintenance purposes. The bottom of the back panel shall be not less than 6 inches (150 mm) above the bottom of the cabinet.

c. Cabinets shall have a thermostatically controlled ventilating fan with exhausting capability, in an enclosure, of at least 150 cubic feet per minute (4.25 m^3/min) for cabinets up to 30.5 cubic feet (0.86 m^3) and at least 250 cubic feet per minute (7.08 m^3/min) for cabinets 30.5 cubic feet (0.86 m^3) and more, installed in the top of the cabinet. These cabinets shall be supplied with a replaceable furnace type fiberglass filter of at least one square foot (m^2) area mounted behind louvers in the lower one fourth of the door.

d. Double controller cabinets for two controllers shall be not less than 57 inches (1425 mm) high by 74 inches (1850 mm) wide by 17 inches (425 mm) deep and shall support two 12 position back panels. All double cabinets shall have two doors that are hinged on the outside corners of the cabinet so that the doors open away from each other. Double cabinets shall have a divider between the two halves of the cabinet with an 8-inch (200-mm) opening between the compartments at the bottom of the divider for wiring between the compartments.

B. Induction Loop Detectors. Loop detector units shall conform to NEMA. If specified, each channel shall have extension and delay timing features as specified in NEMA. Each detector shall have a regulator for the power input. The regulator shall have the appropriate power and voltage rating for operation of the detector. Card rack detectors shall be card rack-mounted detectors as specified in NEMA unless otherwise specified on the controller order form.

6. These controllers shall be equipped with internal time base coordination using

daily midnight reference or a selectable daily reference of which midnight can be selected. All necessary components shall be furnished. Cabinet type, interconnect information and delivery locations are attached.

7. All boxes of equipment delivered for a specific intersection should be clearly marked with both the controller number and the intersection, as shown on the Delivery Schedule.

8. All controllers shall be stamped or tagged with a manufacturer's serial number.

TS2/TYPE 2 - TS1 CABINET

NEMA TS1/TS2 Traffic Signal Controller Order Form

NK

DISTRICT	COUNTY	DESIGNATION	TRAVELWAY	CROSS STREET	LOG MILE
NE - HANNIBAL	MARION	MO	79	US 36 West	0.13000

SHIP TO:

MICHAEL LAKS	1711 HIGHWAY 61 SOUTH	HANNIBAL. MO	63401

SIGNAL ID 3380

CABINET TYPE NEMA/PT STANDARD EV

CABINET TS1/TS2 TS1

CONTROLLER TS2/Type2

CONTROLLER TYPE ACTUATED

CABINET DESCRIPTION

SYSTEM MASTER

DETECTION TYPE INDUCTION

INTERCONNECT TYPE

VIDEO SYSTEM INTERFACE

PRE-EMPT

BACKPANEL 12-POSITION-TS1

VIDEO SYSTEM TYPE

PRE-EMPT INFORMATION

☑ **D PLUG**

NEMA TS1 LOAD SWITCH ASSIGNMENTS

1	2	3	4	5	6	7	8	9	10	11	12
	2	3		5	6						

☐ **EXCLUSIVE PED PHASE**

NEMA TS2 LOAD SWITCH ASSIGNMENTS

13	14	15	16

 # OF STANDARD 2-CHANNEL DETECTOR 4

NEMA

 # OF DELAY/EXT 2-CHANNEL DETECTOR 0

CARD RACK CONFIGURATION

FILL IN POSITIONS NEEDED WITH ASSOCIATED PHASE NUMBER

1-CH1	2-CH1	3-CH1	4-CH1	5-CH1	6-CH1	7-CH1	8-CH1
0	0	6	6	3	0	0	0
1-CH2	**2-CH2**	**3-CH2**	**4-CH2**	**5-CH2**	**6-CH2**	**7-CH2**	**8-CH2**
5	0	2	2	0	0	0	0

	DET 1	DET 2	DET 3	DET 4	DET 5	DET 6	DET 7	DET 8
DELAY/EXTEND	☐	☐	☐	☐	☐	☐	☐	☐

	V DET	V DET 2	V DET 3	V DET 4	V DET 5	V DET 6	V DET 7	V DET 8
VIDEO	☐	☐	☐	☐	☐	☐	☐	☐

OTHER INFORMATION OR SPECIAL REQUIREMENTS:

TS2/TYPE 2 - TS1 CABINET

NEMA TS1/TS2 Traffic Signal Controller Order Form

NK

DISTRICT	COUNTY	DESIGNATION	TRAVELWAY	CROSS STREET	LOG MILE
NE - HANNIBAL	MARION	MO	79	EB US 36	0.31530

SHIP TO:

MICHAEL LAKS	1711 HIGHWAY 61 SOUTH	HANNIBAL, MO	63401

SIGNAL ID 3381

CABINET TYPE NEMA/PT STANDARD EV

CABINET TS1/TS2 TS1

CONTROLLER TS2/Type2

CONTROLLER TYPE ACTUATED

CABINET DESCRIPTION

SYSTEM MASTER

DETECTION TYPE INDUCTION

INTERCONNECT TYPE

VIDEO SYSTEM INTERFACE

PRE-EMPT

BACKPANEL 12-POSITION-TS1

VIDEO SYSTEM TYPE

PRE-EMPT INFORMATION

☑ **D PLUG**

NEMA TS1 LOAD SWITCH ASSIGNMENTS

1	2	3	4	5	6	7	8	9	10	11	12
1	2		4		6						

☐ **EXCLUSIVE PED PHASE**

NEMA TS2 LOAD SWITCH ASSIGNMENTS

13	14	15	16

 # OF STANDARD 2-CHANNEL DETECTOR 4

NEMA

 # OF DELAY/EXT 2-CHANNEL DETECTOR 0

CARD RACK CONFIGURATION

FILL IN POSITIONS NEEDED WITH ASSOCIATED PHASE NUMBER

1-CH1	2-CH1	3-CH1	4-CH1	5-CH1	6-CH1	7-CH1	8-CH1
1	0	6	6	0	0	0	0
1-CH2	**2-CH2**	**3-CH2**	**4-CH2**	**5-CH2**	**6-CH2**	**7-CH2**	**8-CH2**
0	0	2	2	0	0	4	0

	DET 1	DET 2	DET 3	DET 4	DET 5	DET 6	DET 7	DET 8
DELAY/EXTEND	☐	☐	☐	☐	☐	☐	☐	☐

	V DET	V DET 2	V DET 3	V DET 4	V DET 5	V DET 6	V DET 7	V DET 8
VIDEO	☐	☐	☐	☐	☐	☐	☐	☐

OTHER INFORMATION OR SPECIAL REQUIREMENTS:

TS2/TYPE 2 - TS1 CABINET

NEMA TS1/TS2 Traffic Signal Controller Order Form

NE

DISTRICT	COUNTY	DESIGNATION	TRAVELWAY	CROSS STREET	LOG MILE
NE - HANNIBAL	AUDRAIN	MO	15	MO 22/Monroe	117.76200

SHIP TO:

MICHAEL LAKS	1711 HIGHWAY 61 SOUTH	HANNIBAL. MO	63401

SIGNAL ID 3459

CABINET TYPE NEMA/PT STANDARD EV

CABINET TS1/TS2 TS1

CONTROLLER TS2/Type2

CONTROLLER TYPE ACTUATED

CABINET DESCRIPTION

SYSTEM MASTER

DETECTION TYPE INDUCTION

INTERCONNECT TYPE

VIDEO SYSTEM INTERFACE

PRE-EMPT

BACKPANEL 12-POSITION-TS1

VIDEO SYSTEM TYPE

PRE-EMPT INFORMATION

☐ **D PLUG**

NEMA TS1 LOAD SWITCH ASSIGNMENTS

1	2	3	4	5	6	7	8	9	10	11	12
1	2	3	4	5	6	7	8				

☐ **EXCLUSIVE PED PHASE**

NEMA TS2 LOAD SWITCH ASSIGNMENTS

13	14	15	16

 # OF STANDARD 2-CHANNEL DETECTOR 4

NEMA

 # OF DELAY/EXT 2-CHANNEL DETECTOR 0

CARD RACK CONFIGURATION

FILL IN POSITIONS NEEDED WITH ASSOCIATED PHASE NUMBER

1-CH1	2-CH1	3-CH1	4-CH1	5-CH1	6-CH1	7-CH1	8-CH1
1	6	3	8	0	0	0	0
1-CH2	**2-CH2**	**3-CH2**	**4-CH2**	**5-CH2**	**6-CH2**	**7-CH2**	**8-CH2**
5	2	7	4	0	0	0	0

	DET 1	DET 2	DET 3	DET 4	DET 5	DET 6	DET 7	DET 8
DELAY/EXTEND	☐	☐	☐	☐	☐	☐	☐	☐

	V DET	V DET 2	V DET 3	V DET 4	V DET 5	V DET 6	V DET 7	V DET 8
VIDEO	☐	☐	☐	☐	☐	☐	☐	☐

OTHER INFORMATION OR SPECIAL REQUIREMENTS:

NW

NEMA TS1/TS2 Traffic Signal Controller Order Form

DISTRICT	COUNTY	DESIGNATION	TRAVELWAY	CROSS STREET	LOG MILE
NW - ST. JOSEPH	BUCHANAN	US	169	Pear St	75.27000

SHIP TO:

JOHN SHORES	3602 NORTH BELT HIGHWAY	ST. JOSEPH. MO	64506

SIGNAL ID 5038

CABINET TYPE NEMA/PT STANDARD EV

CABINET TS1/TS2 TS2

CONTROLLER TS2/Type2

CONTROLLER TYPE ACTUATED

CABINET DESCRIPTION 49"H x 30"W x 17"D - TS2

SYSTEM MASTER

DETECTION TYPE INDUCTION

INTERCONNECT TYPE RADIO CLOSED LOOP

VIDEO SYSTEM INTERFACE INDUCTION DETECTOR PANEL

PRE-EMPT

BACKPANEL 12-POSITION-TS2

VIDEO SYSTEM TYPE

PRE-EMPT INFORMATION

☐ **D PLUG**

NEMA TS1 LOAD SWITCH ASSIGNMENTS

1	2	3	4	5	6	7	8	9	10	11	12
1	2	3	4	5	6	7	8	1FYA	3FYA	5FYA	7FYA

☐ **EXCLUSIVE PED PHASE**

NEMA TS2 LOAD SWITCH ASSIGNMENTS

13	14	15	16

NEMA

 # OF STANDARD 2-CHANNEL DETECTOR 6

 # OF DELAY/EXT 2-CHANNEL DETECTOR 0

CARD RACK CONFIGURATION

FILL IN POSITIONS NEEDED WITH ASSOCIATED PHASE NUMBER

1-CH1	2-CH1	3-CH1	4-CH1	5-CH1	6-CH1	7-CH1	8-CH1
0	1	2	2	0	3	4	4
1-CH2	**2-CH2**	**3-CH2**	**4-CH2**	**5-CH2**	**6-CH2**	**7-CH2**	**8-CH2**
0	5	6	6	0	7	8	8

	DET 1	DET 2	DET 3	DET 4	DET 5	DET 6	DET 7	DET 8
DELAY/EXTEND	☐	☐	☐	☐	☐	☐	☐	☐

	V DET	V DET 2	V DET 3	V DET 4	V DET 5	V DET 6	V DET 7	V DET 8
VIDEO	☐	☐	☐	☐	☐	☐	☐	☐

OTHER INFORMATION OR SPECIAL REQUIREMENTS:

PLEASE HAVE CABINET WIRED WITH A GENERATOR SOCKET INSTALLED IN THE POLICE DOOR AND CORD PROVIDED. CONTROLLER SOFTWARE SHALL BE NTCIP COMPLIANT. CONTROLLER AND MMU SHALL BE CAPABLE OF OPERATING FYA.

Go To Next Record ▶ Go to Previous Record ◀ Add a New Record ▶* Close File

NEMA TS1/TS2 Traffic Signal Controller Order Form

DISTRICT	COUNTY	DESIGNATION	TRAVELWAY	CROSS STREET	LOG MILE
NW - ST. JOSEPH	BUCHANAN	US	169	Pickett Road	74.76000

SHIP TO:

JOHN SHORES	3602 NORTH BELT HIGHWAY	ST. JOSEPH. MO	64506

SIGNAL ID 5027

CABINET TYPE NEMA/PT STANDARD EV

CABINET TS1/TS2 TS2

CONTROLLER TS2/Type2

CONTROLLER TYPE ACTUATED

CABINET DESCRIPTION 49"H x 30"W x 17"D - TS2

SYSTEM MASTER

DETECTION TYPE VIDEO W/CARD RACK

INTERCONNECT TYPE RADIO CLOSED LOOP

VIDEO SYSTEM INTERFACE INDUCTION DETECTOR PANEL

PRE-EMPT

BACKPANEL 12-POSITION-TS2

VIDEO SYSTEM TYPE Iteris

PRE-EMPT INFORMATION

☐ **D PLUG**

NEMA TS1 LOAD SWITCH ASSIGNMENTS

1	2	3	4	5	6	7	8	9	10	11	12
1	2	3	4	5	6	7	8	OLA	OLB	5FYA	OLD

☐ **EXCLUSIVE PED PHASE**

NEMA TS2 LOAD SWITCH ASSIGNMENTS

13	14	15	16

NEMA

 # OF STANDARD 2-CHANNEL DETECTOR 6

 # OF DELAY/EXT 2-CHANNEL DETECTOR 0

CARD RACK CONFIGURATION

FILL IN POSITIONS NEEDED WITH ASSOCIATED PHASE NUMBER

	1	2	3	4	5	6	7	8
CH1	0	1	2	2	0	3	4	4
CH2	0	5	6	6	0	7	8	8

	DET 1	DET 2	DET 3	DET 4	DET 5	DET 6	DET 7	DET 8
DELAY/EXTEND	☐	☐	☐	☐	☐	☐	☐	☐

	V DET	V DET 2	V DET 3	V DET 4	V DET 5	V DET 6	V DET 7	V DET 8
VIDEO	☐	☐	☐	☐	☐	☐	☐	☐

OTHER INFORMATION OR SPECIAL REQUIREMENTS:

PLEASE HAVE CABINET WIRED WITH A GENERATOR SOCKET INSTALLED IN THE POLICE DOOR AND CORD PROVIDED. CONTROLLER SOFTWARE SHALL BE NTCIP COMPLIANT. CONTROLLER AND MMU SHALL BE CAPABLE OF OPERATING FYA.

Go To Next Record ▶ Go to Previous Record ◀ Add a New Record ▶* Close File

NEMA TS1/TS2 Traffic Signal Controller Order Form

NW

DISTRICT	COUNTY	DESIGNATION	TRAVELWAY	CROSS STREET	LOG MILE
NW - ST. JOSEPH	BUCHANAN	US	169	Sherman Rd	71.99000

SHIP TO:

JOHN SHORES	3602 NORTH BELT HIGHWAY	ST. JOSEPH. MO	64506

SIGNAL ID 5032

CABINET TYPE NEMA/PT STANDARD EV

CABINET TS1/TS2 TS2

CONTROLLER TS2/Type2

CONTROLLER TYPE ACTUATED

CABINET DESCRIPTION 49"H x 30"W x 17"D - TS2

SYSTEM MASTER

DETECTION TYPE VIDEO W/CARD RACK

INTERCONNECT TYPE RADIO CLOSED LOOP

VIDEO SYSTEM INTERFACE INDUCTION DETECTOR PANEL

PRE-EMPT

BACKPANEL 12-POSITION-TS2

VIDEO SYSTEM TYPE Iteris

PRE-EMPT INFORMATION

☐ **D PLUG**

NEMA TS1 LOAD SWITCH ASSIGNMENTS

1	2	3	4	5	6	7	8	9	10	11	12
1	2	3	4	5	6	7	8	OLA	OLB	OLC	OLD

☐ **EXCLUSIVE PED PHASE**

NEMA TS2 LOAD SWITCH ASSIGNMENTS

13	14	15	16

 # OF STANDARD 2-CHANNEL DETECTOR 6

NEMA

 # OF DELAY/EXT 2-CHANNEL DETECTOR 0

CARD RACK CONFIGURATION

FILL IN POSITIONS NEEDED WITH ASSOCIATED PHASE NUMBER

	1-CH1	2-CH1	3-CH1	4-CH1	5-CH1	6-CH1	7-CH1	8-CH1
	0	1	2	2	0	3	4	4
	1-CH2	2-CH2	3-CH2	4-CH2	5-CH2	6-CH2	7-CH2	8-CH2
	0	5	6	6	0	7	8	8

	DET 1	DET 2	DET 3	DET 4	DET 5	DET 6	DET 7	DET 8
DELAY/EXTEND	☐	☐	☐	☐	☐	☐	☐	☐

	V DET	V DET 2	V DET 3	V DET 4	V DET 5	V DET 6	V DET 7	V DET 8
VIDEO	☐	☐	☐	☐	☐	☐	☐	☐

OTHER INFORMATION OR SPECIAL REQUIREMENTS:

PLEASE HAVE CABINET WIRED WITH A GENERATOR SOCKET INSTALLED IN THE POLICE DOOR AND CORD PROVIDED. CONTROLLER SOFTWARE SHALL BE NTCIP COMPLIANT. CONTROLLER AND MMU SHALL BE CAPABLE OF OPERATING FYA.

Go To Next Record ▶ Go to Previous Record ◀ Add a New Record ▶* Close File

NKN

NEMA TS1/TS2 Traffic Signal Controller Order Form

DISTRICT	COUNTY	DESIGNATION	TRAVELWAY	CROSS STREET	LOG MILE
NW - ST. JOSEPH	BUCHANAN	US	169	Messanie St	73.26000

SHIP TO:

JOHN SHORES	3602 NORTH BELT HIGHWAY	ST. JOSEPH. MO	64506

SIGNAL ID 5503

CABINET TYPE NEMA/PT STANDARD EV

CABINET TS1/TS2 TS2

CONTROLLER TS2/Type2

CONTROLLER TYPE ACTUATED

CABINET DESCRIPTION 49"H x 30"W x 17"D - TS2

SYSTEM MASTER

DETECTION TYPE VIDEO W/CARD RACK

INTERCONNECT TYPE RADIO CLOSED LOOP

VIDEO SYSTEM INTERFACE INDUCTION DETECTOR PANEL

PRE-EMPT

BACKPANEL 12-POSITION-TS2

VIDEO SYSTEM TYPE Iteris

PRE-EMPT INFORMATION

☐ **D PLUG**

NEMA TS1 LOAD SWITCH ASSIGNMENTS

1	2	3	4	5	6	7	8	9	10	11	12
1	2	3	4	5	6	7	8	1FYA	3FYA	5FYA	7FYA

☐ **EXCLUSIVE PED PHASE**

NEMA TS2 LOAD SWITCH ASSIGNMENTS

13	14	15	16

 # OF STANDARD 2-CHANNEL DETECTOR 6

NEMA

 # OF DELAY/EXT 2-CHANNEL DETECTOR 0

CARD RACK CONFIGURATION

FILL IN POSITIONS NEEDED WITH ASSOCIATED PHASE NUMBER

1-CH1	2-CH1	3-CH1	4-CH1	5-CH1	6-CH1	7-CH1	8-CH1
0	1	2	2	0	3	4	4
1-CH2	**2-CH2**	**3-CH2**	**4-CH2**	**5-CH2**	**6-CH2**	**7-CH2**	**8-CH2**
0	5	6	6	0	7	8	8

	DET 1	DET 2	DET 3	DET 4	DET 5	DET 6	DET 7	DET 8
DELAY/EXTEND	☐	☐	☐	☐	☐	☐	☐	☐

	V DET	V DET 2	V DET 3	V DET 4	V DET 5	V DET 6	V DET 7	V DET 8
VIDEO	☐	☐	☐	☐	☐	☐	☐	☐

OTHER INFORMATION OR SPECIAL REQUIREMENTS:

PLEASE HAVE CABINET WIRED WITH A GENERATOR SOCKET INSTALLED IN THE POLICE DOOR AND CORD PROVIDED. CONTROLLER SOFTWARE SHALL BE NTCIP COMPLIANT. CONTROLLER AND MMU SHALL BE CAPABLE OF OPERATING FYA.

