

BID FORM

MISSOURI DEPARTMENT OF TRANSPORTATION
 GENERAL SERVICES
 830 MoDOT DRIVE – P.O. BOX 270
 JEFFERSON CITY, MO 65102

REQUEST NO.	5-110714FR
DATE	June 29, 2011
PAGE NO. 1	NO. OF PAGES 13

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

2:00 PM, CDST, July 14, 2011

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

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

Various Locations throughout Missouri
See attached locations listing

SIGN AND RETURN BEFORE TIME SET FOR OPENING. **ALL BIDS SHOULD BE EXTENDED AND TOTALED.**

BUYER: Frankie Ryan

BUYER TELEPHONE: 573-522-9481

ITEM NO.	SUPPLIES OR SERVICES			
	<p>Contract for furnishing “Flashing Arrow Panels” for a contract period beginning date of award through July 31, 2012</p> <p>PLEASE SEE ATTACHED PRICING PAGE AND SPECIFICATIONS</p> <p>Note to Respondent: A vendor must be in compliance with the laws regarding conducting business in the State of Missouri. The compliance to conduct business in the state shall include but may not be limited to: Registration of business name, vendors MUST submit a bid/proposal that correctly and accurately identifies the company name that is registered to do business in the State of Missouri. All vendors who are required to execute a contractual agreement MUST submit a copy of their certificate with the signed copy of the contract agreement before the purchasing department can proceed with MoDOT legal contract approval.</p> <p><i>VENDOR MUST SIGN AND SUBMIT THIS FORM WITH THE PRICING PAGE</i></p>			<p>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.</p>

(SEE ATTACHED FOR CONDITIONS AND INSTRUCTIONS)

SEE ATTACHED FOR INFORMATION ON DELIVERY REQUIREMENTS.

Date: _____
Telephone No.: _____
Fax No.: _____
Cell Phone No.: _____
EMAIL: _____

Firm Name: _____
Address: _____

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

BID SUBMITTAL:

Your written bid must be mailed in **a sealed** envelope or box, or else delivered by hand or courier service (UPS, Federal Express, etc.) to be *received on or before the date and time specified on the front page of this bid document*, at the office of:

Ms. Frankie Ryan
Missouri Department of Transportation
General Services – Procurement and Inventory Management
830 MoDOT Drive (physical location: Zip – 65109)
P.O. Box 270 (mail address: Zip – 65102)
Jefferson City, MO

All documents must be sealed and the outermost wrapping should be clearly marked "**Bid for Flashing Arrow Panels**".

ADDITIONAL DOCUMENTS TO SIGN AND SUBMIT:

The Bidder will be required to complete, sign, and submit the following documentation, in addition to the signed bid page:

- Pricing Pages (to be signed and submitted with bid)
- Vendor Information & Preference Certification Form (to be signed and submitted with bid)
- Cooperative Procurement Agreement (to be signed and submitted with bid)

CONTRACT PERIOD:

The contract period will be from the date of notice of award through July 31, 2012. Pricing submitted by the bidder must be firm, fixed pricing through this period.

DELIVERY:

Bids shall be quoted with delivery F.O.B to various locations statewide noted on Exhibit A. Bidder agrees to furnish and **deliver any or all the items on which prices were quoted within the number of calendar days submitted by the bidder as part of the pricing for this bid.**

QUANTITIES:

MoDOT makes no guarantee as to how many units will be ordered or by which District or delivered to a specific delivery location.

AWARD:

This bid will be a **'Multiple Award'** bid where no one bidder is the apparent low bid. MoDOT personnel will use the prices and number of calendar days for delivery in their selection to determine the best price based on their location. Listed prices shall include all costs, including delivery costs, associated with providing the commodities described herein. Shipping cost determined as F.O.B. District(s) is required and must include shipping to any location as noted on Exhibit A "Shipping Locations" **Notification of awards will 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.**

INSPECTION:

A final inspection of each item purchased will be conducted after delivery to determine the compliance with specifications.

PURCHASE ORDERS:

PURCHASE ORDERS ARE ISSUED ON AN AS NEEDED BASIS. The issuance of an award to provide these products does not constitute the issuance of a purchase order. Further, purchase orders are issued with the quantities required by the specific location issuing the purchase order.

NON-EXCLUSIVITY:

The Missouri Department of Transportation reserves the right to obtain like or similar products of this or other manufacturers when use of such products is deemed in the best interest of MoDOT.

COMPLIANCE WITH BID REQUIREMENTS:

Failure to comply with the requirements published in this bid may result in the bid being subject to rejection. Product that does not meet specifications will cause all of the shipments to be returned at the bidders expense.

VENDOR NAME REGISTRATION:

On all bid documents, the bidder must use the firm name under which he/she is registered to do business in the state of Missouri. The bidder must ensure that his/her firm name is registered with the office of the Secretary of State.

CONTRACT PRICE ESCALATION:

In the event the contractor requests a price increase during the contract period (original contract period or contract renewal period), the contractor must provide a written request and documentation justifying the need for a price increase, and the amount of such price increase. MoDOT will review the contractor's written request and documentation, and decide if a price increase is to be granted at that particular time. The contractor shall understand and agree that MoDOT's decision shall be final and without recourse.

- a. No price increase shall be granted during the first 3 months of the original contract period, or if applicable, first 3 months of a contract renewal period.
- b. In the event a price increase is granted due to an approved escalation, the renewal percentage shall be based upon the current contract value.

DESIGNATED REPRESENTATIVE:

The Central Office Maintenance Liaison Engineer is designated as MoDOT's representative, herein after referred to as MoDOT's Representative, for the purpose of administering the provisions of this solicitation and resulting contracts. MoDOT's Representative may designate by written notice other persons having the authority to act on behalf of MoDOT in furtherance of the performance of this solicitation and resulting contracts.

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PRICING PAGES

Page 1 of 7

In addition to pricing, the following will apply as part of the Bidders response to this request for bid. *FAILURE TO PROVIDE THE BELOW ITEMS MAY RENDER THE BIDDER NON-RESPONSIVE* which will result in the bid not being considered for award. Complete this page, *sign where indicated below*, and submit with your bid and pricing pages. **THERE ARE SEVEN (7) PRICING PAGES TO SUBMIT.**

1. Submit descriptive literature and specifications showing the exact equipment you propose to furnish. This must be provided for all equipment on which the Bidder submits pricing.
2. Each unit price *must include the cost* of two (2) Operator's Manuals, two (2) Parts Books, and two (2) Technical Service Manuals.
3. A complete list or catalog *describing all available training materials* related to the items you are bidding must be included in your bid.
4. Bidder needs to provide a *percentage of discount on Manufacturer's Suggested Retail Prices (MSRP)* for all Data Book or Pricing Guide Options, as part of this bid, for each type of unit for which pricing is submitted. However, the Bidder is cautioned that the determination of lowest, responsive bid will not include an evaluation of the discount offered.
5. Each unit shall be delivered *complete and ready for use* to the requested delivery destinations noted on Exhibit A. Unless otherwise specified in the bid, **all prices quoted by the bidder must be F.O.B. MoDOT** with all delivery, handling, surcharges, and other charges included in the bid price. Failure to do so may cause rejection of bid. **MoDOT will not pay additional surcharges.**
6. The vendor shall demonstrate to the District *prior to acceptance by the District*, that the equipment delivered complies fully with the enclosed specifications.
7. **Renewals:** In the event MHTC exercises its options to renew the contract, and upon mutual consideration by Missouri Department of Transportation and the successful bidder to renew the contract, the contract may be renewed for three (3) additional one-year periods, or any portion therein, pursuant to the applicable provisions outlined in this document.
 - a. The Bidder shall provide on the pricing page the maximum percentage of increase and the maximum percentage of decrease for each renewal period. The Bidder is cautioned the percentages shall be computed against the then CURRENT contract prices in effect during renewal periods.
 - b. The Bidder is advised the MHTC does not automatically grant increases at the time of renewing the contract and if an increase is requested, documentation of need must be provided at the time of renewal.
 - c. **If renewal percentages are not provided,** the prices during renewal periods shall be the same as during the current contract period.

By signing below, the Bidder verifies he/she has read the above requirements and, in addition to unit pricing, has provided all information requested as part of his/her bid submittal.

Name of the Bidders Firm

Signature of Authorized Representative

Date Signed

PRICING PAGES

Items #1: NEW; TRAILER MOUNT; WIRED CONTROLLER

Units offered by the Bidder must meet the *attached MoDOT specifications as indicated below*. Unit price is to include all appropriate items as noted on Pricing Page 1 of 7, for delivery statewide to locations indicated on *Exhibit A*.

Item No. & Spec	Power Source	Controller/Lamps	Make and Model	Unit Price/Each
1A (Spec A)	Solar Powered	Wired Controller/LED		\$
1B (Spec B)	Diesel Powered	Wired Controller/Sealed Beam Lamp		\$
1C (Spec C)	Diesel Powered	Wired Controller/LED		\$

OPTIONS	DESCRIPTION	Price
<i>Please list any vendor-recommended options relevant to this operation. Use additional sheets if necessary.</i>		
Option 1		\$
Option 2		\$
Option 3		\$

Please submit all information outlined on Pricing Page 1 of 8 along with your unit pricing. Also, please complete the below information as part of your bid pricing submittal.

DISCOUNT: % off MSRP for all Data Book or Pricing Guide Options: _____ %

DELIVERY will be made _____ calendar days after receipt of order.

RENEWAL INFORMATION: The Bidder shall provide below the maximum percentage of increase and the maximum percentage of decrease for each renewal period. **Please note: if the Bidder does not provide a percent of increase/decrease for each renewal period, MoDOT will assume the renewal percentage is zero percent (0%) for that renewal period.**

1st Renewal Period: _____ % of maximum increase _____ % of maximum decrease
 2nd Renewal Period: _____ % of maximum increase _____ % of maximum decrease
 3rd Renewal Period: _____ % of maximum increase _____ % of maximum decrease

PRICING PAGES

Items #2: NEW; TRAILER MOUNT; WIRELESS CONTROLLER

Units offered by the Bidder must meet the attached MoDOT *Specification A, B or C*, as appropriate. Unit price is to include all appropriate items as noted on Pricing Page 1 of 7 for delivery statewide to locations indicated on *Exhibit A*.

Item No. & Spec	Power Source	Controller/Lamps	Make and Model	Unit Price/Each
2A (Spec A)	Solar Powered	Wireless Controller/LED		\$
2B (Spec B)	Diesel Powered	Wireless Controller/Sealed Beam Lamp		\$
2C (Spec C)	Diesel Powered	Wireless Controller/LED		\$

OPTIONS	DESCRIPTION	Price
<i>Please list any vendor-recommended options relevant to this operation. Use additional sheets if necessary.</i>		
Option 1		\$
Option 2		\$
Option 3		\$

Please submit all information outlined on Pricing Page 1 of 8 along with your unit pricing. Also, please complete the below information as part of your bid pricing submittal.

