

**SECTION 905 -- PROPOSAL (CONTINUED)**

I (We) hereby certify by digital signature and electronic submission via Bid Express of the Section 905 proposal below, that all certifications, disclosures and affidavits incorporated herein are deemed to be duly executed in the aggregate, fully enforceable and binding upon delivery of the bid proposal. I (We) further acknowledge that this certification shall not extend to the bid bond or alternate security which must be separately executed for the benefit of the Commission. This signature does not cure deficiencies in any required certifications, disclosures and/or affidavits. I (We) also acknowledge the right of the Commission to require full and final execution on any certification, disclosure or affidavit contained in the proposal at the Commission's election upon award. Failure to so execute at the Commission's request within the time allowed in the Standard Specifications for execution of all contract documents will result in forfeiture of the bid bond or alternate security.

Bidder acknowledges receipt of and has added to and made a part of the proposal and contract documents the following addendum (addenda):

ADDENDUM NO. <u>  1  </u>	DATED <u>  1/18/2022  </u>	ADDENDUM NO. <u>          </u>	DATED <u>          </u>
ADDENDUM NO. <u>          </u>	DATED <u>          </u>	ADDENDUM NO. <u>          </u>	DATED <u>          </u>
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Number	Description
1	Revised Table of Contents; Add NTB No. 3771; Revised Wage Rates; SP 907-639-3 replaces SP 907-639-2; Amendment EBSx Download Required.

TOTAL ADDENDA:   1    
(Must agree with total addenda issued prior to opening of bids)

Respectfully Submitted,

DATE \_\_\_\_\_

\_\_\_\_\_  
Contractor

BY \_\_\_\_\_  
Signature

TITLE \_\_\_\_\_

ADDRESS \_\_\_\_\_

CITY, STATE, ZIP \_\_\_\_\_

PHONE \_\_\_\_\_

FAX \_\_\_\_\_

E-MAIL \_\_\_\_\_

(To be filled in if a corporation)

Our corporation is chartered under the Laws of the State of \_\_\_\_\_ and the names, titles and business addresses of the executives are as follows:

\_\_\_\_\_  
President Address

\_\_\_\_\_  
Secretary Address

\_\_\_\_\_  
Treasurer Address

The following is my (our) itemized proposal.

ER-0003-01(215)/ 108756301000 & ER-0003-01(215)/ 108757302000

Hancock & Harrison County(ies)

Revised 01/26/2016

**MISSISSIPPI DEPARTMENT OF TRANSPORTATION  
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**PROJECT: ER-0003-01(215)/108756301 - Hancock  
ER-0003-01(215)/108757302 - Harrison**

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OF SECTION 905 AS ADDENDA)

01/20/2022 04:37 PM

## MISSISSIPPI DEPARTMENT OF TRANSPORTATION

**SECTION 904 -NOTICE TO BIDDERS NO. 3771**

**CODE: (SP)**

**DATE: 1/20/2022**

**SUBJECT: Additional Construction Requirements**

**PROJECT: ER-0003-01(215) / 108756301 & 108757302 – Hancock & Harrison Counties**

Bidders are hereby advised that the Department has agreements in place with the structure owners to locate the equipment as shown in the plans and contract documents. The Contractor will be required to contact the property owner and structure owner and make arrangements to perform the required work at each location.

Bidders are also advised of the following requirements of Pay Item No. 907-632-PP002, Repair of Traffic Signal Equipment Ground System, that are in addition to information on the Contract Plans. The Contractor shall correct any apparent problems found with the grounding system. The Contractor shall conduct a light investigation with a shovel to attempt to find the ground rods and replace any missing rods. If everything is determined to be correct after the investigation, the Contractor shall test the resistance by unhooking the ground wire from the pole and testing it. If the reading is 10 ohms or less, then no further work is required. The Contractor is not expected to do an extensive excavation to investigate the ground rods in an area where replacing the rods is not feasible, such as poles that are completely encased in a sidewalk with no way to get outside of the pole base. In these situations, the ground rod may be omitted if it is agreeable to the Engineer. If necessary, the Contractor may utilize the signal conduit and drive a ground rod in the adjacent pullbox. In the event there is no pullbox present adjacent to the pole, the required traveling ground will sufficiently supply the grounding requirement.

"General Decision Number: MS20220132 01/07/2022

Superseded General Decision Number: MS20210132

State: Mississippi

Construction Type: Highway

County: Hancock County in Mississippi.

HIGHWAY CONSTRUCTION PROJECTS

Note: Contracts subject to the Davis-Bacon Act are generally required to pay at least the applicable minimum wage rate required under Executive Order 14026 or Executive Order 13658. Please note that these Executive Orders apply to covered contracts entered into by the federal government that are subject to the Davis-Bacon Act itself, but do not apply to contracts subject only to the Davis-Bacon Related Acts, including those set forth at 29 CFR 5.1(a)(2)-(60).

If the contract is entered into on or after January 30, 2022, or the contract is renewed or extended (e.g., an option is exercised) on or after January 30, 2022, Executive Order 14026 generally applies to the contract. The contractor must pay all covered workers at least \$15.00 per hour (or the applicable wage rate listed on this wage determination, if it is higher) for all hours spent performing on that contract in 2022.

