BID FORM

MISSOURI DEPARTMENT OF TRANSPORTATION
GENERAL SERVICES
2309 Barrett Station Rd.,
Ballwin, MO. 63021

REQUEST NO.	SL-061-RW
DATE	November 21, 2013

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

10:00 a.m., Local Time, December 12, 2013

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

St. Louis Signal Bldg.
2309 Barrett Station Rd.
Ballwin, MO. 63021

BUYER: **Teresa (Terri) Mount**
BUYER EMAIL:
Teresa.Mount@modot.mo.gov

BUYER TELEPHONE: 314-301-1431

SUPPLIES OR SERVICES

Traffic Controllers

To establish a contract to furnish **"Traffic Controllers"** with an effective date of Notice to Proceed and ending September 30, 2014 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: _____

Firm Name: _____
Address: _____
_____
By (Signature): _____
Type/Print Name _____
Title:
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 September 30, 2014, to the Missouri Highways and Transportation Commission (MHTC) and Missouri Department of Transportation (MoDOT). All questions regarding the RFB shall be submitted to Teresa (Terri) Mount Bids must be returned to the office of General Services Procurement, St. Louis, no later than 10:00 ., Local Time, December 12, 2013.

RFB Coordinator:
Teresa (Terri) Mount
Missouri Department of Transportation
General Services – Procurement- St. Louis

Phone: **314-301-1431**
E-mail: **Teresa.Mount@modot.mo.gov**

1. SCOPE OF WORK

1.1 General Requirements:

1.1.1 The contractor shall provide *NEMA TS1 and TS2 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 St. Louis District , Signals 2309 Barrett Station Road, Ballwin, MO. 63021.

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 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.

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 September 30, 2014.

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 December 12, 2013 at 10:00 a.m., Local time.

The Missouri Department of Transportation
General Services – Procurement Division
Attn: Teresa Mount

2309 Barrett Station Road,
Ballwin, MO. 63021

2.1.3 The bidder should complete and submit a copy of *Equipment List for NEMA Traffic Signal Controller Assemblies and/ Traffic Signal Controller* with the bid, listing each component with the manufacturer name, and model number.

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. With the exception of the equipment list specified herein, no bid may be modified after the time specified for the opening of bids.

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 – TS1				
Item #	**Description and C/S Code**	**Estimated Qty.**	**Firm, Fixed Price,** ***per unit***	**Extended Price**
001	NEMA TS1 Traffic Signal Controller Assemblies with TS1 Cabinet –St. Louis	2	**$**_____ ***per unit***	**$**_____ ***total***
TRAFFIC CONTROLLERS – TS2				
Item #	**Description and C/S Code**	**Estimated Qty.**	**Firm, Fixed Price,** ***per unit***	**Extended Price**
002	NEMA TS2/Type 2 Traffic Signal Controller Assemblies with TS1 Cabinet – St. Louis District	6	**$**_____ ***per unit***	**$**_____ ***total***

3.2 The bidder is hereby advised that the following TS2 Traffic Signal Controllers are approved for purchase:

Eagle EPAC M42
Eagle EPAC M52
Econolite ASC/2S-1000
Econolite ASC/2S-2100
Econolite ASC/3-2100
Naztec 980

_____ _____

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.)

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

Temporary Suspension of Work

a. The **District Engineer** shall have authority to suspend work wholly or in part for such period or periods as may be deemed necessary when weather or other conditions are such that in the opinion of the engineer, the work may be done at a later time with advantage to MoDOT or for failure on the part of the Contractor to comply with any of the provisions of the Contract.
b. If MoDOT suspends the work for its own advantages and not because of the Contractor's failure to comply with the Contract, the Contractor will be allowed an equal number of calendar days after the completion date for the completion of the work. MoDOT may at its discretion give the Contractor an extension of time for completing the work where the Contractor incurs delays for causes beyond his control.
c. Normal rainfall is not considered a cause qualifying for an extension of time. Claim for extension of time for all causes must be submitted by the Contractor in writing within **30 Days** after the claimed cause for the delay has ceased to exist.

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.