Go To Next Record ▶ Go to Previous Record ◀ Add a New Record ▶* Close File

NW

NEMA TS1/TS2 Traffic Signal Controller Order Form

DISTRICT	COUNTY	DESIGNATION	TRAVELWAY	CROSS STREET	LOG MILE
NW - ST. JOSEPH	BUCHANAN	US	169	Gene Field Rd	71.09000

SHIP TO:

JOHN SHORES	3602 NORTH BELT HIGHWAY	ST. JOSEPH. MO	64506

SIGNAL ID 5030

CABINET TYPE NEMA/PT STANDARD EV

CABINET TS1/TS2 TS2

CONTROLLER TS2/Type2

CONTROLLER TYPE ACTUATED

CABINET DESCRIPTION 49"H x 30"W x 17"D - TS2

SYSTEM MASTER

DETECTION TYPE VIDEO W/CARD RACK

INTERCONNECT TYPE RADIO CLOSED LOOP

VIDEO SYSTEM INTERFACE INDUCTION DETECTOR PANEL

PRE-EMPT

BACKPANEL 16-POSITION-TS2

VIDEO SYSTEM TYPE Iteris

PRE-EMPT INFORMATION

☐ **D PLUG**

NEMA TS1 LOAD SWITCH ASSIGNMENTS

1	2	3	4	5	6	7	8	9	10	11	12
1	2	3	4	5	6	7	8	2PED	4PED	6PED	8PED

☐ **EXCLUSIVE PED PHASE**

NEMA TS2 LOAD SWITCH ASSIGNMENTS

13	14	15	16
1FYA	3FYA	5FYA	7FYA

NEMA

 # OF STANDARD 2-CHANNEL DETECTOR 6

 # OF DELAY/EXT 2-CHANNEL DETECTOR 0

CARD RACK CONFIGURATION

FILL IN POSITIONS NEEDED WITH ASSOCIATED PHASE NUMBER

1-CH1	2-CH1	3-CH1	4-CH1	5-CH1	6-CH1	7-CH1	8-CH1
0	1	2	2	0	3	4	4
1-CH2	**2-CH2**	**3-CH2**	**4-CH2**	**5-CH2**	**6-CH2**	**7-CH2**	**8-CH2**
0	5	6	6	0	7	8	8

	DET 1	DET 2	DET 3	DET 4	DET 5	DET 6	DET 7	DET 8
DELAY/EXTEND	☐	☐	☐	☐	☐	☐	☐	☐

	V DET	V DET 2	V DET 3	V DET 4	V DET 5	V DET 6	V DET 7	V DET 8
VIDEO	☐	☐	☐	☐	☐	☐	☐	☐

OTHER INFORMATION OR SPECIAL REQUIREMENTS:

PLEASE HAVE CABINET WIRED WITH A GENERATOR SOCKET INSTALLED IN THE POLICE DOOR AND CORD PROVIDED. CONTROLLER SOFTWARE SHALL BE NTCIP COMPLIANT. CONTROLLER AND MMU SHALL BE CAPABLE OF OPERATING FYA.

Go To Next Record ▶ Go to Previous Record ◀ Add a New Record ▶* Close File

NW

NEMA TS1/TS2 Traffic Signal Controller Order Form

DISTRICT	COUNTY	DESIGNATION	TRAVELWAY	CROSS STREET	LOG MILE
NW - ST. JOSEPH	BUCHANAN	US	169	Beck Rd	71.62000

SHIP TO:

JOHN SHORES	3602 NORTH BELT HIGHWAY	ST. JOSEPH. MO	64506

SIGNAL ID 5031

CABINET TYPE NEMA/PT STANDARD EV

CABINET TS1/TS2 TS2

CONTROLLER TS2/Type2

CONTROLLER TYPE ACTUATED

CABINET DESCRIPTION 49"H x 30"W x 17"D - TS2

SYSTEM MASTER

DETECTION TYPE VIDEO W/CARD RACK

INTERCONNECT TYPE RADIO CLOSED LOOP

VIDEO SYSTEM INTERFACE INDUCTION DETECTOR PANEL

PRE-EMPT

BACKPANEL 16-POSITION-TS2

VIDEO SYSTEM TYPE Iteris

PRE-EMPT INFORMATION

☐ **D PLUG**

NEMA TS1 LOAD SWITCH ASSIGNMENTS

1	2	3	4	5	6	7	8	9	10	11	12
1	2	3	4	5	6	7	8	2PED	4PED	6PED	8PED

☐ **EXCLUSIVE PED PHASE**

NEMA TS2 LOAD SWITCH ASSIGNMENTS

13	14	15	16
1FYA	3FYA	5FYA	7FYA

 # OF STANDARD 2-CHANNEL DETECTOR 6

NEMA

 # OF DELAY/EXT 2-CHANNEL DETECTOR 0

CARD RACK CONFIGURATION

FILL IN POSITIONS NEEDED WITH ASSOCIATED PHASE NUMBER

1-CH1	2-CH1	3-CH1	4-CH1	5-CH1	6-CH1	7-CH1	8-CH1
0	1	2	2	0	3	4	4
1-CH2	**2-CH2**	**3-CH2**	**4-CH2**	**5-CH2**	**6-CH2**	**7-CH2**	**8-CH2**
0	5	6	6	0	7	8	8

	DET 1	DET 2	DET 3	DET 4	DET 5	DET 6	DET 7	DET 8
DELAY/EXTEND	☐	☐	☐	☐	☐	☐	☐	☐

	V DET	V DET 2	V DET 3	V DET 4	V DET 5	V DET 6	V DET 7	V DET 8
VIDEO	☐	☐	☐	☐	☐	☐	☐	☐

OTHER INFORMATION OR SPECIAL REQUIREMENTS:

PLEASE HAVE CABINET WIRED WITH A GENERATOR SOCKET INSTALLED IN THE POLICE DOOR AND CORD PROVIDED.
CONTROLLER SOFTWARE SHALL BE NTCIP COMPLIANT. CONTROLLER AND MMU SHALL BE CAPABLE OF OPERATING FYA.

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TS2/TYPE2_TS2 CABINET

NEMA TS1/TS2 Traffic Signal Controller Order Form

DISTRICT	COUNTY	DESIGNATION	TRAVELWAY	CROSS STREET	LOG MILE
KC - KANSAS CITY	CLAY	US	69	Highland	29.55400

SHIP TO:

MARK DURHAM	9101 EAST 40TH TERRACE	KANSAS CITY, MO	64133

SIGNAL ID 1561

CABINET TYPE NEMA/PT STANDARD EV

CABINET TS1/TS2 TS2

CONTROLLER TS2/Type2

CONTROLLER TYPE ACTUATED

CABINET DESCRIPTION

SYSTEM MASTER

DETECTION TYPE INDUCTION AND VIDEO

INTERCONNECT TYPE

VIDEO SYSTEM INTERFACE SDLC PORT

PRE-EMPT

BACKPANEL 12-POSITION-TS2

VIDEO SYSTEM TYPE

PRE-EMPT INFORMATION

☑ **D PLUG**

NEMA TS1 LOAD SWITCH ASSIGNMENTS

1	2	3	4	5	6	7	8	9	10	11	12
1	2	3	4	5	6	7	8	9	10	11	12

☐ **EXCLUSIVE PED PHASE**

NEMA TS2 LOAD SWITCH ASSIGNMENTS

13	14	15	16

NEMA

 # OF STANDARD 2-CHANNEL DETECTOR 8

 # OF DELAY/EXT 2-CHANNEL DETECTOR 0

CARD RACK CONFIGURATION

FILL IN POSITIONS NEEDED WITH ASSOCIATED PHASE NUMBER

1-CH1	2-CH1	3-CH1	4-CH1	5-CH1	6-CH1	7-CH1	8-CH1
1	2	2	2	3	4	4	4
1-CH2	**2-CH2**	**3-CH2**	**4-CH2**	**5-CH2**	**6-CH2**	**7-CH2**	**8-CH2**
5	6	6	6	7	8	8	8

	DET 1	DET 2	DET 3	DET 4	DET 5	DET 6	DET 7	DET 8
DELAY/EXTEND	☐	☐	☐	☐	☐	☐	☐	☐

	V DET	V DET 2	V DET 3	V DET 4	V DET 5	V DET 6	V DET 7	V DET 8
VIDEO	☐	☐	☐	☐	☐	☐	☐	☐

OTHER INFORMATION OR SPECIAL REQUIREMENTS:

Cabinet shall include a fiber hub for 8 connections minimum and include a slide out drawer. And be FYA Compliant.

NEMA TS1/TS2 Traffic Signal Controller Order Form

KC

DISTRICT	COUNTY	DESIGNATION	TRAVELWAY	CROSS STREET	LOG MILE
KC - KANSAS CITY	JOHNSON	MO	23	McPherson	13.14700

SHIP TO:

MARK DURHAM	9101 EAST 40TH TERRACE	KANSAS CITY. MO	64133

SIGNAL ID 1767

CABINET TYPE NEMA/PT STANDARD EV

CABINET TS1/TS2 TS2

CONTROLLER TS2/Type2

CONTROLLER TYPE ACTUATED

CABINET DESCRIPTION

SYSTEM MASTER

DETECTION TYPE INDUCTION AND VIDEO

INTERCONNECT TYPE

VIDEO SYSTEM INTERFACE SDLC PORT

PRE-EMPT

BACKPANEL 12-POSITION-TS2

VIDEO SYSTEM TYPE

PRE-EMPT INFORMATION

☑ **D PLUG**

NEMA TS1 LOAD SWITCH ASSIGNMENTS

1	2	3	4	5	6	7	8	9	10	11	12
1	2	3	4	5	6	7	8	9	10	11	12

☐ **EXCLUSIVE PED PHASE**

NEMA TS2 LOAD SWITCH ASSIGNMENTS

13	14	15	16

 # OF STANDARD 2-CHANNEL DETECTOR 8

NEMA

 # OF DELAY/EXT 2-CHANNEL DETECTOR 0

CARD RACK CONFIGURATION

FILL IN POSITIONS NEEDED WITH ASSOCIATED PHASE NUMBER

1-CH1	2-CH1	3-CH1	4-CH1	5-CH1	6-CH1	7-CH1	8-CH1
1	2	2	2	3	4	4	4
1-CH2	**2-CH2**	**3-CH2**	**4-CH2**	**5-CH2**	**6-CH2**	**7-CH2**	**8-CH2**
5	6	6	6	7	8	8	8

	DET 1	DET 2	DET 3	DET 4	DET 5	DET 6	DET 7	DET 8
DELAY/EXTEND	☐	☐	☐	☐	☐	☐	☐	☐

	V DET	V DET 2	V DET 3	V DET 4	V DET 5	V DET 6	V DET 7	V DET 8
VIDEO	☐	☐	☐	☐	☐	☐	☐	☐

OTHER INFORMATION OR SPECIAL REQUIREMENTS:

Cabinet shall include a fiber hub for 8 connections minimum and include a slide out drawer. And be FYA Compliant.