If the contract was awarded on or between January 1, 2015 and January 29, 2022, and the contract is not renewed or extended on or after January 30, 2022, Executive Order 13658 generally applies to the contract. The contractor must pay all covered workers at least \$11.25 per hour (or the applicable wage rate listed on this wage determination, if it is higher) for all hours spent performing on that contract in 2022.

The applicable Executive Order minimum wage rate will be adjusted annually. If this contract is covered by one of the Executive Orders and a classification considered necessary for performance of work on the contract does not appear on this wage determination, the contractor must still submit a conformance request.

Additional information on contractor requirements and worker protections under the Executive Orders is available at [www.dol.gov/whd/govcontracts](http://www.dol.gov/whd/govcontracts).

Modification Number      Publication Date  
 0                              01/07/2022

SUMS2010-055 08/04/2014

	Rates	Fringes
CARPENTER (Form Work Only).....	\$ 14.53	0.00

CEMENT MASON/CONCRETE FINISHER...\$ 15.25	0.00
ELECTRICIAN.....\$ 25.57	6.79
HIGHWAY/PARKING LOT STRIPING: Truck Driver (Line Striping Truck).....\$ 14.75	0.00
INSTALLER - SIGN.....\$ 13.00	0.00
INSTALLER: Guardrail.....\$ 11.78	0.00
IRONWORKER, REINFORCING.....\$ 16.44	0.00
LABORER: Asphalt, Includes Raker, Shoveler, Spreader and Distributor.....\$ 12.55	0.00
LABORER: Common or General.....\$ 10.50	0.00
LABORER: Flagger.....\$ 10.88	0.00
LABORER: Grade Checker.....\$ 16.13	0.00
LABORER: Landscape.....\$ 12.00	0.00
LABORER: Luteman.....\$ 12.88	0.00
LABORER: Mason Tender - Cement/Concrete.....\$ 13.04	0.00
LABORER: Pipelayer.....\$ 13.24	0.00
LABORER: Laborer-Cones/ Barricades/Barrels - Setter/Mover/Sweeper.....\$ 13.19	0.00
OPERATOR: Asphalt Spreader.....\$ 14.71	0.00
OPERATOR: Backhoe/Excavator/Trackhoe.....\$ 13.20	0.00
OPERATOR: Bobcat/Skid Steer/Skid Loader.....\$ 11.86	0.00
OPERATOR: Broom/Sweeper.....\$ 13.33	0.00
OPERATOR: Bulldozer.....\$ 14.38	0.00
OPERATOR: Concrete Saw.....\$ 14.68	0.00
OPERATOR: Crane.....\$ 15.89	0.00
OPERATOR: Distributor.....\$ 13.91	0.00
OPERATOR: Grader/Blade.....\$ 16.62	0.00
OPERATOR: Loader.....\$ 12.00	0.00
OPERATOR: Mechanic.....\$ 18.44	0.00
OPERATOR: Milling Machine.....\$ 15.91	0.00
OPERATOR: Oiler.....\$ 12.22	0.00

OPERATOR: Paver (Asphalt, Aggregate, and Concrete).....	\$ 16.43	0.00
OPERATOR: Roller (All Types)....	\$ 14.24	0.00
OPERATOR: Scraper.....	\$ 14.00	0.00
OPERATOR: Tractor.....	\$ 12.83	0.00
TRUCK DRIVER: Flatbed Truck.....	\$ 14.72	0.00
TRUCK DRIVER: Lowboy Truck.....	\$ 11.00	0.00
TRUCK DRIVER: Mechanic.....	\$ 12.31	0.00
TRUCK DRIVER: Water Truck.....	\$ 17.08	0.00
TRUCK DRIVER: Dump Truck (All Types).....	\$ 14.59	0.00
TRUCK DRIVER: Semi/Trailer Truck.....	\$ 14.36	0.00

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WELDERS - Receive rate prescribed for craft performing operation to which welding is incidental.

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Note: Executive Order (EO) 13706, Establishing Paid Sick Leave for Federal Contractors applies to all contracts subject to the Davis-Bacon Act for which the contract is awarded (and any solicitation was issued) on or after January 1, 2017. If this contract is covered by the EO, the contractor must provide employees with 1 hour of paid sick leave for every 30 hours they work, up to 56 hours of paid sick leave each year. Employees must be permitted to use paid sick leave for their own illness, injury or other health-related needs, including preventive care; to assist a family member (or person who is like family to the employee) who is ill, injured, or has other health-related needs, including preventive care; or for reasons resulting from, or to assist a family member (or person who is like family to the employee) who is a victim of, domestic violence, sexual assault, or stalking. Additional information on contractor requirements and worker protections under the EO is available at [www.dol.gov/whd/govcontracts](http://www.dol.gov/whd/govcontracts).

Unlisted classifications needed for work not included within the scope of the classifications listed may be added after award only as provided in the labor standards contract clauses (29CFR 5.5 (a) (1) (ii)).

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The body of each wage determination lists the classification and wage rates that have been found to be prevailing for the cited type(s) of construction in the area covered by the wage determination. The classifications are listed in alphabetical order of ""identifiers"" that indicate whether the particular rate is a union rate (current union negotiated rate for local), a survey rate (weighted average rate) or a union average rate (weighted union average rate).