TRAFFIC CONTROLLER ASSEMBLY EQUIPMENT LIST
NEMA Traffic Signal Controller Assemblies

The following list shall be completed and returned with the bid. Equipment shall meet Missouri's Standard Specifications 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.**

Item	**Manufacturer**	**Catalog Number**
Please circle one:	TS1 or TS2	
Cabinet and Back Panel Assembly	_____	_____
NEMA Controller	_____	_____
Conflict Monitor	_____	_____
Load Switch	_____	_____
Flasher	_____	_____
Flash Transfer Relay	_____	_____
Surge Protector	_____	_____
Controller Breaker	_____	_____
Auxiliary Breaker	_____	_____
Power Supply (Card Rack Detectors)	_____	_____
Detector, Induction Loop (2 Channel-Rack Mounted)	_____	_____

_____ _____ _____

_____ _____ _____

Signed: _____ Title: _____ Date: _____

NEMA TS1/TS2 Traffic Signal Controller Order Form

DISTRICT	COUNTY	DESIGNATION	TRAVELWAY	CROSS STREET	LOG MILE
SL - ST. LOUIS	ST. CHARLES	OR	70	Mid Rivers Mall Drive	0.47000

SHIP TO:

WILLIAM MARSHALL	2309 A BARRETT STATION ROAD	BALLWIN. MO	63021

SIGNAL ID 431

CABINET TYPE NEMA/PT STANDARD EV

CABINET TS1/TS2 TS1

CONTROLLER TS2/Type2

CONTROLLER TYPE ACTUATED

CABINET DESCRIPTION TS1 Cabinet

SYSTEM MASTER

DETECTION TYPE VIDEO W/CARD RACK

INTERCONNECT TYPE

VIDEO SYSTEM INTERFACE INDUCTION DETECTOR PANEL

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-NBL	2-SB	3-WB	4-EB	5-SBL	6-NB		7-WB				

☐ **EXCLUSIVE PED PHASE**

NEMA TS2 LOAD SWITCH ASSIGNMENTS

13	14	15	16

 # OF STANDARD 2-CHANNEL DETECTOR 0

NEMA

 # 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	0	0	0	0	0	0	0
CH2	0	0	0	0	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:

Include hard copy and electronic cabinet prints (micro-station dgn and pdf files) Wire ped/ veh door buttons directly to back panel (not thru D-plug) Include MMU with ethernet port and compatible with FYA operation. Include 3 plug SDLC panel. Add status 6 alarm circuit for controller D-plug, jumper DT1b to logic ground (303). All 12 position signal cabinet shall have load switches 9-12 wired as such for FYA compatibility: LS 9, 10, 11 and 12 Green/Amber to corresponding channels Green/Amber, respectively on the back panel. OLA, OLB, OLC and OLD Green output to corresponding Ch 9,10,11, and 12 Yel control, respectively. ** No controller required.

NEMA TS1/TS2 Traffic Signal Controller Order Form

DISTRICT	COUNTY	DESIGNATION	TRAVELWAY	CROSS STREET	LOG MILE
SL - ST. LOUIS	ST. CHARLES	RT	K	Mexico	0.78000

SHIP TO:

WILLIAM MARSHALL	2309 A BARRETT STATION ROAD	BALLWIN. MO	63021

SIGNAL ID 1472

CABINET TYPE NEMA/PT STANDARD EV

CABINET TS1/TS2 TS1

CONTROLLER TS2/Type2

CONTROLLER TYPE ACTUATED

CABINET DESCRIPTION TS1 Cabinet

SYSTEM MASTER

DETECTION TYPE VIDEO W/O CARD RACK

INTERCONNECT TYPE

VIDEO SYSTEM INTERFACE SDLC PORT

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-SBL	2-NB	3-EBL	4-WB	5-NBL	6-SB	7-WBL	8-EB				

☐ **EXCLUSIVE PED PHASE**

NEMA TS2 LOAD SWITCH ASSIGNMENTS

13	14	15	16

NEMA

 # OF STANDARD 2-CHANNEL DETECTOR 0

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

Include hardcopy and electronic cabinet prints (micro-station dgn and pdf files) MMU with ethernet port and FYA compatible. Wire ped/ veh door buttons directly to back panel (not thru D-plug). Include 3 plug SDLC panel. ** No controller required.