TS2/TYPE2 - TS2 CABINET

NEMA TS1/TS2 Traffic Signal Controller Order Form

DISTRICT	COUNTY	DESIGNATION	TRAVELWAY	CROSS STREET	LOG MILE
KC - KANSAS CITY	JACKSON	RT	BB	Duncan	7.13600

SHIP TO:

MARK DURHAM	9101 EAST 40TH TERRACE	KANSAS CITY, MO	64133

SIGNAL ID 6183

CABINET TYPE NEMA/PT STANDARD EV

CABINET TS1/TS2 TS2

CONTROLLER TS2/Type2

CONTROLLER TYPE ACTUATED

CABINET DESCRIPTION

SYSTEM MASTER

DETECTION TYPE VIDEO W/CARD RACK

INTERCONNECT TYPE

VIDEO SYSTEM INTERFACE SDLC PORT

PRE-EMPT

BACKPANEL 12-POSITION-TS2

VIDEO SYSTEM TYPE

PRE-EMPT INFORMATION

☑ **D PLUG**

NEMA TS1 LOAD SWITCH ASSIGNMENTS

1	2	3	4	5	6	7	8	9	10	11	12
1	2	3	4	5	6	7	8	9	10	11	12

☐ **EXCLUSIVE PED PHASE**

NEMA TS2 LOAD SWITCH ASSIGNMENTS

13	14	15	16

 # OF STANDARD 2-CHANNEL DETECTOR 8

NEMA

 # OF DELAY/EXT 2-CHANNEL DETECTOR 0

CARD RACK CONFIGURATION

FILL IN POSITIONS NEEDED WITH ASSOCIATED PHASE NUMBER

1-CH1	2-CH1	3-CH1	4-CH1	5-CH1	6-CH1	7-CH1	8-CH1
1	2	2	2	3	4	4	4
1-CH2	**2-CH2**	**3-CH2**	**4-CH2**	**5-CH2**	**6-CH2**	**7-CH2**	**8-CH2**
5	6	6	6	7	8	8	8

	DET 1	DET 2	DET 3	DET 4	DET 5	DET 6	DET 7	DET 8
DELAY/EXTEND	☐	☐	☐	☐	☐	☐	☐	☐

	V DET	V DET 2	V DET 3	V DET 4	V DET 5	V DET 6	V DET 7	V DET 8
VIDEO	☐	☐	☐	☐	☐	☐	☐	☐

OTHER INFORMATION OR SPECIAL REQUIREMENTS:

Cabinet shall include a fiber hub for 8 connections minimum and include a slide out drawer. And be FYA Compliant. Will need loop input panel in odere to get video to the card.....for existing Trafican video detection system

TS2/TYPE2 - TS2 CABINET

NEMA TS1/TS2 Traffic Signal Controller Order Form

DISTRICT	COUNTY	DESIGNATION	TRAVELWAY	CROSS STREET	LOG MILE
KC - KANSAS CITY	JACKSON	CST	Chipman	Murray	2.40500

SHIP TO:

MARK DURHAM	9101 EAST 40TH TERRACE	KANSAS CITY. MO	64133

SIGNAL ID 5723

CABINET TYPE NEMA/PT STANDARD EV

CABINET TS1/TS2 TS2

CONTROLLER TS2/Type2

CONTROLLER TYPE ACTUATED

CABINET DESCRIPTION

SYSTEM MASTER

DETECTION TYPE VIDEO W/CARD RACK

INTERCONNECT TYPE FIBER CLOSED LOOP

VIDEO SYSTEM INTERFACE SDLC PORT

PRE-EMPT OTHER PRE-EMPT

BACKPANEL 12-POSITION-TS2

VIDEO SYSTEM TYPE

PRE-EMPT INFORMATION

☑ **D PLUG**

NEMA TS1 LOAD SWITCH ASSIGNMENTS

1	2	3	4	5	6	7	8	9	10	11	12
1	2	3	4	5	6	7	8	9	10	11	12

☐ **EXCLUSIVE PED PHASE**

NEMA TS2 LOAD SWITCH ASSIGNMENTS

13	14	15	16

NEMA

 # OF STANDARD 2-CHANNEL DETECTOR 8

 # OF DELAY/EXT 2-CHANNEL DETECTOR 0

CARD RACK CONFIGURATION

FILL IN POSITIONS NEEDED WITH ASSOCIATED PHASE NUMBER

1-CH1	2-CH1	3-CH1	4-CH1	5-CH1	6-CH1	7-CH1	8-CH1
1	2	2	2	3	4	4	4
1-CH2	**2-CH2**	**3-CH2**	**4-CH2**	**5-CH2**	**6-CH2**	**7-CH2**	**8-CH2**
5	6	6	6	4	8	8	8

	DET 1	DET 2	DET 3	DET 4	DET 5	DET 6	DET 7	DET 8
DELAY/EXTEND	☐	☐	☐	☐	☐	☐	☐	☐

	V DET	V DET 2	V DET 3	V DET 4	V DET 5	V DET 6	V DET 7	V DET 8
VIDEO	☐	☐	☐	☐	☐	☐	☐	☐

OTHER INFORMATION OR SPECIAL REQUIREMENTS:

Cabinet shall include a fiber hub for 8 connections minimum and include a slide out drawer. And be FYA Compliant.

TS2 CABINET ONLY

NEMA TS1/TS2 Traffic Signal Controller Order Form

DISTRICT	COUNTY	DESIGNATION	TRAVELWAY	CROSS STREET	LOG MILE
KC - KANSAS CITY	JACKSON	US	24	River	9.98500

SHIP TO:

MARK DURHAM	9101 EAST 40TH TERRACE	KANSAS CITY. MO	64133

SIGNAL ID 780

CABINET TYPE NEMA/PT STANDARD EV

CABINET TS1/TS2 TS2

CONTROLLER

CONTROLLER TYPE

CABINET DESCRIPTION

SYSTEM MASTER

DETECTION TYPE INDUCTION AND VIDEO

INTERCONNECT TYPE

VIDEO SYSTEM INTERFACE SDLC PORT

PRE-EMPT OTHER PRE-EMPT

BACKPANEL 12-POSITION-TS2

VIDEO SYSTEM TYPE

PRE-EMPT INFORMATION

☑ **D PLUG**

NEMA TS1 LOAD SWITCH ASSIGNMENTS

1	2	3	4	5	6	7	8	9	10	11	12
1	2	3	4	5	6	7	8	9	10	11	12

☐ **EXCLUSIVE PED PHASE**

NEMA TS2 LOAD SWITCH ASSIGNMENTS

13	14	15	16

NEMA

 # OF STANDARD 2-CHANNEL DETECTOR 8

 # OF DELAY/EXT 2-CHANNEL DETECTOR 0

CARD RACK CONFIGURATION

FILL IN POSITIONS NEEDED WITH ASSOCIATED PHASE NUMBER

1-CH1	2-CH1	3-CH1	4-CH1	5-CH1	6-CH1	7-CH1	8-CH1
1	2	2	2	3	4	4	4
1-CH2	**2-CH2**	**3-CH2**	**4-CH2**	**5-CH2**	**6-CH2**	**7-CH2**	**8-CH2**
5	6	6	6	7	8	8	8

	DET 1	DET 2	DET 3	DET 4	DET 5	DET 6	DET 7	DET 8
DELAY/EXTEND	☐	☐	☐	☐	☐	☐	☐	☐

	V DET	V DET 2	V DET 3	V DET 4	V DET 5	V DET 6	V DET 7	V DET 8
VIDEO	☐	☐	☐	☐	☐	☐	☐	☐

OTHER INFORMATION OR SPECIAL REQUIREMENTS:

Cabinet only. Cabinet shall include a fiber hub for 8 connections minimum and include a slide out drawer. And be FYA Compliant.

TS2 CABINET ONLY

NEMA TS1/TS2 Traffic Signal Controller Order Form

KC

DISTRICT	COUNTY	DESIGNATION	TRAVELWAY	CROSS STREET	LOG MILE
KC - KANSAS CITY	PLATTE	MO	45	MO 273	13.68600

SHIP TO:

MARK DURHAM	9101 EAST 40TH TERRACE	KANSAS CITY, MO	64133

SIGNAL ID 12865

CABINET TYPE NEMA/PT STANDARD EV

CABINET TS1/TS2 TS2

CONTROLLER

CONTROLLER TYPE

CABINET DESCRIPTION

SYSTEM MASTER

DETECTION TYPE VIDEO W/CARD RACK

INTERCONNECT TYPE

VIDEO SYSTEM INTERFACE SDLC PORT

PRE-EMPT

BACKPANEL 12-POSITION-TS2

VIDEO SYSTEM TYPE

PRE-EMPT INFORMATION

☑ **D PLUG**

NEMA TS1 LOAD SWITCH ASSIGNMENTS

1	2	3	4	5	6	7	8	9	10	11	12
1	2	3	4	5	6	7	8	9	10	11	12

☐ **EXCLUSIVE PED PHASE**

NEMA TS2 LOAD SWITCH ASSIGNMENTS

13	14	15	16

NEMA

 # OF STANDARD 2-CHANNEL DETECTOR 8

 # OF DELAY/EXT 2-CHANNEL DETECTOR 0

CARD RACK CONFIGURATION

FILL IN POSITIONS NEEDED WITH ASSOCIATED PHASE NUMBER

1-CH1	2-CH1	3-CH1	4-CH1	5-CH1	6-CH1	7-CH1	8-CH1
1	2	2	2	3	4	4	4
1-CH2	**2-CH2**	**3-CH2**	**4-CH2**	**5-CH2**	**6-CH2**	**7-CH2**	**8-CH2**
5	6	6	6	7	8	8	8

	DET 1	DET 2	DET 3	DET 4	DET 5	DET 6	DET 7	DET 8
DELAY/EXTEND	☐	☐	☐	☐	☐	☐	☐	☐

	V DET	V DET 2	V DET 3	V DET 4	V DET 5	V DET 6	V DET 7	V DET 8
VIDEO	☐	☐	☐	☐	☐	☐	☐	☐

OTHER INFORMATION OR SPECIAL REQUIREMENTS:

Cabinet only. Cabinet shall include a fiber hub for 8 connections minimum and include a slide out drawer. And be FYA Compliant.