### Union Rate Identifiers

A four letter classification abbreviation identifier enclosed in dotted lines beginning with characters other than ""SU"" or ""UAVG"" denotes that the union classification and rate were prevailing for that classification in the survey. Example: PLUM0198-005 07/01/2014. PLUM is an abbreviation identifier of the union, which prevailed in the survey for this classification, which in this example would be Plumbers 0198 indicates the local union number or district council number where applicable, i.e., Plumbers Local 0198. The next number, 005 in the example, is an internal number used in processing the wage determination. 07/01/2014 is the effective date of the most current negotiated rate, which in this example is July 1, 2014.

Union prevailing wage rates are updated to reflect all rate changes in the collective bargaining agreement (CBA) governing this classification and rate.

### Survey Rate Identifiers

Classifications listed under the ""SU"" identifier indicate that no one rate prevailed for this classification in the survey and the published rate is derived by computing a weighted average rate based on all the rates reported in the survey for that classification. As this weighted average rate includes all rates reported in the survey, it may include both union and non-union rates. Example: SULA2012-007 5/13/2014. SU indicates the rates are survey rates based on a weighted average calculation of rates and are not majority rates. LA indicates the State of Louisiana. 2012 is the year of survey on which these classifications and rates are based. The next number, 007 in the example, is an internal number used in producing the wage determination. 5/13/2014 indicates the survey completion date for the classifications and rates under that identifier.

Survey wage rates are not updated and remain in effect until a new survey is conducted.

### Union Average Rate Identifiers

Classification(s) listed under the UAVG identifier indicate that no single majority rate prevailed for those classifications; however, 100% of the data reported for the classifications was union data. EXAMPLE: UAVG-OH-0010 08/29/2014. UAVG indicates that the rate is a weighted union average rate. OH indicates the state. The next number, 0010 in the example, is an internal number used in producing the wage determination. 08/29/2014 indicates the survey completion date for the classifications and rates under that identifier.

A UAVG rate will be updated once a year, usually in January of each year, to reflect a weighted average of the current negotiated/CBA rate of the union locals from which the rate is based.

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### WAGE DETERMINATION APPEALS PROCESS

1.) Has there been an initial decision in the matter? This can



be:

- \* an existing published wage determination
- \* a survey underlying a wage determination
- \* a Wage and Hour Division letter setting forth a position on a wage determination matter
- \* a conformance (additional classification and rate) ruling

On survey related matters, initial contact, including requests for summaries of surveys, should be with the Wage and Hour Division National Office Branch of Wage Surveys. If the response from this initial contact is not satisfactory, then the process described in 2.) and 3.) should be followed.

With regard to any other matter not yet ripe for the formal process described here, initial contact should be with the Branch of Construction Wage Determinations. Write to:

Branch of Construction Wage Determinations  
 Wage and Hour Division  
 U.S. Department of Labor  
 200 Constitution Avenue, N.W.  
 Washington, DC 20210

2.) If the answer to the question in 1.) is yes, then an interested party (those affected by the action) can request review and reconsideration from the Wage and Hour Administrator (See 29 CFR Part 1.8 and 29 CFR Part 7). Write to:

Wage and Hour Administrator  
 U.S. Department of Labor  
 200 Constitution Avenue, N.W.  
 Washington, DC 20210

The request should be accompanied by a full statement of the interested party's position and by any information (wage payment data, project description, area practice material, etc.) that the requestor considers relevant to the issue.

3.) If the decision of the Administrator is not favorable, an interested party may appeal directly to the Administrative Review Board (formerly the Wage Appeals Board). Write to:

Administrative Review Board  
 U.S. Department of Labor  
 200 Constitution Avenue, N.W.  
 Washington, DC 20210

4.) All decisions by the Administrative Review Board are final.

=====

END OF GENERAL DECISION"

"General Decision Number: MS20220133 01/07/2022

Superseded General Decision Number: MS20210133

State: Mississippi

Construction Type: Highway

County: Harrison County in Mississippi.

HIGHWAY CONSTRUCTION PROJECTS

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OPERATOR: Broom/Sweeper.....	\$ 14.25	0.00
OPERATOR: Bulldozer.....	\$ 15.47	0.00
OPERATOR: Concrete Saw.....	\$ 14.96	3.27
OPERATOR: Crane.....	\$ 15.89	0.00
OPERATOR: Distributor.....	\$ 13.87	0.00
OPERATOR: Grader/Blade.....	\$ 16.44	0.00
OPERATOR: Loader.....	\$ 14.38	0.00
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### WAGE DETERMINATION APPEALS PROCESS

1.) Has there been an initial decision in the matter? This can

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With regard to any other matter not yet ripe for the formal process described here, initial contact should be with the Branch of Construction Wage Determinations. Write to:

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 U.S. Department of Labor  
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 U.S. Department of Labor  
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The request should be accompanied by a full statement of the interested party's position and by any information (wage payment data, project description, area practice material, etc.) that the requestor considers relevant to the issue.

3.) If the decision of the Administrator is not favorable, an interested party may appeal directly to the Administrative Review Board (formerly the Wage Appeals Board). Write to:

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 200 Constitution Avenue, N.W.  
 Washington, DC 20210

4.) All decisions by the Administrative Review Board are final.

=====

END OF GENERAL DECISION"

# MISSISSIPPI DEPARTMENT OF TRANSPORTATION

SPECIAL PROVISION NO. 907-639-3

CODE: (SP)

DATE: 03/10/2020

SUBJECT: Traffic Signal Preemption Systems

Section 639, Traffic Signal Preemption Systems, of the 2017 Edition of the Mississippi Standard Specifications for Road and Bridge Construction is hereby amended as follows.