NEMA TS1/TS2 Traffic Signal Controller Order Form

DISTRICT	COUNTY	DESIGNATION	TRAVELWAY	CROSS STREET	LOG MILE
SL - ST. LOUIS	ST. CHARLES	MO	79	70 SOR	87.94000

SHIP TO:

WILLIAM MARSHALL	2309 A BARRETT STATION ROAD	BALLWIN. MO	63021

SIGNAL ID 1747

CABINET TYPE NEMA/PT STANDARD EV

CABINET TS1/TS2 TS1

CONTROLLER TS1

CONTROLLER TYPE ACTUATED

CABINET DESCRIPTION TS1 Cabinet

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-SBL	2-NB	3-EB	4-WB	5-NBL	6-SB						

☐ **EXCLUSIVE PED PHASE**

NEMA TS2 LOAD SWITCH ASSIGNMENTS

13	14	15	16

 # OF STANDARD 2-CHANNEL DETECTOR 7

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

Include hardcopy and electronic cabinet prints (micro-station dgn and pdf files) Include MMU with ethernet port and compatible with FYA operation. Wire ped/ veh door buttons directly to back panel (not thru D-plug). Include 3-plug SDLC panel. Add status 6 alarm circuit, jumper DT1b to logic ground (303). ** No controller required.

NEMA TS1/TS2 Traffic Signal Controller Order Form

DISTRICT	COUNTY	DESIGNATION	TRAVELWAY	CROSS STREET	LOG MILE
SL - ST. LOUIS	ST. CHARLES	RT	K	Ofallon Pte/Walmart	0.65000

SHIP TO:

WILLIAM MARSHALL	2309 A BARRETT STATION ROAD	BALLWIN. MO	63021

SIGNAL ID 1958

CABINET TYPE NEMA/PT STANDARD EV

CABINET TS1/TS2 TS1

CONTROLLER TS1

CONTROLLER TYPE ACTUATED

CABINET DESCRIPTION TS1 Cabinet

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-SBL	2-NB	3-EB	4-WB	5-NBL	6-SB						

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

Include hardcopy and electronic Cabinet prints (micro-station dgn and pdf files) Include MMU with ethernet port and compatible with FYA operation. Wire ped/ veh door buttons directly to back panel (not thru D-plug). Include 3 plug SDLC panel. ** No controller required.

NEMA TS1/TS2 Traffic Signal Controller Order Form

DISTRICT	COUNTY	DESIGNATION	TRAVELWAY	CROSS STREET	LOG MILE
SL - ST. LOUIS	ST. CHARLES	RT	K	Ofallon	4.91000

SHIP TO:

WILLIAM MARSHALL	2309 A BARRETT STATION ROAD	BALLWIN. MO	63021

SIGNAL ID 1959

CABINET TYPE NEMA/PT STANDARD EV

CABINET TS1/TS2 TS1

CONTROLLER TS2/Type2

CONTROLLER TYPE ACTUATED

CABINET DESCRIPTION TS1 Cabinet

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-SLF	2-NB	3-WB			6-SB						

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

Include Electronic Cabinet prints (micro-station dgn and pdf files) Include MMU with ethernet port and compatible with FYA operation. Wire ped/ veh door buttons directly to back panel (not thru D-plug). Include 3 plug SDLC panel. Existing FYA-must be FYA compatible. ** No controller needed.

NEMA TS1/TS2 Traffic Signal Controller Order Form

DISTRICT	COUNTY	DESIGNATION	TRAVELWAY	CROSS STREET	LOG MILE
SL - ST. LOUIS	ST. CHARLES	MO	94	Route D	98.05000

SHIP TO:

WILLIAM MARSHALL	2309 A BARRETT STATION ROAD	BALLWIN. MO	63021

SIGNAL ID 1988

CABINET TYPE NEMA/PT STANDARD EV

CABINET TS1/TS2 TS1

CONTROLLER TS2/Type2

CONTROLLER TYPE ACTUATED

CABINET DESCRIPTION TS1 Cabinet

SYSTEM MASTER

DETECTION TYPE VIDEO W/CARD RACK

INTERCONNECT TYPE

VIDEO SYSTEM INTERFACE INDUCTION DETECTOR PANEL

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-NBL	2-SB		4-WB	5-SBL	6-NB		8-EB		10-Ped 4		