DISCOUNT: % off MSRP for all Data Book or Pricing Guide Options: _____ %

DELIVERY will be made _____ calendar days after receipt of order.

RENEWAL INFORMATION: The Bidder shall provide below the maximum percentage of increase and the maximum percentage of decrease for each renewal period. ***Please note:*** if the Bidder does not provide a percent of increase/decrease for each renewal period, **MoDOT will assume the renewal percentage is zero percent (0%) for that renewal period.**

1st Renewal Period: _____ % of maximum increase _____ % of maximum decrease
 2nd Renewal Period: _____ % of maximum increase _____ % of maximum decrease
 3rd Renewal Period: _____ % of maximum increase _____ % of maximum decrease

PRICING PAGES

Page 4 of 7

Items #3: NEW; TRUCK MOUNTED; WIRED CONTROLLER; LED LAMPS

Units shall be skid mounted to slip into the back of dump trucks. Units offered by the Bidder must meet the attached MoDOT *Specification D or E*, as appropriate and *Attachment 1 (truck powered LED)* or *Attachment 2 (solar powered LED)*, as appropriate. Unit price is to include all appropriate items as noted on Pricing Page 1 of 7 for delivery statewide to locations indicated on *Exhibit A*.

Item No. & Spec	Power Source	Controller/Lamps	Make and Model	Unit Price/Each
3A (Spec D)	Truck Powered	Wired Controller/LED		\$
3B (Spec E)	Solar Powered	Wired Controller/LED		\$

OPTIONS	DESCRIPTION	Price
<i>Please list any vendor-recommended options relevant to this operation. Use additional sheets if necessary.</i>		
Option 1		\$
Option 2		\$
Option 3		\$

Please submit all information outlined on Pricing Page 1 of 8 along with your unit pricing. Also, please complete the below information as part of your bid pricing submittal.

DISCOUNT: % off MSRP for all Data Book or Pricing Guide Options: _____ %

DELIVERY will be made _____ calendar days after receipt of order.

RENEWAL INFORMATION: The Bidder shall provide below the maximum percentage of increase and the maximum percentage of decrease for each renewal period. **Please note: if the Bidder does not provide a percent of increase/decrease for each renewal period, MoDOT will assume the renewal percentage is zero percent (0%) for that renewal period.**

1st Renewal Period: _____ % of maximum increase _____ % of maximum decrease

2nd Renewal Period: _____ % of maximum increase _____ % of maximum decrease

3rd Renewal Period: _____ % of maximum increase _____ % of maximum decrease

PRICING PAGES

Page 5 of 7

Items #4: NEW; TRUCK MOUNTED; WIRELESS CONTROLLER; LED LAMPS

Units shall be skid mounted to slip into the back of dump trucks. Units offered by the Bidder must meet the attached MoDOT *Specification D or E*, as appropriate, and *Attachment 1 (truck powered LED)* or *Attachment 2 (solar powered LED)*, as appropriate. Unit price is to include all appropriate items as noted on Pricing Page 1 of 7 for delivery statewide to locations indicated on *Exhibit A*.

Item No. & Spec	Power Source	Controller/Lamps	Make and Model	Unit Price/Each
4A (Spec D)	Truck Powered	Wireless Controller/LED		\$
4B (Spec E)	Solar Powered	Wireless Controller/LED		\$

OPTIONS	DESCRIPTION	Price
<i>Please list any vendor-recommended options relevant to this operation. Use additional sheets if necessary.</i>		
Option 1		\$
Option 2		\$
Option 3		\$
Option 4		\$

Please submit all information outlined on Pricing Page 1 8 along with your unit pricing. Also, please complete the below information as part of your bid pricing submittal.

DISCOUNT: % off MSRP for all Data Book or Pricing Guide Options: _____ %

DELIVERY will be made _____ calendar days after receipt of order.

RENEWAL INFORMATION: The Bidder shall provide below the maximum percentage of increase and the maximum percentage of decrease for each renewal period. **Please note: if the Bidder does not provide a percent of increase/decrease for each renewal period, MoDOT will assume the renewal percentage is zero percent (0%) for that renewal period.**

1st Renewal Period: _____ % of maximum increase _____ % of maximum decrease

2nd Renewal Period: _____ % of maximum increase _____ % of maximum decrease

3rd Renewal Period: _____ % of maximum increase _____ % of maximum decrease

PRICING PAGES

Page 6 of 7

Items #5: REPLACEMENT BOARDS

Unit price is to include all appropriate items as noted on Pricing Page 1 of 7 for delivery statewide to locations indicated on *Exhibit A*.

Item No.	Controller	Make and Model	Unit Price/Each
5A	Wired Controller		\$
5B	Wireless Controller		\$

OPTIONS	DESCRIPTION	Price
<i>Please list any vendor-recommended options relevant to this operation. Use additional sheets if necessary.</i>		
Option 1		\$
Option 2		\$
Option 3		\$
Option 4		\$
Option 5		\$

Please submit all information outlined on Pricing Page 1 of 8 along with your unit pricing. Also, please complete the below information as part of your bid pricing submittal.

DISCOUNT: % off MSRP for all Data Book or Pricing Guide Options: _____ %

DELIVERY will be made _____ calendar days after receipt of order.

RENEWAL INFORMATION: The Bidder shall provide below the maximum percentage of increase and the maximum percentage of decrease for each renewal period. **Please note: if the Bidder does not provide a percent of increase/decrease for each renewal period, MoDOT will assume the renewal percentage is zero percent (0%) for that renewal period.**

1st Renewal Period: _____ % of maximum increase _____ % of maximum decrease

2nd Renewal Period: _____ % of maximum increase _____ % of maximum decrease

3rd Renewal Period: _____ % of maximum increase _____ % of maximum decrease

PRICING PAGES

Page 7 of 7

INITIAL TRAINING REQUIREMENTS

All flashing arrow panel equipment, and related products, purchased by MoDOT shall have the minimum vendor training supplied as outlined below. ***Cost for the initial training module, outlined below, is to be included as part of the unit price for each type of equipment.***

- a. *Training shall take place at each district where equipment is delivered or at an offsite location at the vendor's expense. All training activities and locations are to be coordinated with MoDOT's Representative. A qualified service technician or mechanic shall conduct the training. Training will be supplied to operators and mechanics of equipment and will cover safe operation and routine/preventative maintenance. The vendor shall supply training within one (1) month of delivery and acceptance by MoDOT. The vendor shall supply all training materials.*
- b. *Training shall be supplied to MoDOT personnel by the vendor and will be a minimum four (4) hours contact time per module. If more than four (4) hours of training is necessary, the districts shall notify the vendor in advance of the scheduled training to setup the additional hours needed. Modules to be covered are electrical and hydraulics, if applicable. Warranty coverage(s) will be explained during each of these modules.*
- c. *Repair manuals shall be supplied in hardcover and CD at a ratio of two (2) books and five (5) CD's for every five (5) like units. A minimum of two (2) hardcover repair manuals will be supplied with any specialty equipment as well as a CD for each piece.*
- d. *Operator manuals must be in hard copy and supplied with each individual unit.*

Should the initial training not meet the requirements (needs of the employees being trained), the vendor will be required to repeat the training. This activity must be coordinated with the MoDOT Representative as to location, number of trainees, etc.

PURCHASES OF LESS THAN FIVE (5) PIECES OF EQUIPMENT: INITIAL TRAINING

Purchases of equipment in quantities of less than five (5) will require the vendor to provide, at a minimum, the below training. All such training activities are to be coordinated with the MoDOT Representative:

- a. *Operator training on site by a qualified technician / mechanic.*
- b. *Operator manuals must be hard copy and supplied with each individual unit.*
- c. *Repair manuals a minimum of two (2) hardcover repair manuals will be supplied with any specialty equipment as well as a CD for each piece.*

ADDITIONAL TRAINING

Additional training modules may be purchased by MoDOT after initial training. Please indicate below the pricing for the this training:

- a. *Per student rate:* \$ _____
- b. *Minimum class size.* _____

TELEPHONE SUPPORT FOR TECHNICAL ASSISTANCE

All vendors shall provide an 800 telephone number for technical assistance, manned during normal working hours (8AM to 5PM). ***Cost for the telephone support is to be included as part of the unit price for each type of equipment.***

VENDOR INFORMATION & PREFERENCE CERTIFICATION FORM

Vendor Information

All bidders must furnish ALL applicable information requested below

Vendor Name/Mailing Address: Email Address:	Vendor Contact Information (including area codes): 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:

<u>M/WBE Name</u>	<u>Percentage of Contract</u>	<u>M/WBE Certifying Agency</u>

*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 PROCUREMENT AGREEMENT

The department is interested in assisting Missouri counties, cities, special road districts, etc. in purchasing equipment that meets the Missouri Department of Transportation's specifications.

Each bidder is asked to indicate below whether they would be willing to offer equipment 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 equipment ordered by any of these agencies. It is further understood the price is based on the unit meeting the department's 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 above.

\$ _____
(Price) (Location)

Company Name _____

Address _____

Phone Number _____

Signature _____

Title _____

Date _____

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

EXHIBIT A: SHIPPING LOCATIONS

All prices must include completed delivery to any of the below listed delivery destinations.