Delete Section 639 on pages 566 thru 578, and substitute the following.

## SECTION 907-639 - TRAFFIC SIGNAL PREEMPTION SYSTEMS

**907-639.01--Description.** This item consists of providing Railroad Signal Preemption, Type 1, Type 2, and Type 3 Emergency Vehicle Preemption for the traffic signal controller in accordance with Plan details, the Standard Specifications, these specifications, and as directed by the Engineer.

The Type 1 Emergency Vehicle Preemption for the traffic signal controller shall use optical communication to identify the presence of designated priority vehicles and cause the traffic signal controller to advance to and/or hold a desired traffic signal display selected from phases normally available.

The Type 2 Emergency Vehicle Preemption for the traffic signal controller shall utilize Radio/GPS to identify the presence of designated priority vehicles and cause the traffic signal controller to advance to and/or hold a desired traffic signal display selected from phases normally available.

The Type 3 Emergency Vehicle Preemption with Remote Cabinet Monitoring for the traffic signal controller shall utilize Radio/GPS to identify the presence of designated priority vehicles and cause the traffic signal controller to advance to and/or hold a desired traffic signal display selected from phases normally available. The system also allows remote monitoring capabilities of Traffic Signals using either Ethernet communications via fiber or Cellular communications.

A confirmation lights and rotating beacons shall be utilized to indicate the activation of preemption call. The system shall initiate beacons indicating a priority call has been received. The system shall initiate a confirming steady white light to the approach direction from which the vehicle is approaching once the desired priority display has been received. The beacon and confirming white light shall remain energized until the preemption call is dropped.

**907-639.02--Materials.** All connections and equipment shall be new and constructed using the highest quality, commercially available components and techniques to assure high reliability and minimum maintenance of the emergency vehicle and railroad signal preemption systems.

The requirements for the emergency preemption vehicle equipment in Subsection 907-639.02.2.1 are to be furnished and installed by the local maintaining agencies and not the responsibility of the

Contractor. However, it is the responsibility of the Contractor to provide the intersection preemption equipment required in Subsections 907-639.02.2.2 and 907-639.03 that is compatible with the equipment listed in Subsection 907-639.02.2.1.

**907-639.02.1--Railroad Preemption.** The Railroad Signal Preemption shall consist of the minimum following components:

- Coordination
- Flagger (as required)
- Application Submittals (as required)
- Connections to hardware (as required)

**907-639.02.2--Type 1 Emergency Vehicle Preemption.** Emergency Vehicle Preemption Systems shall consist of the following principal Intersection Equipment components: Detectors/Receivers, Multimode Phase Selectors, and Auxiliary Interface Panel. The function intended for use with this system includes Emergency Vehicle Preemption to the traffic signal.

**907-639.02.2.1--Vehicle Equipment.**

**907-639.02.2.1.1--Emitter.** The emitter shall include a multi-purpose communication port compliant with the SAE J1708 communication standard. This port shall enable unit configuration to be set into the emitter and read from the emitter. It also shall allow real-time communication between the vehicle and the emitter.

An ON/OFF switch (available for each emitter) shall be equipped with an indicator light providing internal diagnostics to assist in troubleshooting.

While operating, the emitter shall conduct self-diagnostics designed to monitor data transmission integrity by checking for missing pulses. Any failures of the self-diagnostic tests shall be displayed by flashing of the ON/OFF switch indicator light.

The emitter shall be equipped with a disabling input that, when activated, will cause the emitter to stop flashing. This input shall eliminate the possibility of inadvertent signal transmission after the priority vehicle has arrived at its destination. The disable input shall be programmable to operate in either a latching or non-latching mode. Operation of the disable input shall be programmable using software.

The emitter shall provide operating modes that allow it to be powered on with the strobe/LEDs for activation of the preempt.

The emitter shall be powered by the DC voltage supplied from the battery of the vehicle, 10 to 32 volts DC.

The unit shall be equipped with a weatherproof in-line fuse holder and a weatherproof quick-disconnect plug.



The emitter shall contain visible light LEDs which may be user configured as follows:

- Flash at emitter flash rate during normal operation.
- Flash at diagnostic rate when unit has failed or is in disable mode.
- Off during normal operation, flash at diagnostic rate when unit has failed or is in
- Disable mode. The visible LEDs will be Off during normal operation.
- Flash once per second for ten (10) seconds at power up.
- Always Off: The visible LEDs will remain Off at all times.

The Emitter shall be supplied complete with a two (2) foot installation cable.

The flash sequence generated by the emitter shall carry three (3) types of information:

- The first type shall be one (1) of three (3) distinctly different base frequencies of:
  - 10Hz for a low priority emitter;
  - 14Hz for a high priority emitter; or
  - 12Hz for Probe frequency.
- The second type of information generated by the emitter shall be a vehicle classification and identification code that is interwoven into the base frequency flashes. Setting the vehicle classification and identification code shall be accomplished through Emitter Programming Software.
- The third type of information generated by the emitter shall be reserved for setting the intersection detection range. A specially equipped emitter control module with a range setting command switch will enable the Engineer to activate the range code from the vehicle.