TS2 CABINET ONLY

NEMA TS1/TS2 Traffic Signal Controller Order Form

KC

DISTRICT	COUNTY	DESIGNATION	TRAVELWAY	CROSS STREET	LOG MILE
KC - KANSAS CITY	JACKSON	MO	78	I-435 Ramps	0.35900

SHIP TO:

MARK DURHAM	9101 EAST 40TH TERRACE	KANSAS CITY, MO	64133

SIGNAL ID 1018

CABINET TYPE NEMA/PT STANDARD EV

CABINET TS1/TS2 TS2

CONTROLLER

CONTROLLER TYPE

CABINET DESCRIPTION

SYSTEM MASTER

DETECTION TYPE INDUCTION AND VIDEO

INTERCONNECT TYPE

VIDEO SYSTEM INTERFACE SDLC PORT

PRE-EMPT OTHER PRE-EMPT

BACKPANEL 16-POSITION-TS2

VIDEO SYSTEM TYPE

PRE-EMPT INFORMATION

☑ **D PLUG**

NEMA TS1 LOAD SWITCH ASSIGNMENTS

1	2	3	4	5	6	7	8	9	10	11	12
1	2	3	4	5	6	7	8	9	10	11	12

☐ **EXCLUSIVE PED PHASE**

NEMA TS2 LOAD SWITCH ASSIGNMENTS

13	14	15	16
13	14	15	16

NEMA

 # OF STANDARD 2-CHANNEL DETECTOR 8

 # OF DELAY/EXT 2-CHANNEL DETECTOR 0

CARD RACK CONFIGURATION

FILL IN POSITIONS NEEDED WITH ASSOCIATED PHASE NUMBER

1-CH1	2-CH1	3-CH1	4-CH1	5-CH1	6-CH1	7-CH1	8-CH1
1	2	2	2	3	4	4	4
1-CH2	**2-CH2**	**3-CH2**	**4-CH2**	**5-CH2**	**6-CH2**	**7-CH2**	**8-CH2**
5	6	6	6	7	8	8	8

	DET 1	DET 2	DET 3	DET 4	DET 5	DET 6	DET 7	DET 8
DELAY/EXTEND	☐	☐	☐	☐	☐	☐	☐	☐

	V DET	V DET 2	V DET 3	V DET 4	V DET 5	V DET 6	V DET 7	V DET 8
VIDEO	☐	☐	☐	☐	☐	☐	☐	☐

OTHER INFORMATION OR SPECIAL REQUIREMENTS:

Cabinet only. Cabinet shall include a fiber hub for 8 connections minimum and include a slide out drawer. And be FYA Compliant.

TS2 CABINET ONLY

NEMA TS1/TS2 Traffic Signal Controller Order Form

DISTRICT	COUNTY	DESIGNATION	TRAVELWAY	CROSS STREET	LOG MILE
KC - KANSAS CITY	JACKSON	MO	78	Crysler	3.55300

SHIP TO:

MARK DURHAM	9101 EAST 40TH TERRACE	KANSAS CITY, MO	64133

SIGNAL ID 1025

CABINET TYPE NEMA/PT STANDARD EV

CABINET TS1/TS2 TS2

CONTROLLER

CONTROLLER TYPE

CABINET DESCRIPTION

SYSTEM MASTER

DETECTION TYPE INDUCTION AND VIDEO

INTERCONNECT TYPE

VIDEO SYSTEM INTERFACE SDLC PORT

PRE-EMPT OTHER PRE-EMPT

BACKPANEL 16-POSITION-TS2

VIDEO SYSTEM TYPE

PRE-EMPT INFORMATION

☑ **D PLUG**

NEMA TS1 LOAD SWITCH ASSIGNMENTS

1	2	3	4	5	6	7	8	9	10	11	12
1	2	3	4	5	6	7	8	9	10	11	12

☐ **EXCLUSIVE PED PHASE**

NEMA TS2 LOAD SWITCH ASSIGNMENTS

13	14	15	16
13	14	15	16

NEMA

 # OF STANDARD 2-CHANNEL DETECTOR 8

 # OF DELAY/EXT 2-CHANNEL DETECTOR 0

CARD RACK CONFIGURATION

FILL IN POSITIONS NEEDED WITH ASSOCIATED PHASE NUMBER

1-CH1	2-CH1	3-CH1	4-CH1	5-CH1	6-CH1	7-CH1	8-CH1
1	2	2	2	3	4	4	4
1-CH2	**2-CH2**	**3-CH2**	**4-CH2**	**5-CH2**	**6-CH2**	**7-CH2**	**8-CH2**
5	6	6	6	7	8	8	8

	DET 1	DET 2	DET 3	DET 4	DET 5	DET 6	DET 7	DET 8
DELAY/EXTEND	☐	☐	☐	☐	☐	☐	☐	☐

	V DET	V DET 2	V DET 3	V DET 4	V DET 5	V DET 6	V DET 7	V DET 8
VIDEO	☐	☐	☐	☐	☐	☐	☐	☐

OTHER INFORMATION OR SPECIAL REQUIREMENTS:

Cabinet only. Cabinet shall include a fiber hub for 8 connections minimum and include a slide out drawer. And be FYA Compliant.

TS2 CABINET ONLY

NEMA TS1/TS2 Traffic Signal Controller Order Form

DISTRICT	COUNTY	DESIGNATION	TRAVELWAY	CROSS STREET	LOG MILE
KC - KANSAS CITY	JACKSON	CST	Lee's Summit Rd	I-70 Ramps	4.32000

SHIP TO:

MARK DURHAM	9101 EAST 40TH TERRACE	KANSAS CITY, MO	64133

SIGNAL ID 973

CABINET TYPE NEMA/PT STANDARD EV

CABINET TS1/TS2 TS2

CONTROLLER

CONTROLLER TYPE

CABINET DESCRIPTION

SYSTEM MASTER

DETECTION TYPE INDUCTION AND VIDEO

INTERCONNECT TYPE RADIO CLOSED LOOP

VIDEO SYSTEM INTERFACE SDLC PORT

PRE-EMPT OTHER PRE-EMPT

BACKPANEL 16-POSITION-TS2

VIDEO SYSTEM TYPE

PRE-EMPT INFORMATION

☑ **D PLUG**

NEMA TS1 LOAD SWITCH ASSIGNMENTS

1	2	3	4	5	6	7	8	9	10	11	12
1	2	3	4	5	6	7	8	9	10	11	12

☐ **EXCLUSIVE PED PHASE**

NEMA TS2 LOAD SWITCH ASSIGNMENTS

13	14	15	16
13	14	15	16

NEMA

 # OF STANDARD 2-CHANNEL DETECTOR 8

 # OF DELAY/EXT 2-CHANNEL DETECTOR 0

CARD RACK CONFIGURATION

FILL IN POSITIONS NEEDED WITH ASSOCIATED PHASE NUMBER

1-CH1	2-CH1	3-CH1	4-CH1	5-CH1	6-CH1	7-CH1	8-CH1
1	6	6	6	3	8	8	8
1-CH2	**2-CH2**	**3-CH2**	**4-CH2**	**5-CH2**	**6-CH2**	**7-CH2**	**8-CH2**
5	2	2	2	7	4	4	4

	DET 1	DET 2	DET 3	DET 4	DET 5	DET 6	DET 7	DET 8
DELAY/EXTEND	☐	☐	☐	☐	☐	☐	☐	☐

	V DET	V DET 2	V DET 3	V DET 4	V DET 5	V DET 6	V DET 7	V DET 8
VIDEO	☐	☐	☐	☐	☐	☐	☐	☐

OTHER INFORMATION OR SPECIAL REQUIREMENTS:

Cabinet only! Cabinet shall include a fiber hub for 8 connections minimum and include a slide out drawer. And be FYA Compliant.

SPECIAL NOTE:

Verify all information selected/entered for each category is correct prior to submitting your bid.
Incorrect entries will result in your bid being considered nonresponsive for the category.

TRAFFIC CONTROLLER ASSEMBLY EQUIPMENT LIST
Type 170E Traffic Signal Controller Assemblies

The following list shall be completed and returned with the bid. Equipment shall meet Missouri's Standard Specifications and Standard Plans for Highway Construction and Approved Products List. Equipment shall be agreed to and approved prior to the contract award. All delivered equipment shall be the products circled or listed below.

New Controllers shall be fully assembled and furnished WITH J-Bolts.
Replacement Controllers shall be fully assembled and furnished WITHOUT J-Bolts.

Circle the product(s) you will provide for each item:

170E Controller:

Manufacturer	Model/Catalog Number
McCain	170E
Phillips/Sisson Industries, Inc	170E
Safetran	170E
Siemens	170E

332 and 336S Cabinet and Rack Assembly (170E):

Manufacturer
McCain
Phillips/Sisson Industries, Inc.
Safetran

Conflict Monitor (170E):

Manufacturer	Model/Catalog Number
Eberle Design Incorporated (EDI)	210E
Reno A&E	2018
Solid State Devices	210P

Flasher (170E):

Manufacturer	Model/Catalog Number
Eberle Design Incorporated (EDI)	NSM-6
Power Distribution & Control (PDC)	SSF-86
Power Distribution & Control (PDC)	SSF-88
Reno A&E	FL-200
Traffic Sensor Corp.	204
Traffic Sensor Corp.	204-15
Traffic Sensor Corp.	304
Traffic Sensor Corp.	304-15

Signed: _____ Title: _____ Date: _____

SPECIAL NOTE:

Verify all information selected/entered for each category is correct prior to submitting your bid.
Incorrect entries will result in your bid being considered nonresponsive for the category.