Missouri Department of Transportation
Northwest District Garage
3602 N. Belt Highway
St. Joseph, Missouri 64506
Maint & Traffic Eng, **Koelle Barbour**
Koelle.barbour@modot.mo.gov
816-387-2452

Missouri Department of Transportation
St. Louis District Garage
2309 Barrett Station Rd.
Ballwin, Missouri 63021
General Services Manager, **Scott Boyer**
scott.boyer@modot.mo.gov
314-301-1422

Missouri Department of Transportation
Northeast District Garage
902 N. Missouri St.
Macon, Missouri 63552
General Services Manager, **Joseph Hinton**
joseph.hinton@modot.mo.gov
660-385-8240

Missouri Department of Transportation
Southwest District Garage
3901 East 32nd Street
Joplin, Missouri 64804
General Services Manager, **John Sinclair**
john.sinclair@modot.mo.gov
417-629-3220

Missouri Department of Transportation
Northeast District Garage
Highway 61 South
Hannibal, Missouri 63401
General Services Manager, **Darrell Barnes**
darrell.barnes@modot.mo.gov
573-248-2590

Missouri Department of Transportation
Southwest District Garage
3025 E. Kearney
Springfield, Missouri 65804
General Services Manager, **Brad Leonard**
brad.leonard@modot.mo.gov
417-895-7700

Missouri Department of Transportation
Kansas City District Garage
2050 N.E. Independence.
Lee Summit Missouri 64064
General Services Manager, **Chad Foley**
Chad.Foley@modot.mo.gov
816-347-4101

Missouri Department of Transportation
Southeast District Garage
3956 East Main
Willow Springs, Missouri 65793
General Services Manager, **Jacky Traw**
jacky.traw@modot.mo.gov
417-469-9041

Missouri Department of Transportation
Central District Garage
830 MoDOT Drive -Main Garage
Jefferson City, Missouri 65101
General Services Manager, Coleen Welter
coleen.welter@modot.mo.gov
573-751-3660

Missouri Department of Transportation
Southeast District Garage
2675 N. Main, Bldg. B
Sikeston, Missouri 63801
General Services Manager, Michael
Helpingstine
michael.helpingstine@modot.mo.gov
573-472-5215

SPECIFICATION A

MISSOURI DEPARTMENT OF TRANSPORTATION (MoDOT) TRAILER MOUNTED FLASHING ARROW PANEL SPECIFICATIONS (SOLAR POWERED, WITH LED LAMPS)

Description

The trailer mounted flashing arrow panel shall consist of an arrow panel, mounting frame and rotating mechanism, control switches and circuitry, a control box housing electronic components, trailer, and self-contained power supply. Each unit shall be fully assembled when delivered.

Panel and Mounting Assembly

The arrow panel shall be aluminum and contain a minimum of 15 LED (Light Emitting Diode) lamps. Lamps shall be energized from control switches located in a lockable weatherproof aluminum box located in the arrow panel support frame.

A nominal 5 1/2-inch, 360° tunnel visor with full-attachment flange shall be provided for each lamp. Visors shall be attached to the panel with stainless steel machine screws. Visors shall be removable without removing the screws. The panel or lamp holder shall be notched to match a projection on the lamp to ensure proper lamp alignment. All lamps shall be replaceable from the front of the panel.

A lamp of the same type used on the panel face shall be provided on the backside of the panel and be continuously energized or flashed when the arrow panel is operating. A visor is not required on this lamp. It shall be located in the uppermost corner of the panel on the driver's side.

Lamps shall be PAR-46 yellow, 5 1/2" DIA., LED lamps specifically designed for solar applications. Each lamp shall have an optical lens and contain enough light emitting diodes to meet the existing MoDOT specifications for visibility and legibility performance standards as stated later in these specifications.

Overall size of the arrow panel shall be a nominal 4 feet by 8 feet.

Panel mounting height shall be 7 to 9 feet from the roadway surface to the lowest point on the panel. The bottom edge of the panel shall be relatively level when in use.

The arrow panel shall consist of a nominal 3-inch by 1 inch by 1/8 inch welded aluminum channel with a 1/16 inch thick aluminum sheet attached to the front and back. The front and back surfaces of the panel shall be painted non-reflective flat black. All wiring inside the arrow panel shall be corrosion resistant wiring and shall be attached to the panel approximately every 8-inches. Company names or logos shall not be placed on the arrow panel.

The arrow panel shall be supported on a two or four vertical post framework consisting of a minimum of 2-inch by 2-inch by 1/8 inches thick welded steel tubing. All open ends of tubing shall be capped and welded shut. Steel supports shall be welded to the deck plate and the deck plate welded to the frame and cross members. The panel shall be rotatable from a horizontal to a vertical position electrically, hydraulically, by winch and cable (minimum 1/4- inch diameter galvanized aircraft cable) with automatic brake, with a screw type mechanism, or by a self-locking, manually operated square stainless steel tube. The supporting frame shall have a locking device to secure the panel in the horizontal and vertical positions. When in the

horizontal position, the panel shall rest on a rigid frame support, relieving the load from the rotating device. Angle and cross bracing of the vertical supports shall be provided at the top and bottom of the supports to ensure a rigid frame. Manually operated winch mechanisms shall be located on the right, or passenger side, of the trailer.

The support frame shall be painted one coat of primer and one coat of Dupont Automotive Deluxe Enamel Code 93-75306 (yellow), or Chrome Enamel 13432 (yellow), of Federal Standard 595, or equal. A high-visibility, Safety Orange Paint, such as Sherwin Williams Omaha Orange Paint, which is similar to Federal Standard 595B #12243, or equal, may be used in lieu of yellow paint.

Control and Wiring: STANDARD CONTROL AND OPTIONAL WIRELESS

A remote cab control will be considered the standard control. An optional wireless remote control, if available, should perform the same functions as the remote cab control.

The control switches shall provide left and right flashing arrows, double flashing arrow, and caution modes of operation. The caution mode shall consist of flashing 4 lamps using the upper and lower lamps of the left and right arrowheads. Left and right flashing arrows shall flash 10 lamps, 5 in the arrowhead and 5 in the horizontal shank simultaneously. The double flashing arrow shall flash 13 lamps, 5 in each arrowhead and 3 in the horizontal shank simultaneously.

The control shall include an on/off switch, a dim/bright selector switch, an operation mode selector switch, and a photoelectric cell. All electronic components shall be solid state and electrically protected by fuses or circuit breakers. All cables and control wiring shall enter the control cabinet from either the back or the bottom through salt-resistant, weatherproof connectors. No external or spliced wire connections will be accepted outside of the control cabinet.

The optional wireless remote control unit shall be FCC approved. The wireless modules should derive power from the controller and remote respectively

The flashing rate of the lamps shall not be less than 25 or greater than 40 flashes per minute. Lamp "on-time" shall be at least 50 percent.

Control circuitry shall provide dimming of all lamps to prevent blinding during night operation. Dimming shall be by manual and automatic control. The photoelectric cell shall automatically reduce the flashing arrow light intensity as ambient light reduces. The photoelectric control shall be mounted on the side or bottom of the arrow control cabinet.

A readily accessible cartridge fuse or circuit breaker shall be provided in the circuit between the power supply and arrow panel control. The fuse or breaker shall be rated to handle the maximum lamp load of 14 lamps. The fuse or breaker shall be located in the control cabinet.

Solar Panels: Solar panels shall be a minimum of 100-110 watt panels, with a remote battery charger backup. Solar panels shall be mounted above top of arrow panel with a 4 degree pitch from the horizontal position to encourage shedding of dirt and rainwater.

Battery Charger: A built in 50 amp, 120 volt AC input, 12 volts DC output battery charger with charge indicator shall be included and shall be mounted at the base of the frame of the arrow panel support, inside a lockable, weatherproof, battery box.

- Batteries: Batteries shall be the gel cell type; a minimum of 6 batteries, , with a minimum of 700 amp-hours of energy when fully charged, wired to provide 12 volt DC power supply.
- Battery Box: A lockable, weatherproof, battery box shall be centered over the trailer axle, made of minimum 14-gauge steel, with louvered side panels for cross-flow ventilation and with bottom and sides coated with acid-resistant protector.
- Voltage Regulator: The voltage regulator shall be solid-state micro-processor-based, utilizing constant positive drive voltage and pulse with modulation to optimize battery charging; measuring battery voltage and adjusting current from the solar panels so the batteries are not overcharged, and also preventing overcharging of batteries by the solar panels when the sign is turned off. An automatic disconnect device shall be included to protect the entire system in case of low voltage.
- Controller: A solid-state, LED optimized, controller shall be utilized to minimize wattage consumption and maximize battery life. Control circuitry shall provide a negative ground to each lamp at all times. Frame-ground circuitry to the lamps will not be permitted. Individual ground circuits to each lamp shall be provided. Positive power shall be supplied to each lamp through individual circuits from solid-state load switches in the control cabinet. The controller cabinet shall be assembled in a manner to allow easy access to internal control circuitry, such as with machine screws for service and repair purposes. Continuous, positive 12-volts to the lamp will not be permitted. The positive power to each lamp shall be reduced to zero voltage by the solid state load switches. It shall have reverse-polarity and short-circuit protection. The voltage regulator and controller shall be in a lockable, weatherproof, aluminum box located on the frame of the arrow panel support.
- Locks: A lockable box shall be mounted on the trailer deck to protect the batteries and battery charger from theft and damage from falling or flying objects.

Performance

The flashing arrow must be visible on a sunny day for a distance of one mile. The flashing arrow must be able to operate for 20 continuous days in the single arrow mode during day/night light conditions with the solar panel disconnected or covered. A device shall be provided to indicate the remaining charge in the batteries. The arrow panel support frame shall contain a device to align the arrow panel to oncoming traffic and to adjust the arrow panel so its bottom edge is relatively level when in use. The panel lamp must be visible during the "on time" at an angle of 15° minimum to both the left and right of center and 4° minimum both up and down of center.

Trailer

- Dimensions: Minimum trailer dimensions shall be length 110" and width 76" (fender to fender).
- Frame: Structural steel tubing, (minimum square tubing 2 1/2" x 2 1/2" x 11-gauge wall thickness or minimum 2" square tubing x 1/8" wall thickness) minimum 3 cross braces (with tie-down loops on front corners.)
- Axle Single, minimum 2,000-pound capacity, tubular, with 5-hole, 4.5" B.C. circle pattern on idler hub.
- Wheels: 15-inch steel, safety rim, 5 lug bolts.

- Tires:* 15-inch, load range B, tubeless, radial highway tread (P205/75R15 minimum.)
- Springs:* Minimum 3-leaf, double eye, minimum 1,200 lb. capacity for each spring.
- Tongue:* 3-inch x 3-inch x 3/16 inch steel tubing (removable for shipping and to prevent theft). Tongue weight approximately 10-15 percent of gross weight. Minimum 4-foot hitch-to-trailer clearance.
- Deck:* 12 sq. ft. minimum, 10 gauge, smooth plate or open deck.
- Fenders:* 16 gauge steel, inside closed in above deck, round, full wheel coverage.
- Safety Chain:* Two, 5/16 inch x 34-inch long plated steel chains connected to a loop that is welded to the tongue. Chain shall have yield strength equal to weight of trailer and payload, or greater. Chain loop shall have yield strength equal to chain, or greater.
- Screw Jack:* Tongue mounted, 2,000-pound capacity, steel base 4" x 4" square foot, minimum size and capacity.
- Leveling Legs:* Adjustable on 1" increments with foot pads (4" x 4" minimum), mounted on four corners of frame, perforated 1 3/4" square tube x 12-gauge wall locked in place by 3/8" diameter snapper pins, secured to trailer frame by wire cable or chain.
- Hitch:* Easily removable combination, 2" diameter ball coupler and a 3 inch inside diameter, flat pintle ring, adjustable 24-inch to 36-inch, in 2-inch increments.
- Paint:* Entire trailer - one coat primer, one coat Dupont Automotive Deluxe Enamel Code 93-75306 (yellow) or Chrome Enamel 13432 (yellow) of Federal Standard 595, including all surfaces under deck and on underside of fenders. A high-visibility, Safety Orange Paint, such as Sherwin Williams Omaha Orange Paint, which is similar to Federal Standard 595B #12243, or equal, may be used in lieu of yellow paint.
- Lights:* (DOT Approved) 12-volt, two tail/stop/turn signal; side, rear and tongue reflectors. Wires shall be identified as to function.