The emitters shall use infrared LEDs with an angle of half intensity of  $\pm 10$  degrees to provide precise directionality control. The emitter shall operate over a temperature range of  $-30^{\circ}\text{F}$  to  $+165^{\circ}\text{F}$ . The emitter shall operate over a relative humidity range of 5% to 95%. Windows™ based software shall be available at no charge for programming the emitter through its SAE J1708 compatible multi-purpose port.

#### **907-639.02.2.2--Intersection Equipment.**

**907-639.02.2.2.1--Multimode Phase Selector.** The multimode phase selector recognizes inputs from both infrared and Radio/GPS activation methods at the intersection and supplies coordinated inputs to the controller.

The multimode phase selector shall be designed to be installed in the traffic controller cabinet and is intended for use directly with numerous controllers. These include Type 170/2070 controllers with compatible software, NEMA controllers, or other controllers along with the system card rack and suitable interface equipment and controller software.

The multimode phase selector shall include the ability to directly sense the green traffic controller signal indications through the use of dedicated sensing circuits and wires connected directly to field wire termination points in the traffic controller cabinet. This connection shall be made using the Auxiliary Interface Panel.

The multimode phase selector will be a plug-in, 4-channel, multiple-priority, multi-modal device intended to be installed directly into a card rack located within the controller cabinet. The multimode phase selector shall be capable of using existing infrared or Radio/GPS system card racks. The multimode phase selector shall be powered from either +24 VDC or 120 VAC.

The multimode phase selector shall support front-panel RS-232, USB and Ethernet interfaces to allow management by on-site interface software and central software. An RS-232 port shall be provided on the unit. Additional RS-232 communication ports shall be available using the Auxiliary Interface Panel.

The multimode phase selector shall have the capability of storing a minimum of 10,000 priority control calls. When the log is full, the phase selector shall drop the oldest entry to accommodate the new entry. The multimode phase selector shall store each call record in non-volatile memory and shall retain the record if power terminates.

The multimode phase selector shall support a minimum of 5,000 code pairs (agency ID, vehicle ID) for each of the priority levels, high and low, providing unique vehicle identification and system security implementation at the vehicle level.

The multimode phase selector shall include several programmable control timers that will limit or modify the duration of a priority control condition, by channel. The control timers will be as follows:

- Max call time
- Off approach call hold time
- Lost signal call hold time
- Call delay time

The multimode phase selector shall have the ability to enable or disable all calls of all priority levels. This shall be independently settable by channel.

A unique intersection name, which shall be broadcast, shall be settable for each Multimode Phase Selector.

Up to 25 different radio channels shall be available to be assigned to the multimode phase selector.

The multimode phase selector shall operate in a mode that shall vary the output based on the status of the approaching vehicle's turn signal. Additional outputs available on an auxiliary interface panel may be needed. Settings shall be available for this mode as follows:

- Output mappings for each channel.
- Separate setting for high and low priority levels.
- Separate settings for each left turn, right turn or straight signal status for each of the four (4) channels and priority levels.

The multimode phase selector's default values shall be programmable by the operator on-site or at a remote location.

The multimode phase selector shall be capable of three (3) levels of signal discrimination, as follows:

- Verification of the presence of the signal of either high priority or low priority.
- Verification that the vehicle is approaching the intersection within a prescribed
- Estimated Time of Arrival (ETA).
- Determination of when the vehicle is within the prescribed range, either by intensity level or distance from the intersection.

The multimode phase selector shall include one (1) opto-isolated NPN, or sinking, output per channel that provides the following electrical signal to the appropriate pin on the card edge connector:

- 6.25Hz  $\pm$ 0.1Hz 50% on/duty square wave in response to a low priority call.
- A steady ON in response to a high priority call.
- The multimode phase selector will also have the option of providing separate outputs for High and Low priority calls for controllers that do not recognize a 6.25 Hz pulsed
- low priority request.
- Additional outputs or output modes shall also be available on the Auxiliary Interface
- Panel in case of need for additional modes of operation.

The multimode phase selector shall accommodate the following three (3) methods for setting range thresholds for High and Low priority signals.

- Based on the approaching vehicle's Estimated Time of Arrival (ETA). This shall be settable between zero (0) and 255 seconds in one (1) second increments.
- Based on the approaching vehicle's distance from the intersection. This shall be settable in one (1) foot increments.
- Based on emitter intensity the system shall accommodate setting a separate range from 200 feet to 2,500 feet with range set points for both High and Low priority signals.

The multimode phase selector will have the following indicators:

- A status indicator that illuminates steadily to indicate proper operation.
- A link indicator on the multimode phase selector illuminates if other radios are within range.
- A radio indicator that indicates the status of the communication between the vehicle control unit and the Radio/GPS unit. The indicator illuminates to indicate that there is communication between the vehicle control unit and the Radio/GPS unit. The indicator illuminates to indicate that a GPS signal has been acquired and the 2.4 GHz radio is on the air.
- LED indicators (one (1) for high priority, one (1) for low priority) for each channel display

active calls as steady ON and pulse to indicate pending preemption requests.

The multimode phase selector shall have a test switch for each channel to test proper operation of High or Low Priority.

The multimode phase selector shall utilize the time obtained from the GPS satellites to time stamp the activity logs. The user will set the local time zone (offset from GPS time) via the interface software.

The interface software shall have the capability to set the multimode phase selector to automatically adjust the GPS time offset for changes in daylight savings time.