TRAFFIC CONTROLLER ASSEMBLY EQUIPMENT LIST
Type 170E Traffic Signal Controller Assemblies

The following list shall be completed and returned with the bid. Equipment shall meet Missouri's Standard Specifications and Standard Plans for Highway Construction and Approved Products List. Equipment shall be agreed to and approved prior to the contract award. All delivered equipment shall be the products listed below.

New Controllers shall be fully assembled and furnished WITH J-Bolts.
Replacement Controllers shall be fully assembled and furnished WITHOUT J-Bolts.

Circle the product(s) you will provide for each item:

Flasher Transfer Relay (170E):

Manufacturer	Model/Catalog Number
AMECO	136-4962
Struthers-Dunn	21ACPX-2/21ACPXD-5
Mid-Tex	136-62T-3A1
Power Distribution & Control (PDC)	FTR 91
Reno A&E	TR-200
Traffic Sensor Corp.	204-15
Traffic Sensor Corp.	304
Traffic Sensor Corp.	304-15

Load Switch (170E):

Manufacturer	Model/Catalog Number
Eberle Design Incorporated (EDI)	510
Power Distribution & Control (PDC)	SSS-86
Power Distribution & Control (PDC)	SSS-88
Reno A&E	LS-200
Traffic Control Technologies (TCT)	SSS-86
Traffic Sensor Corp.	200
Traffic Sensor Corp.	200-15
Traffic Sensor Corp.	300
Traffic Sensor Corp.	300-15

Model 242 Isolator (170E):

Manufacturer	Model/Catalog Number
Eberle Design Incorporated (EDI)	242
GDI	242
Power Distribution & Control (PDC)	242
Reno A&E	242 = DC (2 Channel)
Safetran	242

252 Isolator Module (170E):

Manufacturer	Model/Catalog Number
GDI	252
Power Distribution & Control (PDC)	252
Safetran	252

Signed: _____ Title: _____ Date: _____

SPECIAL NOTE:

Verify all information selected/entered for each category is correct prior to submitting your bid.
Incorrect entries will result in your bid being considered nonresponsive for the category.

TRAFFIC CONTROLLER ASSEMBLY EQUIPMENT LIST
Type 170E Traffic Signal Controller Assemblies

The following list shall be completed and returned with the bid. Equipment shall meet Missouri's Standard Specifications and Standard Plans for Highway Construction and Approved Products List. Equipment shall be agreed to and approved prior to the contract award. All delivered equipment shall be the products listed below.

New Controllers shall be fully assembled and furnished WITH J-Bolts.
Replacement Controllers shall be fully assembled and furnished WITHOUT J-Bolts.

Circle the product(s) you will provide for each item:

Surge Protector:

Manufacturer	Model/Catalog Number
Emerson Network Power	Edco SHA-1250

Model 222 Detector – 2 Channel Card Rack (170E):

Manufacturer	Model/Catalog Number
Eberle Design Incorporated (EDI)	LM222
Eberle Design Incorporated (EDI)	LMD222
Reno A&E	222
Sarasota	222-GP5
Sarasota	222-GP6

The Dial-Up Modem shall meet Missouri's Standard Specifications and Standard Plans for Highway Construction.

List the Manufacturer and Model/Catalog Number you will provide for each item:

Item	Manufacturer	Model/Catalog Number
Dial-Up Modem ** Provide Spec Sheet & Brochure w/ Bid. ** (Specs. 1092.4.6)	_____	_____

Signed: _____ Title: _____ Date: _____

MISSOURI DEPARTMENT OF TRANSPORTATION

SPECIFICATIONS

TYPE 170E SIGNAL CONTROLLER

CABINETS

Controller Cabinets shall be 0.125 inch reinforced shell aluminum alloy, and be of clean-cut design and appearance. The cabinets to be furnished shall be in accordance with the "Traffic Signal Control Specifications"; Published by the State of California, Business, Transportation & Housing Agency: Department of Transportation (CALTRANS), dated January, 1989, and all current Addenda and Revisions. Further, the equipment shall meet the following Specifications. In case of conflict, the Department Specifications shall govern.

Bids shall provide a certification that the equipment proposed is included on the most current QPL of CALTRANS and MoDOT Approved Products List. Exception: Department specific equipment, that is not defined in the CALTRANS specification is exempt from this QPL requirement.

Only items on the latest revision of the Missouri Department of Transportation Approved Products List for Traffic Signals and Highway Lighting Equipment will be accepted. The attached Traffic Controller Assembly Equipment List shall be completed and returned with the bids.

The additional requirements for the model 332 and the model 336S stretched or any other cabinet assemblies to be supplied by the bidder are as follows. Supplier must be approved for model 332 cabinet. All cabinets shall exhibit a "bare" aluminum finish and the Police door shall be made of the same finished material as the rest of the cabinet. The handles for each door shall swing outward. All main cabinet doors shall accept a NO. 2 Corbin Key. Two sets of keys shall be supplied with each cabinet. All cabinet assemblies shall be supplied with a Power Distribution Assembly Number 2, (PDA#2). The 336S stretched cabinet shall be provided with the standard "M" base adapter attached to the cabinet and anchor bolts. If any auxiliary output file is specified, the C5 connections shall be included.

Each cabinet shall include two (2) fluorescent lighting fixtures mounted inside the front and back portion of the cabinet. These fixtures shall include a cool white lamp with protective cover and shall operate by a normal power UL listed ballast. A door actuated switch shall be installed to turn on the cabinet light when the door is open. Each switch should work each individual light.

The police panel door shall contain one DPST toggle switch which shall be labeled FLASH/AUTOMATIC and may be used to switch output control from the switch packs to the flash unit and vice versa. This shall be the only control switch accessible from the police panel.

All output field conductors shall be terminated in the cabinet on a one piece copper 600 volt heavy duty mechanical screw connector offset tang assembly. Each mechanical screw connector shall accommodate up to four No. 12 AWG conductors. Each clamp shall be captive to the contact screw and the screw captive to the contact. Field wiring shall not be spade lugged. The A.C. neutral buss and chassis ground buss shall be a 17 position solid copper neutral bar with set screws that allows the wires to be attached without tang or spade assemblies.

The output file shall be hand wired, no printed circuit boards shall be allowed except for red fail monitoring. The back of the load switch bay and the conflict monitor bay shall be enclosed to prevent any wires interfering with plugging in of components.

A 420 auxiliary output file shall be required when called for on the plans or if more than 12 load switches are required. This file shall meet the latest CALTRANS Specifications.

I and J input files shall be provided unless otherwise specified.

All cables shall be located and secured so that they do not interfere with the removal of the controller or the opening of the controller front panel.

A removable and replaceable furnace type fiberglass filter shall be housed behind the door vents. The filter filtration area shall cover the vent openings. A filter shell shall be provided that fits over the filter providing mechanical support for the filter. The shell shall be louvered to direct the incoming air downward.

A diagnostic cabinet test program complete with documentation will be provided for each 10 or less cabinets ordered.

PULL OUT DRAWER

A pull-out, hinged-top drawer, having sliding tracks, with lockout and quick-disconnect feature, such as a Vent-Rak Retractable Writing Shelf, #D-4090-13 or equivalent. The pull-out drawer shall extend a minimum of 14 inches in order to facilitate removal of the processor by providing the processor with an aluminum platform covered by a formica-type chemical-proof plastic sheet while the rear connector is being removed. It shall be possible to lift this hinged platform in order to gain access to the interior of the drawer. Minimum interior dimensions of the drawer shall be 1 inch high, 13 inches deep, and 16 inches wide. The drawer shall be capable of supporting a 40 pound controller when fully extended. Drawer shall be mounted immediately below the controller assembly.

SURGE PROTECTION

Each cabinet shall be provided with devices to protect the control equipment from surges and over voltages. This shall include incoming power lines, the Input File, the Output File, and communication lines.

All input file inputs shall be protected with a 30V MOV with (30 Joule rating). The output of all load switch outputs shall be protected with a 150V MOV (80 Joule Rating). The MOV's shall be connected from the AC positive field terminal to the chassis ground. The output MOV's shall be mounted on the field terminal side of the output assembly.

For the 332A cabinet, appropriate input surge protection shall be mounted on the Lower Input Termination Panel (LIP). The power distribution assembly (PDA#2) of each controller cabinet shall include a surge protection unit on the AC Service Input. The protector shall be installed between the applied line voltage and earth ground. The surge protector shall be capable of reducing the effect of lightning transient voltages applied to the AC line. The protection device shall be a two stage series parallel device, and shall be an SHA 1210. (Refer to MoDOT approved product list) It shall include the following features and functions:

Maximum AC line voltage: 140 VAC

Twenty pulses of peak current, each of which will rise in 8 microseconds and fall in 20 microseconds to 1/2 the peak: 20000 Amperes.

The protector shall be provided with the following terminals:

Main line (AC line first stage terminal).

Main Neutral (AC Neutral input terminal).

Equipment Line Out (AC Line second stage output terminal, 10 Amps.).

Equipment Neutral Out (Neutral terminal to protected equipment).

GND (Earth connection).

The Main AC line in and the Equipment Line out terminals shall be separated by a 200 Microhenry (minimum) inductor rated to handle 10 Amp AC Service. The first stage clamp shall be between Main Line and Ground terminals.

The second stage clamp shall be between Equipment Line out and Equipment Neutral.

The protector for the first and second stage clamp must have a MOV or similar solid state device rated at 20KA and be of a completely solid stage design (i.e. no gas discharge tubes allowed).

The Main Neutral and Equipment Neutral Out shall be connected together internally and shall have an MOV similar solid state device or gas discharge tubes rated at 20 KA between Main Neutral and Ground terminals.