General

All units shall meet or exceed the specifications for advance warning arrow panels as listed in Part 6F.53 of the Federal Highway Administration's Manual on Uniform Traffic Control Devices (MUTCD) Millennium Edition, December, 2000.

Owner's Manual

The successful bidder shall furnish two Owner's Manuals for each arrow panel. Each manual shall include the manufacturer's instructions for maintenance and operation of the power supply, arrow panel and control. Each manual shall also include a detailed, schematic, wiring diagram showing all circuits and components from the power supply through the control to the arrow panel. The schematic diagram shall list all transistors, resistors, triacs, diodes and other components with the manufacturer's name and part number.

~ End Specification ~

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SPECIFICATION B

MISSOURI DEPARTMENT OF TRANSPORTATION (MoDOT) TRAILER MOUNTED FLASHING ARROW PANEL SPECIFICATIONS (DIESEL ENGINE POWERED, WITH SEALED BEAM LAMPS)

Description

The trailer mounted flashing arrow panel shall consist of an arrow panel, mounting frame and rotating mechanism, control switches and circuitry, trailer, and self-contained power supply. Each unit shall be fully assembled when delivered.

Panel and Mounting Assembly

The arrow panel shall be aluminum and contain 15 lamps. Lamps shall be energized from control switches located in a lockable, weatherproof aluminum box located on the arrow panel support frame, power supply cover, or under the power supply cover.

A nominal 5-inch, 360° tunnel visor with full attachment flange shall be provided for each lamp. Visors shall be attached to the panel with stainless steel machine screws and steel, blind rivet nuts. Visors shall be removable without removing the screws. A nominal 1/2 inch, butyl rubber or neoprene gasket shall be provided between each lamp and the panel face to absorb vibration and prevent intrusion of moisture. The panel or lamp holder shall be notched to match a projection on the lamp to ensure proper lamp alignment. All lamps shall be replaceable from the front of the panel.

A lamp of the same type used on the panel face shall be provided on the back side of the panel and be continuously energized or flashed when the arrow panel is operating. A visor is not required on this lamp. It shall be located in the uppermost corner of the panel on the driver's side.

Lamps shall be 12-volt DC, 18-watt, PAR-46, (NO. 4412A), yellow, sealed-beam type and each lamp shall meet the existing MoDOT specifications for visibility and legibility performance standards as stated later in these specifications.

Overall size of the arrow panel shall be a nominal 4 feet by 8 feet.

Panel mounting height shall be 7 to 9 feet from the roadway surface to the lowest point on the panel. The bottom edge of the panel shall be relatively level when in use.

The arrow panel shall consist of a nominal 3-inch by 1 inch by 1/8 inch welded aluminum channel with a 1/16 inch thick aluminum sheet attached to the front and back. A nominal 6-inch square removable panel shall be provided on the back panel to provide access to the control cable connector and ground wire bus. The access panel shall have a rubber or neoprene gasket. The interior of the panel shall be reinforced with aluminum spacers and nylon spacers. The front and back surfaces of the panel shall be painted non-reflective flat black. All wiring inside the arrow

panel shall be corrosion resistant wiring and shall be attached to the panel approximately every 8-inches. Company names or logos shall not be placed on the arrow panel.

The arrow panel shall be supported on a two or four vertical post framework consisting of 2-inch by 2-inch by 1/8 inch welded steel tubing. All tubing shall be capped and welded shut. Steel supports shall be welded to the deck plate and the deck plate welded to the frame and cross members. The panel shall be rotatable from a horizontal to a vertical position electrically, hydraulically, by winch and cable (minimum 1/4-inch diameter galvanized aircraft cable) with automatic brake, with a screw type mechanism, or by a self-locking, manually operated square stainless steel tube. The supporting frame shall have a locking device to secure the panel in the horizontal and vertical positions. When in the horizontal position, the panel shall rest on a rigid frame support, relieving the load from the rotating device. Angle and cross bracing of the vertical supports shall be provided at the top and bottom of the supports to ensure a rigid frame. Manually operated winch mechanisms shall be located on the right, or passenger, side of the trailer.

The support frame shall be painted one coat of primer and one coat of Dupont Automotive Deluxe Enamel Code 93-75306 (yellow), or Chrome Enamel 13432 (yellow), of Federal Standard 595, or equal. A high visibility safety orange paint, such as Sherwin Williams Omaha Orange Paint, which is similar to Federal Standard 595B #12243, or equal, may be used in lieu of yellow paint.

Control and Wiring: STANDARD CONTROL AND OPTIONAL WIRELESS

A remote cab control will be considered the standard control. An optional wireless remote control, if available, should perform the same functions as the remote cab control.

The control switches shall provide left and right flashing arrows, a double flashing arrow, and caution modes of operation. The caution mode shall consist of flashing 4 lamps using the upper and lower lamps of the left and right arrowheads. Left and right flashing arrows shall flash 10 lamps, 5 in the arrowhead and 5 in the horizontal shank, simultaneously. The double flashing arrow shall flash 13 lamps, 5 in each arrowhead and 3 in the horizontal shank, simultaneously.

The control shall include an on/off switch, a dim/bright selector switch, an operation mode selector switch, a photoelectric cell, flasher and load relays. All electronic components, except flasher and load relays, shall be solid state and electrically protected by fuses or circuit breakers. All cables and control wiring shall enter the control cabinet from either the back or bottom through salt-resistant, weatherproof connectors. No external or spliced wire connections will be accepted outside of the control cabinet.

The optional wireless remote control unit shall be FCC approved. The wireless modules should derive power from the controller and remote respectively.

The flashing rate of the lamps shall not be less than 25 or greater than 40 flashes per minute. Lamp "on-time" shall be at least 50 percent.

Control circuitry shall provide a minimum 50 percent voltage reduction to all lamps during night operation. Dimming shall be by manual and automatic control. The photoelectric cell shall automatically reduce the flashing arrow light intensity as ambient light reduces, by reducing the voltage to the lamps from 12-volts to 6 volts. When in the dimmed condition, voltage to any lamp shall be within 1.5 volts of the voltage to any other lamp. The photoelectric control shall

be mounted on the side or bottom of the arrow control cabinet.

A readily accessible cartridge fuse or circuit breaker shall be provided in the circuit between the power supply and arrow panel control. The fuse or breaker shall be rated to handle the maximum lamp load of 14 lamps. The fuse or breaker shall be located in the control cabinet.

The arrow panel control shall be housed in a removable, weather and splash proof cabinet. The cabinet shall be securely mounted to the arrow panel support frame, or on or under the power supply protective cover. Removal of the entire cabinet shall be accomplished by disconnecting two amphanol, or equivalent amp-type, cable connectors and removing no more than two cabinet attachment bolts. The cabinet door shall contain a gasket and a non-ferrous metal locking mechanism with provision for padlocking, if the control is not located under the power supply cover. A baffle shall be placed inside the cabinet to prevent water from reaching electrical components through ventilation louvers, if used. No openings will be permitted in the cabinet top. All wiring entrances to the cabinet shall be through salt-resistant, weatherproof connections. All electrical and electronic components in the cabinet shall be readily accessible, removable and serviceable. All electronic components shall be mounted on only one side of the circuit board. All components shall be labeled or coded and printed at their location on the circuit board. If condensation drains are provided in the bottom of the cabinet, they shall be protected from road splash. After assembly, all circuit boards and terminals shall be thoroughly cleaned and coated with clear acrylic or clear polyurethane.

All wiring and electrical and electronic equipment shall be capable of carrying an electrical load of 150 percent of maximum amperage rating of the unit. Solid-state devices containing non-accessible or non-replaceable components will not be permitted. Riveted load switches or heat sinks or solder connected integrated circuits will not be permitted or accepted.

Control circuitry shall provide a negative 12-volt ground to each lamp at all times. Frame ground circuitry to the lamps will not be permitted. A ground circuit shall be supplied to a ground bus bar or terminal strip inside the arrow panel through a minimum of two #12 AWG conductors. Individual ground circuits to each lamp shall be provided from the bus bar or terminal strip through minimum of #16 AWG conductors.

The positive, or plus, 12-volt power shall be supplied to each lamp through a minimum #16 AWG conductors from solid state load switches in the control cabinet. A barrier terminal strip for the positive voltage conductors will not be required or permitted inside the arrow panel. Conductors shall connect from the lamps to the 14-pin, male connector on the bottom edge or front face of the panel. Continuous, plus, 12 volts to the lamps will not be permitted. The plus 12 volts to each lamp shall be reduced to zero voltage by the solid-state load switches.

The arrow panel and control cabinet shall be interconnected through a multi-conductor control cable or individual conductors in an electrical, flexible, salt-resistant, waterproof conduit. The manufacturer shall determine the length of the control cable. Control cable length shall be sufficient to permit arrow panel rotation without binding or kinking the cable. A 14-pin, female connector shall be affixed to each end of the control cable.

A male, 14-pin connector shall be located on the bottom or side of the control cabinet. The connector shall be installed inside the control cabinet and retained by a clip or clips or stainless steel machine screws to permit removal from the cabinet without disconnecting wires from the control.

Control connectors shall be metal, weatherproof, 14-contact Amphanol MS 3106 A 28-02 P plug, or equivalent, amp-type connectors, with cable clamp and boot and MS 3102 A 28-02 S

socket. Power supply connectors shall be metal, weatherproof, 2-contact Amphanol MS 3106 A 22-01 P plug, or equivalent, amp-type connectors, with cable clamp and boot and MS 3106 A 22-01 S socket.

Electrical conductors between the control and arrow panel shall be Type THW UL approved, salt-resistant, weatherproof, multi-conductor cable or single conductors. Conductors shall be soft-drawn, Class B or C stranded copper wire meeting the requirements of IPCEA S-61-402, Part 2.

Electrical circuits between the control and power supply shall be UL approved, single conductors in an electrical, flexible, salt-resistant, waterproof conduit or multiple conductor Type THW cable. Minimum conductor size shall be #10 AWG. Conductors shall be soft drawn Class B or C stranded copper wire meeting the requirements of IPCEA S-61-402, Part 2.