An auxiliary interface panel shall be available to facilitate interconnections between the multimode phase selector and traffic cabinet wiring as well as provide additional outputs.

A multimode phase selector port may be configured to output GPS data at a user selectable baud rate in the NMEA 0183format. It will output the following messages depending on the baud rate:

- GGA - Global Positioning System Fix Data (2400 baud and higher)
- GSA - GPS DOP and active satellites (2400 baud and higher)
- GSV - Satellites in view (4800 baud and higher)
- RMC - Recommended Minimum Navigation Information (1200 baud and higher)

The following diagnostic tests are incorporated in the multimode phase selector:

- Power up built in test
- Communications port tests
- Preemption output test call
- Detector response test

The multimode phase selector shall be capable of call bridging.

When used with a GPS radio unit, the multimode phase selector shall relay a priority request to the next adjacent intersection based on the direction indicated by the vehicle's turn signals.

The multimode phase selector shall support evacuation mode for Low priority calls. The multimode phase selector shall allow relative priority.

**907-639.02.2.2.1.1--Card Rack.** The required card rack shall provide simplified installation of a multimode phase selector into controller cabinets that do not already have a suitable card rack.

The card rack shall be factory wired with one (1) connector, located behind the card slot, and one (1) connector on the front of the card rack.

The card rack connector on the front shall provide for connections to the traffic controller.

The Contractor shall verify card rack requirements with the Engineer prior to submitting this equipment.

One (1) version of the card rack shall contain a 24 VDC power supply to power the phase selector. The power supply shall be capable of being powered by 100-240 VAC 50-60 Hz.

Another version of the card rack shall pass 120 VAC through to the rear card rack connector. This version shall provide labeled terminal blocks for connecting the primary infrared detectors to a phase selector.

Additionally, there shall be an optional card rack with a built-in Electromechanical Relay for use in switching high current loads such as flashers and gate operators. The relay shall be capable of switching the following loads.

<u>Resistive:</u> 10 A, 240 VAC 10 A, 30 VDC	<u>General Use:</u> 7.5 A, 120 VAC 7.5 A, 240 VAC 7 A, 30 VDC 1/6 hp, 120 VAC 1/3 hp, 240 VAC
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**907-639.02.2.2.2--Optical Detector.**

**907-639.02.2.2.2.1--General.** The optical detector shall be a light-weight, weather proof device capable of sensing and transforming pulsed optical energy into electrical signals for use by the traffic signal phase selection equipment.

**907-639.02.2.2.2.2--Functional Requirements.** The optical detector unit shall perform the following functions and meet the requirements listed below.

- a) The unit shall be high-impact polycarbonate construction with stainless steel and/or brass hardware. The unit shall be designed for easy mounting at or near an intersection on mast arm, pedestal, pole, or intersection span wire.
- b) The unit shall accept optical signals from one (1) or two (2) directions and provide a single electrical output signal, as specified in the plans. The unit shall include a design feature to allow aiming of the two optical sensing inputs for hills, skewed approaches or slight curves.
- c) The unit shall have built-in terminal strip to simplify wiring connections. The unit shall receive power from the traffic signal phase selector equipment and have internal voltage regulation to be operational from 16 to 40 volts AC.
- d) The unit shall be responsive to the optical emitter at a distance of 1,800 feet. The unit shall deliver the necessary electrical signal to the traffic signal phase selector equipment via up to 1,000 feet of optical detector cable.
- e) The unit shall employ replacement circuit board assembly and photocells to facilitate repair.

**907-639.02.2.2.3--Optical Detector Cable.** The optical detector cable shall meet the requirements listed below.

- a) The cable shall guarantee delivery of the necessary quality signal from the optical detector to the traffic signal phase selector equipment over non-spliced distance of 1,000 feet. The cable shall guarantee sufficient power to the optical detector over a non-spliced distance of 1,000 feet.
- b) The cable shall be of durable construction for installation by direct burial, in conduit or mast arm, or exposed overhead supported by messenger wire. The weight of the cable shall have a minimum insulation rating of 600 volts and a temperature rating of 80°C.
- c) The cable shall have three (3) conductors of AWG 20 stranded, individually tinned copper color coded as follows.
  1. Orange for delivery of optical detector power (+)
  2. Blue for optical detector power return (-)
  3. Yellow for optical detector signal

The conductors will be shielded with aluminized polyester and have an AWG #20 stranded and individually tinned drain wire to provide signal integrity and transient protection. The shield wrapping shall have 20% overlap to ensure integrity following conduit and mast arm pulls.

**907-639.02.2.2.4--Electrical and Environmental Requirements.** All equipment supplied as part of the priority control system intended for use in the controller cabinet shall meet the following electrical and environmental specifications spelled out in the NEMA Standards Publication TS 2-2003, Part 2: v02.06:

- Line voltage variations per NEMA TS 2-2003, Paragraph 2.1.2.
- Power source frequency per NEMA TS 2-2003, Paragraph 2.1.3.
- Power source noise transients per NEMA TS 2-2003, Paragraph 2.1.6
- Temperature range per NEMA TS 2-2003, Paragraph 2.1.5
- Humidity per NEMA TS 2-2003, Paragraph 2.1.5
- Shock test per NEMA TS 2-2003, Paragraph 2.2.9.
- Vibration per NEMA TS 2-2003, Paragraph 2.2.8
- Non-Destructive Transient immunity NEMA TS 2-2003, Paragraph 2.1.8.
- Input-output terminals NEMA TS 2-2003, Paragraph 2.1.7.
- FCC Part 15 Subpart B Class A EMC Standard
- Canada ICES-003, Issue 4:2004 Class A EMC Standard
- EN50293: 2000 Electromagnetic Compatibility--Road Traffic Signal Systems – Product Standard.
- EN 61326-1:2006 EMC Standard.
- EN 55011:2007 +A2:2007 EMC Standard.