Peak clamp voltage: 350 Volts at 20 KA (Voltage measured between Equipment Line Out and Equipment Neutral Out terminals. Current applied between Main Line and Ground Terminals with Ground and Main Neutral terminals externally tied together). Voltage shall never exceed 350 volts.

The Protector shall be epoxy encapsulated in a flame retardant material.

Continuous service current, 10 Amps at 120 VAC RMS.

The Equipment Line Out shall provide power to the
Type 170 and to the 24V power supply.

Communications line protector for incoming and outgoing communication lines shall be EDCO part #PC642C-008 or equivalent with mounting connector #PCB1B or equivalent. If fiber or radio communications are specified these communications line protectors are not required.

CABINET ACCESSORIES

Model 222 Loop Detector Amplifiers. The loop detector amplifier units shall be as specified in the CALTRANS Specifications. The quantity of units shall be as described on the plans or traffic signal controller order form.

Model 242 D.C. Isolator. The D.C. isolators shall be the Model 242 as specified in the CALTRANS Specifications. A minimum of (1) shall be supplied. Additional quantities of units shall be needed for actuated pedestrian, preemption or as described on the plans or traffic signal controller order form.

Model 200 Load Switch. The load switch shall be the Model 200 as specified in the CALTRANS Specifications. The quantity of units shall be as described on the plans or traffic signal controller order form.

Model 204 Flasher. The flashers shall be the Model 204 as specified in the CALTRANS Specifications. Each cabinet shall be supplied with two (2) model 204 flashers.

Model 252 A.C. Isolator. The A.C. isolators shall be the Model 252 as specified in the CALTRANS Specifications. The quantity of units shall be as described on the plans or traffic signal controller order form.

Model 430 Flash Transfer Relay. The flash transfer unit shall be the Model 430 as specified in the CALTRANS Specifications. Each cabinet shall be supplied with four (4) model 430 flash transfer relays (2 additional model 430 flash transfer relays when a 420 auxiliary is shown on plans).

Model 400 Modem. The quantity of units shall be as described on the plans or traffic signal controller order form.

Model SM 2400 Modem. The quantity of units shall be as described on the plans or traffic signal controller order form.

Computer Cable. The cable will consist of both male and female amp connectors as described in addendum 8 section 2-5-6 C2, C20, C30 and C40 Detail Dated November 19, 1993, of Caltrans Traffic Signal Control Specifications dated January 1989. The female connector of the cable will be located in the front of the cabinet and extend past the front edge of the rack a minimum of .5 inches and a maximum of 1 inch. The male connector will be on the cable end and will be in the back of the cabinet. This cable will extend 14 inches along the side of the rack with a minimum of 12 inches free that can be used to plug into any of the 170E's four ports. The cable will consist of one wire connecting the like pin in the other connector starting with A and ending with R. The wire should be 20 gauge (one cable shall be supplied for each cabinet). The mounting of this cable or any switch shall not interfere in a any way with the installation or removal of the controller. If the cable is mounted within the pull out drawer any hole that is drilled in the drawer shall be equipped with a rubber grommet to protect the cable and shall have enough slack to prevent binding of the cable.

MODEL 210 CONFLICT MONITOR

Each cabinet shall be supplied with a Model 210 Conflict Monitor as specified in the CALTRANS specification and addenda as follows:

> The conflict monitor shall be capable of monitoring for the absence of voltage on all of the inputs of a channel (defined here as red, yellow, and green). If an input is not present on at least one input of a channel at all times, the unit shall begin timing the duration of this condition. If this condition exists for less than 700 milliseconds, the unit shall not trigger, if this condition exist for more than 1000 milliseconds, the unit shall trigger as if a conflict had occurred, causing the intersection to transfer immediately into a flashing mode, and stop-time to be applied to the controller, a red signal shall require the presence of a minimum of 60 (+/-10) volts ac to satisfy the requirements of a red indication.
>
> A connector and terminal assembly designated as P20 (Magnum P/N 722120 or equivalent) for monitoring the absence of red shall be an integral part of the output file. The connector shall terminate and be compatible with the cable and connector of a Type 170 conflict monitor unit (CMU), capable of monitoring the absence of

red. The pin assignments of the P20 connector and terminal assembly shall be provided with the cabinet plans. The OP20 connector shall be physically alike to the cable and connector of a Type 170 CMU to prevent the absence of red cable connector from being inserted into the P20 connector 180 degrees out of alignment. Programming of the unused red channels shall be accomplished via jumpers. These jumpers shall cause 115 VAC to be applied to any and all unused red monitoring channels. These jumpers and their respective attachment points shall be part of the output file.

TYPE 170E MICROCOMPUTER SIGNAL CONTROLLER

Except as herein modified, the Microcomputer 170E controller shall conform to the CALTRANS TRAFFIC SIGNALS CONTROL EQUIPMENT SPECIFICATIONS as published January, 1989, with the exception that Chapter 2, and details related to the Model 170 controller unit, are superseded by addendum 8, dated November 1993, which are herein incorporated by reference and form a part of this Specification as follows:

This controller shall be fully compatible with the software specified on the plans.

The C2, C20, C30 and C40 connectors shall be amp standard.

One spare set of internal printed circuit boards shall be furnished with each controller unit. This includes, but is not limited to, the power supply, front panel, I/O, CPU and modem if specified.

If fiber optics are specified, a fiber optic modem shall be supplied.

Diagnostic Test Program. For each 10 or less Model 170E controllers purchased, the bidder shall provide a Diagnostic Test Program Prom Chip that shall test the operation of the Model 170E controller units, including but not limited to, internal memory, the Program Module,
the real-time clock, input-output circuitry, the modem, and the display and keyboard. The program shall be capable of operating with an external CRT (provided by others), and with controller keypad entries and displays. Full documentation on the program shall be included. The software shall be configured to work on a 412C prom module.

A copy of the CALTRANS specifications will be supplied by the state at the request of the contractor.

PROM MODULE

Each Model 170E controller unit shall be furnished with one (1) Program Module, Model 412C as specified in the CALTRANS Specification, dated January, 1989 and all addendum's up to and including addendum 8, including back up lithium battery, and real time clock adjuster circuit, 1 Dallas 1225 chip, two 6264 ram chips.

SOFTWARE

KC District

The most recent revision of Wapiti W41KS or W70SM shall be mounted on the prom module and configured accordingly.

SW District

The prom module shall be configured for Bitran software.

EQUIPMENT TESTING

Controllers and cabinets purchased under this contract shall be tested for conformance to CALTRANS, "Traffic Signal Control Equipment Specifications" dated January 1989 and the latest addenda. Testing may be done by an independent laboratory if the manufacturer does not have sufficient facilities to carry out the testing. A copy of the test results for all equipment purchased shall be supplied by the manufacturer.

Each Model 170E controller unit shall be tested over a temperature range of minus 34 to plus 74 degrees Celsius. Proper operation of the unit shall be verified at both temperature extremes and at ambient. This testing is not a substitute for any quality control testing or final inspection testing normally performed, it is a process to be carried out prior to final inspection.

Environmental chamber(s) shall have provision for remotely controlling the Model 170E controller being tested. Proper operation of the equipment shall be verified at minus 34, plus 74 degrees Celsius and ambient. Cold and hot soak times shall be sufficient to allow all components in the device to reach the temperatures desires. A minimum soak time of three hours shall be used for all testing.

A representative of the agency may travel to the testing site to verify that the environmental testing is being carried out properly and to observe manufacturing practices at the factory.

The manufacturer shall submit a proposed testing procedure and schedule 30 days in advance for evaluation by the Agency. Test procedures, environmental chambers, automatic test equipment, display boards, power supplies, and controls shall be described in detail. A "dry run" should be carried out in order to work out any problems with the test procedure. Any problems should be resolved before the arrival of the representative of the Agency.

Minimum test requirements are given below. The manufacturer is free to suggest additional tests or variations on the test given below. Any changes should be described in the testing proposal.

Cabinet. Cabinets shall be tested at ambient conditions only. An automatic or semi-automatic method of checking cabinet wiring between equipment harnesses and field connections is required.

Controllers. Controller shall pass the following test at least 5 times at each temperature extreme and ambient.

Recovery from a short power interrupt of approximately 500 milliseconds.

Recovery from a long power interrupt of approximately 5 seconds.

Front panel displays should be visible from a window in the environmental chamber. Signal outputs shall be brought out of the chamber to display board if controllers cannot be directly observed.

The vendor shall provide a method of testing controller inputs and outputs. Diagnostic software and wraparound connector for controller harnesses may be used. If diagnostic software is not used, outputs shall be brought out to a display board. Inputs may be paralleled to each controller.

CONFLICT MONITOR TEST CABLE

To facilitate testing of the conflict monitor by maintenance crews, one additional connector cable shall be furnished by the manufacturer and installed in each cabinet. This cable shall be four feet in length, utilizing #18 wire to connect a 36 pin plug to back panel terminals as indicated below:

Receptable Circuit		Terminal Phase
1		1 G
2		1 Y
3		2 G
4		2 Y
5		3 G
6		3 Y
7		4 G
8		4 Y
9		5 G
10		5 Y
11		6 G
12		6 Y
13		7 G
14		7 Y
15		8 G
16		8 Y
17		2 Walk
18		6 Walk
19		4 Walk
20		8 Walk
21	Circuits used only in a 322A	1 Aux G
22	Cabinet W/Auxiliary Output File	1 Aux Y
23		3 Aux G
24		3 Aux Y
25		5 Aux G
26		5 Aux Y
27		6 Aux G
28		6 Aux Y
29		I14-W Stop Time
30		DC Ground
31		Monitor Reset
32		DC Ground
33		2 Aux G
34		2 Aux Y
35		4 Aux G
36		4 Aux Y

Connector cable shall utilize a 36 circuit polarized nylon Waldom Molex type receptacle (part number 03-06-1361) using 0.062" female terminals made of 70/30 spring tempered tin-plated brass 0.010" thick with contact of resistance 0.0025 ohm mV, drop of 2.5 mV at 1 amp with 250 volts 4 amps maximum per circuit. This connector cable "free floats" in the front bottom 6 inches of the cabinet and is not used in the normal operation of the controller. A moisture proof cap shall be provided to prevent the accumulation of moisture on the plug terminals. This cap shall remain attached to the connector when the cable is in use.