Crimp-on lugs, with amperage ratings equivalent to the conductor size, shall be used for all terminal connections of stranded copper conductors not connected to amphanol, or equivalent amp type, connectors.

Trailer

Dimensions: Minimum trailer dimensions shall be length 110" and width 76" (fender to fender).

Frame: Structural steel tubing or channel, minimum 3 cross braces, with tie-down loops on front corners.

Axle: Single, minimum 3,500-pound capacity, tubular, with 5-hole 4.5" B.C. circle pattern on idler hub.

Wheels: 15-inch steel, safety rim, 5 lug bolts.

Tires: 15-inch, tubeless, radial, highway tread. Size and rating to match axle capacity.

Springs: Minimum 4-leaf, double eye.

Tongue: 3-inch x 3-inch x 3/16 inch steel tubing Y-braced to trailer frame, removable for shipping and to prevent theft. Tongue weight approximately 10-15 percent of gross weight. Minimum 4-foot hitch-to-trailer clearance.

Deck: 32 sq. ft., 1/8 inch steel safety-tread plate.

Fuel Tank: Minimum 20-gallon with gauge. Mounted below deck with filler cap access through *Deck Plate*. Protective metal guard on front and bottom if tank is not metal.

Fuel Valve: In-line, lever operated, on-off.

Power Supply Cover: Hinged, 16 gauge steel, expanded metal sides or vents, lockable. Hinge bolted or riveted through deck plate.

Starting Battery Enclosure: 14-gauge steel, under deck, minimum 2 drain holes, lockable.

Fenders: 16-gauge steel, inside closed in above deck, round, full-wheel coverage.

Safety Chain: Two, 5/16 inch x 34-inch long, plated, steel chains connected to a loop that is welded to the tongue. Chain shall have yield strength equal to weight of trailer and payload or greater. Chain loop shall have yield strength equal to chain, or greater.

Screw Jack: Tongue mounted, 2,000-pound capacity, steel base 4" x 4" square foot, minimum size and capacity.

Leveling Legs: Adjustable, on 1" increments, with foot pads (4" x 4" minimum), mounted on

four corners of frame, perforated 1 3/4" square tube x 12 gauge wall, locked in place by 3/8" diameter snapper pins, secured to the trailer frame by a wire cable or chain..

Hitch: Easily removable combination 2" diameter ball coupler and a 3-inch inside diameter flat pintle ring, adjustable 24-inch to 36-inch, in 2-inch increments.

Paint: Entire trailer - one coat primer, one coat Dupont Automotive Deluxe Enamel Code 93-75306 (yellow) or Chrome Enamel 13432 (yellow) of Federal Standard 595, or equal, including all surfaces under deck and on underside of fenders. A high-visibility, safety orange paint, such as Sherwin Williams Omaha Orange Paint, which is similar to Federal Standard 595B #12243, or equal, may be used in lieu of the yellow paint.

Lights: (DOT Approved) 12-volt, two tail/stop/turn signal; side, rear and tongue reflectors. No electrical connector required. Wires shall be identified as to function.

Power Supply - Diesel Engine Driven Generator Unit

Engine: Diesel, Lombardini 6LD260, 4 HP at 2800 RPM, 262 cc, 3-quart deep-sump, oil capacity with spin-on filter, dry cartridge air filter, electric and manual starter, run/off switch, start switch and 20 gal. fuel tank.

Starting Battery: 12-volt D.C., wet cell BCI Group 24 Marine, minimum 420 amps cold cranking, 2-hour reserve capacity.

Alternator: Delco direct driven with flexible coupling, 12-volt, 51-amp, voltage regulator, ammeter, non-resettable hour meter. A weather-resistant, metal enclosure shall be provided to house the meters and switches.

General

All units shall meet or exceed the specifications for advance warning arrow panels as listed in Part 6F.53 of the Federal Highway Administration's Manual on Uniform Traffic Control Devices (MUTCD) Millennium Edition, December, 2000.

Performance

The flashing arrow must be visible on a sunny day for a distance of one mile. The arrow panel support frame shall contain a device to align the arrow panel to oncoming traffic and to adjust the arrow panel so its bottom edge is relatively level when in use. The panel lamp must be visible during the "on time" at an angle of 15° minimum to both the left and right of center and 4° minimum both up and down of center.

Owner's Manual

The successful bidder shall furnish two Owner's Manuals for each arrow panel. Each manual shall include the manufacturer's instructions for maintenance and operation of the power supply, arrow panel and control. Each manual shall also include a detailed, schematic, wiring diagram showing all circuits and components from the power supply through the control to the arrow panel. The schematic diagram shall list all transistors, resistors, triacs, diodes and other components with the manufacturer's name and part number.

~ End Specification ~

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SPECIFICATION C

MISSOURI DEPARTMENT OF TRANSPORTATION (MoDOT) TRAILER MOUNTED FLASHING ARROW PANEL SPECIFICATIONS (DIESEL ENGINE POWERED, WITH LED LAMPS)

Description

The trailer mounted flashing arrow panel shall consist of an arrow panel, mounting frame and rotating mechanism, control switches and circuitry, trailer, and self-contained power supply. Each unit shall be fully assembled when delivered.

Panel and Mounting Assembly

The arrow panel shall be aluminum and contain a minimum of 15 LED (Light Emitting Diode) lamps. Lamps shall be energized from control switches located in a lockable weatherproof aluminum box located in the arrow panel support frame, power supply cover, or under the power supply cover.

A nominal 5-inch, 360° tunnel visor with full attachment flange shall be provided for each lamp. Visors shall be attached to the panel with stainless steel machine screws and steel, blind rivet nuts. Visors shall be removable without removing the screws. A nominal 1/2 inch, butyl rubber or neoprene gasket shall be provided between each lamp and the panel face to absorb vibration and prevent intrusion of moisture. The panel or lamp holder shall be notched to match a projection on the lamp to ensure proper lamp alignment. All lamps shall be replaceable from the front of the panel.

A lamp of the same type used on the panel face shall be provided on the back side of the panel and be continuously energized or flashed when the arrow panel is operating. A visor is not required on this lamp. It shall be located in the uppermost corner of the panel on the driver's side.

Lamps shall be PAR-46 yellow, 5 1/2" DIA., LED lamps. Each lamp shall have an optical lense and contain enough light emitting diodes to meet the existing MoDOT specifications for visibility and legibility performance standards as stated later in these specifications.

Overall size of the arrow panel shall be a nominal 4 feet by 8 feet.

Panel mounting height shall be 7 to 9 feet from the roadway surface to the lowest point on the panel. The bottom edge of the panel shall be relatively level when in use.

The arrow panel shall consist of a nominal 3-inch by 1 inch by 1/8 inch welded aluminum channel with a 1/16 inch thick aluminum sheet attached to the front and back. A nominal 6-inch square removable panel shall be provided on the back panel to provide access to the control cable connector and ground wire bus. The access panel shall have a rubber or neoprene gasket. The interior of the panel shall be reinforced with aluminum spacers and nylon spacers. The front and back surfaces of the panel shall be painted non-reflective flat black. All wiring inside the arrow panel shall be corrosion resistant wiring and shall be attached to the panel approximately every 8-inches. Company names or logos shall not be placed on the arrow panel.

The arrow panel shall be supported on a two or four vertical post framework consisting of 2-inch by 2-inch by 1/8 inch welded steel tubing. All tubing shall be capped and welded shut. Steel

supports shall be welded to the deck plate and the deck plate welded to the frame and cross members. The panel shall be rotatable from a horizontal to a vertical position electrically, hydraulically, by winch and cable (minimum 1/4-inch diameter galvanized aircraft cable) with automatic brake, with a screw type mechanism, or by a self-locking, manually operated square stainless steel tube. The supporting frame shall have a locking device to secure the panel in the horizontal and vertical positions. When in the horizontal position, the panel shall rest on a rigid frame support, relieving the load from the rotating device. Angle and cross bracing of the vertical supports shall be provided at the top and bottom of the supports to ensure a rigid frame. Manually operated winch mechanisms shall be located on the right, or passenger, side of the trailer.

The support frame shall be painted one coat of primer and one coat of Du pont Automotive Deluxe Enamel Code 93-75306 (yellow), or Chrome Enamel 13432 (yellow), of Federal Standard 595, or equal. A high visibility safety orange paint, such as Sherwin Williams Omaha Orange Paint, which is similar to Federal Standard 595B #12243, or equal, may be used in lieu of yellow paint.

Control and Wiring: STANDARD CONTROL AND OPTIONAL WIRELESS

A remote cab control will be considered the standard control. An optional wireless remote control, if available, should perform the same functions as the remote cab control.

The control switches shall provide left and right flashing arrows, a double flashing arrow, and caution modes of operation. The caution mode shall consist of flashing 4 lamps using the upper and lower lamps of the left and right arrowheads. Left and right flashing arrows shall flash 10 lamps, 5 in the arrowhead and 5 in the horizontal shank, simultaneously. The double flashing arrow shall flash 13 lamps, 5 in each arrowhead and 3 in the horizontal shank, simultaneously.

The control shall include an on/off switch, a dim/bright selector switch, an operation mode selector switch, a photoelectric cell, flasher and load relays. All electronic components, except flasher and load relays, shall be solid state and electrically protected by fuses or circuit breakers. All cables and control wiring shall enter the control cabinet from either the back or bottom through salt-resistant, weatherproof connectors. No external or spliced wire connections will be accepted outside of the control cabinet.

The optional wireless remote control unit shall be FCC approved. The wireless modules should derive power from the controller and remote respectively.

The flashing rate of the lamps shall not be less than 25 or greater than 40 flashes per minute. Lamp "on-time" shall be at least 50 percent.

Control circuitry shall provide dimming of all lamps to prevent blinding during night operation. Dimming shall be by manual and automatic control. The photoelectric cell shall automatically reduce the flashing arrow light intensity as ambient light reduces. The photoelectric control shall be mounted on the side or bottom of the arrow control cabinet.

A readily accessible cartridge fuse or circuit breaker shall be provided in the circuit between the power supply and arrow panel control. The fuse or breaker shall be rated to handle the maximum lamp load of 14 lamps. The fuse or breaker shall be located in the control cabinet.