**907-639.02.3--Type 2 Emergency Vehicle Preemption.** Emergency Vehicle Preemption Systems shall consist of the following principal Intersection Equipment components: Detectors/Receivers, Multimode Phase Selectors, and Auxiliary Interface Panel. The function intended for use with this system includes Emergency Vehicle Preemption to the traffic signal.

**907-639.02.3.1--Vehicle Equipment.**

**907-639.02.3.1.1--Vehicle Control Unit.** The vehicle control unit shall provide the interface between the vehicle and the priority control system. The vehicle control unit shall also interface with the Radio/GPS module. The vehicle control unit shall monitor the status of the vehicle turn signal via an interface cable that will connect between the vehicle control unit and the left and right turn signal lines in the vehicle. The vehicle control unit shall also monitor the disable input line as well as the remote activation input. Power to the vehicle equipment shall be provided through the vehicle control unit.

The vehicle shall transmit the following information when within range of an equipped intersection:

- The priority level of the vehicle equipment. This shall be either high priority or low priority. The priority level shall be factory set. Each vehicle control unit shall be capable of setting 254 different agency IDs and 15 different vehicle type classifications with 9,999 different identification numbers per class.
- The location, speed and heading of the vehicle.
- The status of the vehicle's turn signal.
- The radio channel as assigned by the intersection and the serial number of the Vehicle Control Unit.

The vehicle shall be capable of being wired so that the GPS data is available either while the equipment is requesting priority or when not requesting priority. The vehicle control unit shall be equipped with an ON/OFF switch to activate the system and request priority. The switch shall be depressed to activate the system. In addition, a remote activation line shall be provided to interface with other vehicle equipment. This line shall have +12 VDC applied to request priority. The equipment shall be configured to activate with the light bar/remote activation line or via the ON/OFF switch.

The vehicle equipment shall be supplied complete with a 20-foot minimum installation cable as well as a 15-foot minimum vehicle interface cable.

The vehicle control unit shall include multi-purpose communication ports compliant with the RS-232 communication standard. These ports shall enable unit configuration to be set into the vehicle control unit and read from vehicle control unit. It also shall allow real-time communication between the vehicle control unit and the interface computer as well as interfacing with other devices. One of the ports shall be configured to output GPS data at a user selectable baud rate in the NMEA format while the vehicle control unit is turned On. It shall output the following messages (depending on the baud rate):

- GGA Global Positioning System Fix Data (2400 baud and higher)
- GSA GPS DOP and active satellites (2400 baud and higher)
- GSV Satellites in view (4800 baud and higher)
- RMC Recommended Minimum Navigation Information (1200 baud and higher)

The vehicle control unit shall also have a series of indicator lights that will operate as follows:

- A power indicator as well as an indicator light in the switch will indicate that the equipment is powered On.
- A GPS indicator will indicate the status of GPS reception.
- An indicator will indicate the status of the communication between the vehicle control unit and the Radio/GPS unit.
- A disable indicator will indicate if the vehicle equipment is in a Disable mode. The disable indicator and the indicator in the power switch will flash green or any other color as approved by the Engineer.
- The indicators shall be capable of being programmed to provide feedback for the following:
  - Phase selector has received preemption request.
  - Another vehicle approaching the intersection has received the preemption request.
  - Phase selector has received preemption request and another equipped vehicle is approaching the intersection from another direction.

The vehicle control unit shall be equipped with a disable input that, when activated, will cause the radio to transmit that the vehicle is in Disable mode, thereby eliminating the possibility of the priority request continuing after the priority vehicle has arrived at its destination. The disable input shall be programmable to operate in either a latching or non- latching mode. The disable input shall be programmed so that the input may be activated by applying ground or by applying +12 VDC. Operation of the disable input shall be programmable using software. Additional inputs shall be included to temporarily switch the vehicle control unit to low priority and to Probe Mode. The vehicle equipment shall operate over a temperature range of -30°F to 165°F and a relative humidity range of 5% to 95%. Windows™ based software shall be available for programming the vehicle control unit through its RS-232 compatible multi-purpose port.

**907-639.02.3.1.1.1--Antenna.** A GPS receiver and antenna shall obtain the vehicle position, speed and heading from the GPS satellite system operated by the Department of Defense (DOD). The time information from the GPS satellites shall also be used to synchronize the frequency hopping of the 2.4 GHz radio.

The Radio/GPS antenna cables shall consist of a pair of 25-foot coax cables with factory terminated SMA connectors. One of these connectors shall have a pin and the other shall have a socket.