☐ **EXCLUSIVE PED PHASE**

NEMA TS2 LOAD SWITCH ASSIGNMENTS

13	14	15	16

 # OF STANDARD 2-CHANNEL DETECTOR 0

NEMA

 # 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	0	0	0	0	0	0	0
CH2	0	0	0	0	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:

Include hardcopy and electronic cabinet prints (micro-station dgn and pdf files) Include MMU with ethernet port and compatible with FYA operation. Wire ped/ veh door buttons directly to back panel (not thru D-plug). Include 3 plug SDLC panel. ** No controller needed.

NEMA TS1/TS2 Traffic Signal Controller Order Form

DISTRICT	COUNTY	DESIGNATION	TRAVELWAY	CROSS STREET	LOG MILE
SL - ST. LOUIS	ST. CHARLES	RT	K	Waterford Crossing	4.02000

SHIP TO:

WILLIAM MARSHALL	2309 A BARRETT STATION ROAD	BALLWIN. MO	63021

SIGNAL ID 2310

CABINET TYPE NEMA/PT STANDARD EV

CABINET TS1/TS2 TS1

CONTROLLER TS2/Type2

CONTROLLER TYPE ACTUATED

CABINET DESCRIPTION TS1 Cabinet

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-SBL	2-NB	3-FY	4-WB	5-NBL	6-SB	7-FYA	8-EB	9-FYA		11-FYA	

☐ **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	2	3	4	5	6	7	8
CH1	1	6	6	2	2	5	4	4
CH2	1	6	6	2	2	5	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:

Include hardcopy and electronic cabinet prints (micro-station dgn and pdf files) Wire ped/ veh door buttons directly to back panel (not thru D-plug). Include MMU with ethernet port and compatible with FYA operation. Include 3 plug SDLC panel, Need 12 2-channel detectors to cover phase 8 in slot 9; FYA is present (I believe they'er using LS 3,7,9, and 11); OLA = SBL, OLB = EBL, OLC = NBL, OLD = WBL. All 12 position signal cabinets shall have load switches 9-12 wired as such for FYA compatibility: LS 9, 10, 11 and 12 Green/Amber to corresponding channels Green/Amber, respectively on the back panel. OLA, OLB, OLC and OLD Green output to corresponding Ch 9,10,11, and 12 Yel control, respectively. ** No controller required.

NEMA TS1/TS2 Traffic Signal Controller Order Form

DISTRICT	COUNTY	DESIGNATION	TRAVELWAY	CROSS STREET	LOG MILE
SL - ST. LOUIS	ST. CHARLES	OR	70	Campus Dr	4.83000

SHIP TO:

WILLIAM MARSHALL	2309 A BARRETT STATION ROAD	BALLWIN. MO	63021

SIGNAL ID 450

CABINET TYPE NEMA/PT STANDARD EV

CABINET TS1/TS2 TS1

CONTROLLER TS2/Type2

CONTROLLER TYPE ACTUATED

CABINET DESCRIPTION TS1 Cabinet

SYSTEM MASTER

DETECTION TYPE VIDEO W/CARD RACK

INTERCONNECT TYPE

VIDEO SYSTEM INTERFACE INDUCTION DETECTOR PANEL

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-EB	3-SB			6-WB						

☐ **EXCLUSIVE PED PHASE**

NEMA TS2 LOAD SWITCH ASSIGNMENTS

13	14	15	16

 # OF STANDARD 2-CHANNEL DETECTOR 0

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

Include hardcopy and electronic cabinet prints (micro-station dgn and pdf files) Wire ped/ veh door buttons directly to back panel (not thru D-plug) Include MMU with ethernet port and compatible with FYA operation. Include 3 plug SDLC panel. Add status 6 alarm circuit for controller D-plug, jumper DT1b to logic ground (303). ** No controller required.