The arrow panel control shall be housed in a removable, weather and splash proof cabinet. The cabinet shall be securely mounted to the arrow panel support frame, or on or under the power supply protective cover. Removal of the entire cabinet shall be accomplished by disconnecting two amphanol, or equivalent amp-type, cable connectors and removing no more than two cabinet

attachment bolts. The cabinet door shall contain a gasket and a non-ferrous metal locking mechanism with provision for padlocking, if the control is not located under the power supply cover. A baffle shall be placed inside the cabinet to prevent water from reaching electrical components through ventilation louvers, if used. No openings will be permitted in the cabinet top. All wiring entrances to the cabinet shall be through salt-resistant, weatherproof connections. All electrical and electronic components in the cabinet shall be readily accessible, removable and serviceable. All electronic components shall be mounted on only one side of the circuit board. All components shall be labeled or coded and printed at their location on the circuit board. If condensation drains are provided in the bottom of the cabinet, they shall be protected from road splash. After assembly, all circuit boards and terminals shall be thoroughly cleaned and coated with clear acrylic or clear polyurethane.

All wiring and electrical and electronic equipment shall be capable of carrying an electrical load of 150 percent of maximum amperage rating of the unit. Solid-state devices containing non-accessible or non-replaceable components will not be permitted. Riveted load switches or heat sinks or solder connected integrated circuits will not be permitted or accepted.

A solid-state, LED optimized, controller shall be utilized to minimize wattage consumption and maximize battery life. Control circuitry shall provide a negative ground to each lamp at all times. Frame-ground circuitry to the lamps will not be permitted. Individual ground circuits to each lamp shall be provided. Positive power shall be supplied to each lamp through individual circuits from solid-state load switches in the control cabinet. The controller cabinet shall be assembled in a manner to allow easy access to internal control circuitry, such as with machine screws for service and repair purposes. Continuous, positive 12-volts to the lamp will not be permitted. The positive power to each lamp shall be reduced to zero voltage by the solid state load switches. It shall have reverse-polarity and short-circuit protection. The voltage regulator and controller shall be in a lockable, weatherproof, aluminum box located on the frame of the arrow panel support.

The arrow panel and control cabinet shall be interconnected through a multi-conductor control cable or individual conductors in an electrical, flexible, salt-resistant, waterproof conduit. The manufacturer shall determine the length of the control cable. Control cable length shall be sufficient to permit arrow panel rotation without binding or kinking the cable. A 14-pin, female connector shall be affixed to each end of the control cable.

A male, 14-pin connector shall be located on the bottom or side of the control cabinet. The connector shall be installed inside the control cabinet and retained by a clip or clips or stainless steel machine screws to permit removal from the cabinet without disconnecting wires from the control.

Control connectors shall be metal, weatherproof, 14-contact Amphanol MS 3106 A 28-02 P plug, or equivalent, amp-type connectors, with cable clamp and boot and MS 3102 A 28-02 S socket. Power supply connectors shall be metal, weatherproof, 2-contact Amphanol MS 3106 A 22-01 P plug, or equivalent, amp-type connectors, with cable clamp and boot and MS 3106 A 22-01 S socket.

Electrical conductors between the control and arrow panel shall be Type THW UL approved, salt-resistant, weatherproof, multi-conductor cable or single conductors. Conductors shall be soft-drawn, Class B or C stranded copper wire meeting the requirements of IPCEA S-61-402, Part 2.

Electrical circuits between the control and power supply shall be UL approved, single conductors in an electrical, flexible, salt-resistant, waterproof conduit or multiple conductor Type THW

cable. Conductors shall be soft drawn Class B or C stranded copper wire meeting the requirements of IPCEA S-61-402, Part 2.

Crimp-on lugs, with amperage ratings equivalent to the conductor size, shall be used for all terminal connections of stranded copper conductors not connected to amphanol, or equivalent amp type, connectors.

Trailer

Dimensions: Minimum trailer dimensions shall be length 110" and width 76" (fender to fender).

Frame: Structural steel tubing or channel, minimum 3 cross braces, with tie-down loops on front corners.

Axle: Single, minimum 3,500-pound capacity, tubular, with 5-hole 4.5" B.C. circle pattern on idler hub.

Wheels: 15-inch steel, safety rim, 5 lug bolts.

Tires: 15-inch, tubeless, radial, highway tread. Size and rating to match axle capacity.

Springs: Minimum 4-leaf, double eye.

Tongue: 3-inch x 3-inch x 3/16 inch steel tubing Y-braced to trailer frame, removable for shipping and to prevent theft. Tongue weight approximately 10-15 percent of gross weight. Minimum 4-foot hitch-to-trailer clearance.

Deck: 32 sq. ft., 1/8 inch steel safety-tread plate.

Fuel Tank: Minimum 20-gallon with gauge. Mounted below deck with filler cap access through deck plate. Protective metal guard on front and bottom if tank is not metal.

Fuel Valve: In-line, lever operated, on-off.

Power Supply Cover: Hinged, 16 gauge steel, expanded metal sides or vents, lockable. Hinge bolted or riveted through deck plate.

Starting Battery Enclosure: 14-gauge steel, under deck, minimum 2 drain holes, lockable.

Fenders: 16-gauge steel, inside closed in above deck, round, full-wheel coverage.

Safety Chain: Two, 5/16 inch x 34-inch long, plated, steel chains connected to a loop that is welded to the tongue. Chain shall have yield strength equal to weight of trailer and payload or greater. Chain loop shall have yield strength equal to chain, or greater.

Screw Jack: Tongue mounted, 2,000-pound capacity, steel base 4" x 4" square foot, minimum size and capacity.

Leveling Legs: Adjustable, on 1" increments, with foot pads (4" x 4" minimum), mounted on four corners of frame, perforated 1 3/4" square tube x 12 gauge wall, locked in place by 3/8" diameter snapper pins, secured to the trailer frame by a wire cable or chain..

Hitch: Easily removable combination 2" diameter ball coupler and a 3-inch inside diameter flat pintle ring, adjustable 24-inch to 36-inch, in 2-inch increments.

Paint: Entire trailer - one coat primer, one coat Du pont Automotive Deluxe Enamel Code 93-75306 (yellow) or Chrome Enamel 13432 (yellow) of Federal Standard 595, or equal, including all surfaces under deck and on underside of fenders. A high-visibility, safety orange paint, such as Sherwin Williams Omaha Orange Paint, which is similar to Federal Standard 595B #12243, or equal, may be used in lieu of the yellow paint.

Lights: (DOT Approved) 12-volt, two tail/stop/turn signal; side, rear and tongue reflectors. No electrical connector required. Wires shall be identified as to function.

Power Supply - Diesel Engine Driven Generator Unit

Engine: Diesel, Lombardini 6LD260, 4 HP at 2800 RPM, 262 cc, 3-quart deep-sump, oil capacity with spin-on filter, dry cartridge air filter, electric and manual starter, run/off switch, start switch and 20 gal. fuel tank.

Starting Battery: 12-volt D.C., wet cell BCI Group 24 Marine, minimum 420 amps cold cranking, 2-hour reserve capacity.

Alternator: Delco direct driven with flexible coupling, 12-volt, 51-amp, voltage regulator, ammeter, non-resettable hour meter. A weather-resistant, metal enclosure shall be provided to house the meters and switches.

General

All units shall meet or exceed the specifications for advance warning arrow panels as listed in Part 6F.53 of the Federal Highway Administration's Manual on Uniform Traffic Control Devices (MUTCD) Millennium Edition, December, 2000.

Performance

The flashing arrow must be visible on a sunny day for a distance of one mile. The arrow panel support frame shall contain a device to align the arrow panel to oncoming traffic and to adjust the arrow panel so its bottom edge is relatively level when in use. The panel lamp must be visible during the "on time" at an angle of 15° minimum to both the left and right of center and 4° minimum both up and down of center.

Owner's Manual

The successful bidder shall furnish two Owner's Manuals for each arrow panel. Each manual shall include the manufacturer's instructions for maintenance and operation of the power supply, arrow panel and control. Each manual shall also include a detailed, schematic, wiring diagram showing all circuits and components from the power supply through the control to the arrow panel. The schematic diagram shall list all transistors, resistors, triacs, diodes and other components with the manufacturer's name and part number.

~ End Specification ~

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SPECIFICATION D

MISSOURI DEPARTMENT OF TRANSPORTATION (MoDOT) TRUCK MOUNTED FLASHING ARROW PANEL SPECIFICATIONS (TRUCK-SYSTEM POWERED, WITH LED LAMPS)

Description

The truck mounted flashing arrow panel shall consist of an arrow panel, mounting frame and rotating mechanism, remote control switches and circuitry, and a lockable control cabinet housing electronic components. Each unit shall be fully assembled when delivered.

Panel and Mounting Assembly

The arrow panel shall be aluminum and contain 15 LED lamps. Lamps shall be energized from remote control switches located inside the truck cab.

A nominal 5-inch, 360° tunnel visor with full attachment flange shall be provided for each lamp. Visors shall be attached to the panel with stainless steel machine screws and steel, blind-rivet nuts. Visors shall be removable without removing the screws. A nominal 1/2-inch, butyl rubber or neoprene gasket shall be provided between each lamp and the panel face to absorb vibration and prevent intrusion of moisture. The panel or lamp holder shall be notched to match a projection on the lamp to ensure proper lamp alignment. All lamps shall be replaceable from the front of the panel.

A lamp of the same type used on the panel face shall be provided on the back side of the panel and be continuously energized or flashed when the arrow panel is operating. A visor is not required on this lamp. It shall be located in the uppermost corner of the panel on the driver's side.

LED Lamps shall be 12-volt DC, PAR-46, yellow, LED type and each lamp shall meet the existing MoDOT specifications for visibility and legibility performance standards stated later in these specifications.

Overall size of the arrow panel shall be a nominal 3 feet by 6 feet.

Panel mounting height shall be a nominal 4 1/2 feet from the bottom of the support frame to the lowest point on the panel.

The arrow panel shall consist of a nominal 3-inch by 1-inch by 1/8 inch welded aluminum channel with a 1/16 inch thick aluminum sheet attached to the front and back. A nominal 6-inch square, removable panel shall be provided on the back panel to provide access to the control cable connector and ground wire bus. The access panel shall have a rubber or neoprene gasket. The interior of the panel shall be reinforced with aluminum spacers and nylon spacers. The front and back surfaces of the panel shall be painted non-reflective flat black. All wiring inside the arrow panel shall be corrosion resistant wiring and shall be attached to the panel approximately every 8-inches. Company names or logos shall not be placed on the arrow panel.

The arrow panel shall be supported on a four vertical post framework consisting of 2-inch by 2-inch by 1/8 inch welded steel tubing. All open ends of tubing shall be capped and welded shut. The panel shall be rotatable from a horizontal to a vertical position electrically, hydraulically, by winch and cable (minimum 1/4" diameter, galvanized, aircraft cable) with automatic brake, with a screw-type mechanism, or by a self-locking, manually operated square stainless steel tube. Manually

operated winch mechanisms shall be located on the right, or passenger, side of the truck. (See the drawing on Attachment 2.). The supporting frame shall have a locking device to secure the panel in the horizontal and vertical positions. When in the horizontal position, the panel shall rest on a rigid frame support, relieving the load from the rotating device. Angle and cross bracing of the vertical supports shall be provided at the top and bottom of the supports to ensure a rigid frame.