170E - NO CONTROLLER

170 Traffic Signal Controller Order Form

SKY

DISTRICT	COUNTY	DESIGNATION	TRAVELWAY	CROSS STREET	LOG MILE
SW - SPRINGFIELD	TANEY	MO	165	MO 265	0.00000

SHIP TO:

JOE DOTSON	2455 N. MAYFAIR	SPRINGFIELD. MO	65803

SIGNAL ID	170 SOFTWARE	CONTROLLER TYPE	CABINET TYPE
3822		NONE	332

SYSTEM MASTER

INTERCONNECT TYPE

NONE

CABINET DESCRIPTION

Type 332

- [x] PHASE 1
- [x] PHASE 2
- [x] PHASE 3
- [x] PHASE 4
- [x] PHASE 5
- [x] PHASE 6
- [x] PHASE 7
- [x] PHASE 8

 # PED PHASES 4

 # OVERLAPS 0

EXCLUSIVE PED PHASE 0

 # OF LOAD SWITCHES 12

CONFLICT MONITOR TYPE

210E

PRE-EMPT

 # OF STANDARD 2 CHANNEL CARD RACK DETECTORS 8

PRE-EMPT INFORMATION

 # MODEL 242 DC ISOLATORS 3

 # MODEL 252 AC ISOLATORS 0

 # OF DELAY/EXTEND DETECTOR 0

OTHER INFORMATION OR SPECIAL REQUIREMENTS:

Cabinet and listed plug in modules only. No controller requested with this order.

ALL CABINETS AND MODULES MUST BE ON THE MODOT APPROVED PRODUCTS LIST.

SPECIAL NOTE:

Verify all information selected/entered for each category is correct prior to submitting your bid.
Incorrect entries will result in your bid being considered nonresponsive for the category.

TRAFFIC CONTROLLER ASSEMBLY EQUIPMENT LIST
NEMA TS1 Traffic Signal Controller Assemblies

The following list shall be completed and returned with the bid. Equipment shall meet Missouri's Standard Specifications and Standard Plans for Highway Construction and Approved Products List. Equipment shall be agreed to and approved prior to the contract award. All delivered equipment shall be the products circled or listed below.

***New Controllers shall be fully assembled and furnished* WITH J-Bolts.**
***Replacement Controllers shall be fully assembled and furnished* WITHOUT J-Bolts.**

Circle the product(s) you will provide for each item:

NEMA TS1 Controller:

Manufacturer	Model/Catalog Number
Econolite	ASC/2-2100
Econolite	ASC/2S-2100
Econolite	ASC/3-2100
Naztec	980
Peek	3000
Siemens	EPAC Genesis M40
Siemens	EPAC M42
Siemens	EPAC M52
Traffic Control Technologies (TCT)	LMD-8000

Cabinet and Back Panel Assembly (NEMA TS1):

Manufacturer
Control Technology
Econolite
Henke/Bison
IDC/Gibbons
Naztec P-44
Eagle

Conflict Monitor (NEMA TS1):

Manufacturer	Model/Catalog Number
Eberle Design Incorporated (EDI)	NSM-6
Eberle Design Incorporated (EDI)	NSM-12
Eberle Design Incorporated (EDI)	SSM-12LE
Eberle Design Incorporated (EDI)	MMU-16E
Eberle Design Incorporated (EDI)	MMU-16LE
Naztec, Incorporated	NM512
Peek/Transyt	1200
Power Distribution & Control (PDC)	CM82-03
Power Distribution & Control (PDC)	CM82-06
Power Distribution & Control (PDC)	CM82-12
Reno A&E	MMU-1600 Series
Solid State Devices	NM-6
Solid State Devices	NM-12
Solid State Devices	LCD-6P
Solid State Devices	LCD-12P
Traffic Control Technologies (TCT)	LNM Series

Signed: _____ Title: _____ Date: _____

SPECIAL NOTE:

Verify all information selected/entered for each category is correct prior to submitting your bid.
Incorrect entries will result in your bid being considered nonresponsive for the category.

TRAFFIC CONTROLLER ASSEMBLY EQUIPMENT LIST
NEMA TS1 Traffic Signal Controller Assemblies

The following list shall be completed and returned with the bid. Equipment shall meet Missouri's Standard Specifications and Standard Plans for Highway Construction and Approved Products List. Equipment shall be agreed to and approved prior to the contract award. All delivered equipment shall be the products listed below.

New Controllers shall be fully assembled and furnished WITH J-Bolts.
Replacement Controllers shall be fully assembled and furnished WITHOUT J-Bolts.

Circle the product(s) you will provide for each item:

Flasher (NEMA TS1):

Manufacturer	Model/Catalog Number
Eberle Design Incorporated (EDI)……	NSM-6
Power Distribution & Control (PDC).....	SSF-86
Power Distribution & Control (PDC).....	SSF-88
Reno A&E……	FL-200
Traffic Sensor Corp..……	204
Traffic Sensor Corp..……	204-15
Traffic Sensor Corp..……	304
Traffic Sensor Corp..……	304-15

Flasher Transfer Relay (NEMA TS1):

Manufacturer	Model/Catalog Number
AMECO……	136-4962
Struthers-Dunn…….....	21ACPX-2/21ACPXD-5
Mid-Tex…….....	136-62T-3A1
Power Distribution & Control (PDC).....	FTR 91
Reno A&E……	TR-200
Traffic Sensor Corp..……	204-15
Traffic Sensor Corp..……	304
Traffic Sensor Corp..……	304-15

Load Switch (NEMA TS1):

Manufacturer	Model/Catalog Number
Eberle Design Incorporated (EDI)……	510
Power Distribution & Control (PDC).....	SSS-86
Power Distribution & Control (PDC).....	SSS-88
Reno A&E……	LS-200
Traffic Control Technologies (TCT)……	SSS-86
Traffic Sensor Corp..……	200
Traffic Sensor Corp..……	200-15
Traffic Sensor Corp..……	300
Traffic Sensor Corp..……	300-15

Signed: _____ Title: _____ Date: _____

SPECIAL NOTE:

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TRAFFIC CONTROLLER ASSEMBLY EQUIPMENT LIST
NEMA TS1 Traffic Signal Controller Assemblies

The following list shall be completed and returned with the bid. Equipment shall meet Missouri's Standard Specifications and Standard Plans for Highway Construction and Approved Products List. Equipment shall be agreed to and approved prior to the contract award. All delivered equipment shall be the products listed below.

***New Controllers shall be fully assembled and furnished* WITH J-Bolts.**
***Replacement Controllers shall be fully assembled and furnished* WITHOUT J-Bolts.**

Circle the product(s) you will provide for each item:

Surge Protector:

Manufacturer	Model/Catalog Number
Emerson Network Power	Edco SHA-1250

Power Supply Card Rack Detector (NEMA TS1):

Manufacturer	Model/Catalog Number
ICC	PS24
PGK	PS-1.2

2-Channel Card Rack Mounted Detector, Induction Loop (NEMA TS1):

Manufacturer	Model/Catalog Number
Eberle Design Incorporated (EDI)	LMD602R
ICC	S27B
Reno A&E	C
Reno A&E	G
3M	Canoga C800 Series
Eberle Design Incorporated (EDI)	LMD602TR
Reno A&E	C
Reno A&E	GT

The Auxiliary Breaker and Controller Breaker listed shall meet Missouri's Standard Specifications and Standard Plans for Highway Construction.

List the Manufacturer and Model/Catalog Number you will provide for each item:

Item	Manufacturer	Model/Catalog Number
Auxiliary Breaker (15 amps)	_____	_____
Controller Breaker	_____	_____

Signed: _____ Title: _____ Date: _____

MISSOURI DEPARTMENT OF TRANSPORTATION
NEMA TS1 TRAFFIC CONTROLLER ASSEMBLIES

The equipment shall conform to the latest revision of Section 1092 of the Missouri Standard Specifications for Highway Construction and the following:

1. Controller operation shall comply with color sequence and phasing shown on attached intersection layout(s) and phasing and timing sheet(s) *or* controller order form.

2. Time-delay-to-call shall be integral with detectors so indicated. Calling detectors shall be supplied where indicated.

3. Cabinets indicated for side of pole mounting shall be furnished with the bottom undrilled or with a plate of the same cabinet material, covering 85 percent of the bottom area, attached to the bottom with four, 1/4 inch diameter bolts.

4. Furnish three complete operation manuals for all equipment, including but not limited to controllers, conflict monitors, detectors and auxiliary equipment. Furnish four complete cabinet wiring diagrams with each controller. The cabinet wiring diagrams shall include labeling for all field terminal connections and shall provide an orientation of the terminal layout that conforms with the intersection information supplied.

5. Closed Loop Controller Requirements:

If the controller is specified for a closed loop system, then it shall be fully communications and features compatible with the specified system and shall conform to the latest revision of Section 1092 of the Missouri Standard Specifications for Highway Construction and the following. All necessary hardware shall be supplied to provide communications. The MoDOT D Plug is not required for the closed loop controllers.

A. Interconnect Panel:

If this item is specified, the cost shall be included in the price bid for the controller.

B. Dial-Up Modem:

If this item is specified, the cost shall be included in the price bid for the controller.

C. Cabinet Accessories:

1. Telephone Interface Panel

The cost of this item shall be included in the price bid for the system master.

2. Extra Service Outlet

The cost of this item shall be included in the price bid for the system master.

6. These controllers shall be equipped with internal time base coordination using daily midnight reference or a selectable daily reference of which midnight can be selected. Each cabinet shall be furnished with twelve load switch jacks, unless otherwise indicated. Load switch jacks shall be completely wired to field terminal facilities as indicated on the controller order form. Conflict monitor shall be a twelve channel unit. All necessary components such as load switches, conflict monitors, flash transfer relays, and detector amplifiers shall be furnished. Cabinet type, interconnect information and delivery locations are attached.

7. All boxes of equipment delivered for a specific intersection should be clearly marked with both the controller number and the intersection, as shown on the Delivery Schedule.

8. All controllers shall be stamped or tagged with a manufacturer's serial number.