The support frame shall be painted one coat of primer and one coat of Dupont Automotive Deluxe Enamel Code 93-75306 (yellow), or Chrome Enamel 13432 (yellow) of Federal Standard 595, or equal. A high-visibility, safety orange paint, such as Sherwin Williams Omaha Orange Paint, which is similar to Federal Standard 595B #12243, or equal, may be used in lieu of yellow paint.

Control and Wiring: STANDARD CONTROL AND OPTIONAL WIRELESS

A remote cab control will be considered the standard control. An optional wireless remote control, if available, should perform the same functions as the remote cab control.

The remote cab control switches shall provide left and right flashing arrows, a double flashing arrow, and caution modes of operation. The caution mode shall consist of flashing 4 lamps using the upper and lower lamps of the left and right arrowheads and may be energized when the cab control power switch is placed in the "on" position. Left and right flashing arrows shall flash 10 lamps, 5 in arrowhead and 5 in the horizontal shank, simultaneously. The double flashing arrow shall flash 13 lamps, 5 in each arrowhead and 3 in the horizontal shank, simultaneously.

The remote cab control shall include an on/off switch, a dim/bright selector switch, an operation mode selector switch, an LED "power -on" lamp, and be equipped for top of dash mounting. The control shall be provided with at least 30 feet of multi-conductor, salt-resistant, weatherproof cable. The remote cab control shall be assembled in a manner to allow easy access to internal circuitry and switches for service and repair, such as with machine screws. All electronic components shall be solid state and electrically protected by fuses or circuit breakers.

The optional wireless remote control unit shall be FCC approved. The wireless modules should derive power from the controller and remote respectively.

The flashing rate of the lamps shall not be less than 25 or greater than 40 flashes per minute. Lamp "on-time" shall be at least 50 percent.

Control circuitry shall provide a minimum 50 percent voltage reduction to all lamps during night operation. Dimming shall be by manual and automatic control. The photoelectric cell shall automatically reduce the flashing arrow light intensity as ambient light reduces by reducing the voltage to the lamps from 12-volts to 6 volts. When in the dimmed condition, voltage to any lamp shall be within 1.5 volts of the voltage to any other lamp. The weatherproof, photoelectric control shall be mounted on the bottom or side of the arrow panel with a watertight fitting.

A readily accessible cartridge fuse or circuit breaker shall be provided at the power supply end of the circuit between the power supply and cab power switch control. The fuse or breaker shall be rated to handle the maximum lamp load of 14 lamps. An additional fuse or breaker shall be located on the controller cabinet, protecting the circuit supplying the remote cab control.

The arrow panel electronic components shall be housed in a salt-resistant, weatherproof cabinet. The cabinet may be mounted to the arrow panel support frame or located in the truck cab behind the seat. The cabinet door shall contain a gasket and a non-ferrous metal locking mechanism with provision for padlocking if located on the support frame. A baffle shall be placed inside the cabinet to prevent water from reaching electrical components through ventilation louvers, if used. No openings will be permitted in the cabinet top. All wiring entrances to the cabinet shall be through

salt-resistant, weatherproof connections. All electrical and electronic components in the cabinet shall be readily accessible, removable and serviceable. All electronic components shall be mounted on only one side of the circuit board. All components shall be labeled or coded and printed at their location on the circuit board. If condensation drains are provided in the bottom of the cabinet, they shall be protected from road splash. After assembly, all circuit boards and terminals shall be thoroughly cleaned and coated with clear acrylic or clear polyurethane.

All wiring and electrical and electronic equipment shall be capable of carrying an electrical load of 150 percent of maximum amperage rating of the unit. Solid-state devices containing non-accessible or non-replaceable components will not be permitted. Riveted load switches or heat sinks or solder connected integrated circuits will not be permitted or accepted.

Control circuitry shall provide a negative, 12-volt ground to each lamp at all times. Frame ground circuitry to the lamps will not be permitted. A ground circuit shall be supplied to a ground bus bar or terminal strip inside the arrow panel through a minimum of two # 12 AWG conductors. Individual ground circuits to each lamp shall be provided from the bus bar or terminal strip through a minimum of # 16 AWG conductors.

The positive, or plus, 12-volt power shall be supplied to each lamp through a minimum of # 16 AWG conductors from solid-state load switches in the control cabinet. A barrier terminal strip for the positive voltage conductors will not be required or permitted inside the arrow panel. Conductors shall connect from the lamps to the 14-pin, male connector on the bottom edge or front face of the panel. Continuous, plus, 12 volts to the lamps will not be permitted. The plus 12 volts to each lamp shall be reduced to zero voltage by the solid-state load switches.

The arrow panel and control cabinet shall be interconnected through a multi-conductor control cable or individual conductors in an electrical, flexible, salt-resistant, waterproof conduit. Length of the control cable shall be determined by the manufacturer, but not less than 30 feet if the control cabinet is located in the truck cab. Control cable length shall be sufficient to permit arrow panel rotation without binding or kinking the cable. A 14-pin, female connector shall be affixed to each end of the control cable. Caps or covers shall be provided for one end of the control cable and for the connector on the arrow panel to protect the connectors when disconnected, if the control is located in the truck cab.

A male, 14-pin connector shall be located on the bottom or side of the control cabinet. The connector shall be installed inside the control cabinet and retained by a clip or clips or stainless steel machine screws to permit removal from the cabinet without disconnecting wires from the control.

Control connectors shall be metal, salt-resistant, weatherproof, 14-contact Amphanol MS 3106 A 28-02 P plug, or equivalent amp-type connectors, with cable clamp and boot and MS 3102 A 28-02 S socket. Power supply connectors shall be metal, salt-resistant weatherproof, 2-contact Amphanol MS 3106 A 22-01 P plug, or equivalent amp-type connectors, with cable clamp and boot and MS 3106 A 22-01 S socket.

Pin assignments shall be as shown in Attachment 1.

Electrical conductors between the cab control switches and control cabinet and between the control cabinet and arrow panel shall be Type THW UL approved, salt-resistant, weatherproof, multi-conductor cable or single conductors. Conductors shall be soft-drawn, Class B or C stranded copper wire meeting the requirements of IPCEA S-61-402, Part 2.

Electrical circuits between the control and power supply shall be UL approved single conductors in an electrical, flexible, salt-resistant, waterproof conduit or multiple conductor Type THW cable. Minimum conductor size shall be #10 AWG. Conductors shall be soft-drawn, Class B or C

stranded copper wire meeting the requirements of IPCEA S-61-402, Part 2.

Crimp-on lugs, with amperage ratings equivalent to the conductor size, shall be used for all terminal connections of stranded copper conductors not connected to amphanol, or equivalent amp-type, connectors.

Performance

The flashing arrow must be visible on a sunny day for a distance of one mile. The arrow panel support frame shall contain a device to align the arrow panel to oncoming traffic and to adjust the arrow panel so its bottom edge is relatively level when in use. The panel lamp must be visible during the "on time" at an angle of 15° minimum to both the left and right of center and 4° minimum both up and down of center.

General

All units shall meet or exceed the specifications for advance warning arrow panels as listed in Part 6F.53 of the Federal Highway Administration's Manual on Uniform Traffic Control Devices (MUTCD) Millennium Edition, December, 2000. Units shall be skid mounted to slip into the back of dump truck.

Owner's Manual

The successful bidder shall furnish two Owner's Manuals for each arrow panel. Each manual shall include the manufacturer's instructions for maintenance and operation of the arrow panel and control. Each manual shall also include a detailed, schematic, wiring diagram showing all circuits and components from the power supply through the control to the arrow panel. The schematic diagram shall list all transistors, resistors, triacs, diodes and other components with the manufacturer's name and part number.

~ End Specification ~

SPECIFICATION E

MISSOURI DEPARTMENT OF TRANSPORTATION (MoDOT) TRUCK MOUNTED FLASHING ARROW PANEL SPECIFICATIONS (SOLAR POWERED, WITH LED LAMPS)

Description

The truck mounted flashing arrow panel shall consist of an arrow panel, mounting frame and rotating mechanism, remote control switches and circuitry, a control cabinet housing electronic components mounted in a self-contained power supply. Each unit shall be fully assembled when delivered.

Panel and Mounting Assembly

The arrow panel shall be aluminum and contain a minimum of 15 LED (Light Emitting Diode) lamps. Lamps shall be energized from a control cabinet mounted inside the battery compartment and controlled by remote control switches located inside the truck cab.

A nominal 5 1/2-inch, 360° tunnel visor with full attachment flange shall be provided for each lamp. Visors shall be attached to the panel with stainless steel machine screws. Visors shall be removable without removing the screws. The panel or lamp holder shall be notched to match a projection on the lamp to ensure proper lamp alignment. All lamps shall be replaceable from the front of the panel.

A lamp of the same type used on the panel face shall be provided on the backside of the panel and be continuously energized or flashed when the arrow panel is operating. A visor is not required on this lamp. It shall be located in the uppermost corner of the panel on the driver's side.

Lamps shall be PAR-46, yellow, 5 1/2" dia., LED lamps, specifically designed for solar applications. Each lamp shall have an optical lens and contain enough light emitting diodes to meet the existing MoDOT specifications for visibility and legibility performance standards as stated later in these specifications.

Overall size of the arrow panel shall be a nominal 3 feet by 6 feet.

Panel mounting height shall be a nominal 4 1/2 feet from the bottom of the support frame to the lowest point on the panel.

The arrow panel shall consist of a nominal 3-inch by 1 inch by 1/8 inch welded aluminum channel with a 1/16 inch thick aluminum sheet attached to the front and back. The front and back surfaces of the panel shall be painted non-reflective flat black. All wiring inside the arrow panel shall be corrosion resistant wiring and shall be attached to the panel approximately every 8-inches. Company names or logos shall not be placed on the arrow panel.

The arrow panel shall be supported on a four vertical post framework consisting of a minimum of 2-inch by 2-inch by 1/8 inch thick welded steel tubing. All open ends of tubing shall be capped and welded shut. The panel shall be rotatable from a horizontal to a vertical position electrically, hydraulically, by winch and cable (minimum 1/4" diameter, galvanized aircraft cable) with automatic brake, with a screw type mechanism, or by a self-locking, manually operated square stainless steel tube. All manually operated winch mechanisms shall be mounted on the right, or passenger, side of the truck, as according to the drawing on Attachment 2.

The supporting frame shall have a locking device to secure the panel in the horizontal and vertical positions. When in the horizontal position, the panel shall rest on a rigid frame support, relieving the load from the rotating device. Angle and cross bracing of the vertical supports shall be provided at the top and bottom of the supports to ensure a rigid frame. **(See the drawing on Attachment 2.)**

The support frame shall be painted one coat of primer and one coat of Dupont Automotive Deluxe Enamel Code 93-75306 (yellow), or Chrome Enamel 13432 (yellow), of Federal Standard 595, or equal. A high-

visibility, safety orange paint, such as Sherwin Williams Omaha Orange Paint, which is similar to Federal Standard 595B #12243, or equal, may be used in lieu of yellow paint.

Control and Wiring: STANDARD CONTROL AND OPTIONAL WIRELESS

A remote cab control will be considered the standard control. An optional wireless remote control, if available, should perform the same functions as the remote cab control.

The remote cab control switches shall provide left and right flashing arrows, a double flashing arrow, and caution modes of operation. The caution mode shall consist of flashing 4 lamps using the upper and lower lamps of the left and right arrowheads and may be energized when the cab control power switch is placed in the "on" position. Left and right flashing arrows shall flash 10 lamps; 5 in the arrowhead and 5 in the horizontal shank, simultaneously. The double flashing arrow shall flash 13 lamps; 5 in each arrowhead and 3 in the horizontal shank, simultaneously.

The remote cab control shall include an on/off switch, a dim/bright selector switch, an operation mode selector switch, an LED power-on lamp, and be equipped for top of dash mounting. The control shall be provided with at least 30 feet of multi-conductor, salt-resistant, weatherproof cable and a NEMA 4 surface base with cover connector plug to connect to the NEMA 4 side entry hood connector mounted approximately 4 feet from the base of the frame and controller. (See the drawing on Attachment 2.) All electronic components shall be solid state and electrically protected by fuses or circuit breakers. The remote cab control shall be assembled in a manner to allow easy access to internal circuitry and switches for service and repair, such as with machine screws.

The optional wireless remote control unit shall be FCC approved. The wireless modules should derive power from the controller and remote respectively

The flashing rate of the lamps shall not be less than 25 or greater than 40 flashes per minute. Lamp "on-time" shall be at least 50 percent.

Control circuitry shall provide dimming of all lamps to prevent blinding during night operation. Dimming shall be by manual and automatic control. The photoelectric cell shall automatically reduce the flashing arrow light intensity as ambient light reduces. The weatherproof photoelectric control shall be mounted on the side of the battery box.

A readily accessible cartridge fuse or circuit breaker shall be provided at the power supply end of the circuit between the power supply and controller mounted inside of the battery box. The fuse or breaker shall be rated to handle the maximum lamp load of 14 lamps. An additional fuse or breaker shall be located on the controller cabinet, protecting the circuit supplying the remote cab control.

Solar Panels: Solar panels shall be a minimum of 100-110 watt panels, with a remote battery charger backup. Solar panels shall be mounted above top of arrow panel with 4 degree pitch from the horizontal position to encourage shedding of dirt and rainwater.

Battery Charger: A built-in 50 amp, 120 volts AC input, 12 volts DC output, battery charger with charge indicator shall be included and shall be mounted at the base of the frame of the arrow panel support, inside a lockable, weatherproof, battery box.

Batteries: Batteries shall be the gel cell type; a minimum of 6 batteries, with a minimum of 700 amp-hours of energy when fully charged, wired to provide 12 volt DC power supply.

Battery Box: A lockable, weatherproof, battery box, mounted at the base of the frame of the arrow panel support, shall be made of minimum 14-gauge steel, with louvered side panels for cross-flow ventilation and with the bottom and sides coated with acid-resistant protector. The battery box shall be large enough to sufficiently house and service the controller, batteries and charger.

Voltage Regulator: The voltage regulator shall be solid-state, micro-processor-based, utilizing constant

positive drive voltage and pulse with modulation to optimize battery charging, measuring battery voltage and adjusting current from the solar panels so the batteries are not overcharged and also prevent overcharging of batteries by the solar panels when the sign is turned off. An automatic disconnect device shall be included to protect the entire system in case of low voltage.

Controller: A solid-state, LED optimized, controller shall be utilized to minimize wattage consumption and maximize battery life. The control circuitry shall provide a negative ground to each lamp at all times. Frame-ground circuitry to the lamps will not be permitted. Individual ground circuits to each lamp shall be provided. Positive power shall be supplied to each lamp through individual circuits from solid-state load switches in the control cabinet. The controller cabinet shall be assembled in a manner to allow easy access to internal control circuitry, such as with machine screws, for service and repair purposes. The controller shall be provided with approximately a 4 foot long weather and salt-resistant, multi-conductor cable and side entry hood connector to provide a means of connection from the remote cab control. (See the drawing on Attachment 2.) Continuous, positive 12-volts to the lamps will not be permitted. The positive power to each lamp shall be reduced to zero voltage by the solid-state load switches. It shall have reverse-polarity and short-circuit protection. The voltage regulator and controller shall be in a lockable, weatherproof, aluminum enclosure mounted inside the lockable, weatherproof, battery box mounted at the base of the frame.

Disconnect and Enclosures: Disconnect plug and receptacle shall be determined by the current, voltage and number of contacts required for proper operation. Connectors shall have screw terminations and accommodate a wire size of up to # 12 AWG. The male connector shall be enclosed in a NEMA 4 rated surface base enclosure with cover. The female connector shall be enclosed in a NEMA 4 side-entry hood enclosure. Multi-conductor cable shall enter the bottom of the enclosures through a waterproof, flame-resistant and salt and corrosion resistant cable connector with a sealing nut and internal ratchet containing a neoprene cable gland. (**See the drawing on Attachment 2.**)

Locks: A lockable box shall be mounted on the frame of the arrow panel support to protect the batteries and battery charger from theft and damage from falling or flying objects.

General

All units shall meet or exceed the specifications for advance warning arrow panels as listed in Part 6F.53 of the Federal Highway Administration's Manual on Uniform Traffic Control Devices (MUTCD) Millennium Edition, December, 2000. Units shall be skid mounted to slip into the back of dump trucks.

Performance

The flashing arrow must be visible on a sunny day for a distance of one mile. The flashing arrow must be able to operate for 20 continuous days in the single arrow mode during day/night light conditions with the solar panel disconnected or covered.. A device shall be provided to indicate the remaining charge in the batteries. The arrow panel support frame shall contain a device to align the arrow panel to oncoming traffic and to adjust the arrow panel so its bottom edge is relatively level when in use. The panel lamp must be visible during the "on-time" at an angle of 15° minimum to both the left and right of center and 4° minimum both up and down of center.

Owner's Manual

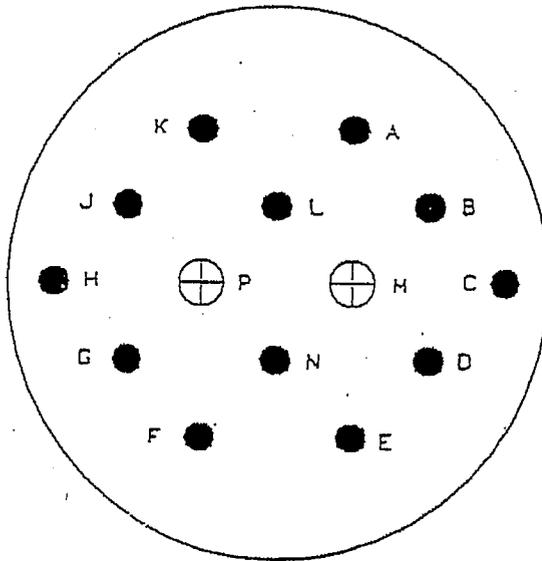
The successful bidder shall furnish two Owner's Manuals for each arrow panel. Each manual shall include the manufacturer's instructions for maintenance and operation of the power supply, arrow panel and control. Each manual shall also include a detailed, schematic, wiring diagram showing all circuits and components from the power supply through the control to the arrow panel. The schematic diagram shall list all transistors, resistors, triacs, diodes and other components with the manufacturer's name and part number.

~ End Specification ~

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ATTACHMENT ONE

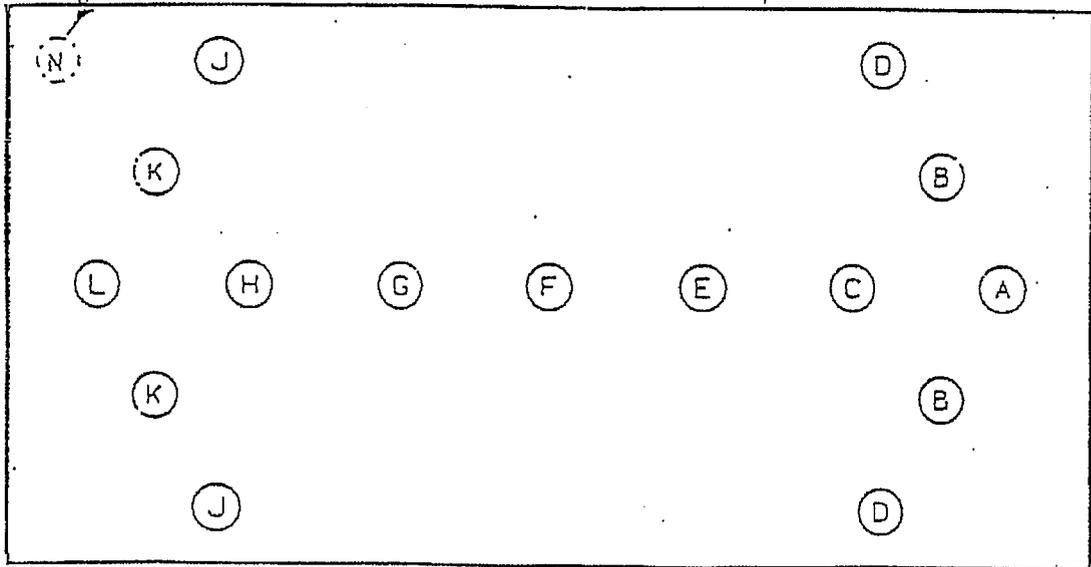
14 PIN
CONNECTOR



● 16 AWG

⊕ 12 AWG
(GROUND)

ON BACK SIDE OF PANEL



SUPPLIER TO DESIGNATE WIRING COLOR CODE.
PINS M AND P ARE NEGATIVE 12-VOLT GROUND.

MET 4-95

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 (6th) 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.

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

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.

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