**907-639.02.3.1.1.2--Radio.** The Radio shall operate in the reserved Industrial, Scientific and Medical (ISM) communications band, requiring no license. A 2.4 GHz spread spectrum/frequency hopping radio shall provide the communications from the vehicle to the intersection when within range of a Radio/GPS equipped intersection. The radio shall have a transmit power of not more than one (1) watt. The radio shall have an unobstructed range of at least 2,500 feet. The radio shall meet FCC Part 15 rules. Radio link association and coordination among intersections and vehicles shall be automatic.

**907-639.02.3.2--Intersection Equipment.**

**907-639.02.3.2.1--Multimode Phase Selector.** The multimode phase selector recognizes inputs from both infrared and Radio/GPS activation methods at the intersection and supplies coordinated



inputs to the controller.

The multimode phase selector shall be designed to be installed in the traffic controller cabinet and is intended for use directly with numerous controllers. These include Type 170/2070 controllers with compatible software, NEMA controllers, or other controllers along with the system card rack and suitable interface equipment and controller software.

The multimode phase selector shall include the ability to directly sense the green traffic controller signal indications through the use of dedicated sensing circuits and wires connected directly to field wire termination points in the traffic controller cabinet. This connection shall be made using the Auxiliary Interface Panel.

The multimode phase selector will be a plug-in, 4-channel, multiple-priority, multi-modal device intended to be installed directly into a card rack located within the controller cabinet. The multimode phase selector shall be capable of using existing infrared or Radio/GPS system card racks. The multimode phase selector shall be powered from either +24 VDC or 120 VAC.

The multimode phase selector shall support front-panel RS-232, USB and Ethernet interfaces to allow management by on-site interface software and central software. An RS-232 port shall be provided on the unit. Additional RS-232 communication ports shall be available using the Auxiliary Interface Panel.

The multimode phase selector shall have the capability of storing a minimum of 10,000 priority control calls. When the log is full, the phase selector shall drop the oldest entry to accommodate the new entry. The multimode phase selector shall store each call record in non-volatile memory and shall retain the record if power terminates.

The multimode phase selector shall support a minimum of 5,000 code pairs (agency ID, vehicle ID) for each of the priority levels, high and low, providing unique vehicle identification and system security implementation at the vehicle level.

The multimode phase selector shall include several programmable control timers that will limit or modify the duration of a priority control condition, by channel. The control timers will be as follows:

- Max call time
- Off approach call hold time
- Lost signal call hold time
- Call delay time

The multimode phase selector shall have the ability to enable or disable all calls of all priority levels. This shall be independently settable by channel.

A unique intersection name, which shall be broadcast, shall be settable for each Multimode Phase Selector.

Up to 25 different radio channels shall be available to be assigned to the multimode phase selector.

The multimode phase selector shall operate in a mode that shall vary the output based on the status of the approaching vehicle's turn signal. Additional outputs available on an auxiliary interface panel may be needed. Settings shall be available for this mode as follows:

- Output mappings for each channel.
- Separate setting for high and low priority levels.
- Separate settings for each left turn, right turn or straight signal status for each of the four (4) channels and priority levels.

The multimode phase selector's default values shall be programmable by the operator on-site or at a remote location.

The multimode phase selector shall be capable of three (3) levels of signal discrimination, as follows:

- Verification of the presence of the signal of either high priority or low priority.
- Verification that the vehicle is approaching the intersection within a prescribed Estimated Time of Arrival (ETA).
- Determination of when the vehicle is within the prescribed range, either by intensity level or distance from the intersection.

The multimode phase selector shall include one (1) opto-isolated NPN, or sinking, output per channel that provides the following electrical signal to the appropriate pin on the card edge connector:

- 6.25Hz  $\pm$ 0.1Hz 50% on/duty square wave in response to a low priority call.
- A steady ON in response to a high priority call.
- The multimode phase selector will also have the option of providing separate outputs for High and Low priority calls for controllers that do not recognize a 6.25 Hz pulsed low priority request.
- Additional outputs or output modes shall also be available on the Auxiliary Interface Panel in case of need for additional modes of operation.

The multimode phase selector shall accommodate the following three (3) methods for setting range thresholds for High and Low priority signals.

- Based on the approaching vehicle's Estimated Time of Arrival (ETA). This shall be settable between zero (0) and 255 seconds in one (1) second increments.
- Based on the approaching vehicle's distance from the intersection. This shall be settable in one (1) foot increments.
- Based on emitter intensity the system shall accommodate setting a separate range from 200 feet to 2,500 feet with range set points for both High and Low priority signals.

The multimode phase selector will have the following indicators:

- A status indicator that illuminates steadily to indicate proper operation.
- A link indicator on the multimode phase selector illuminates if other radios are within range.
- A radio indicator that indicates the status of the communication between the vehicle control unit and the Radio/GPS unit. The indicator illuminates to indicate that there is communication between the vehicle control unit and the Radio/GPS unit. The indicator illuminates to indicate that a GPS signal has been acquired and the 2.4 GHz radio is on the air.
- LED indicators (one (1) for high priority, one (1) for low priority) for each channel display active calls as steady ON and pulse to indicate pending preemption requests.

The multimode phase selector shall have a test switch for each channel to test proper operation of High or Low Priority.

The multimode phase selector shall utilize the time obtained from the GPS satellites to time stamp the activity logs. The user will set the local time zone (offset from GPS time) via the interface software.

The interface software shall have the capability to set the multimode phase selector to automatically adjust the GPS time offset for changes in daylight savings time.

An auxiliary interface panel shall be available to facilitate interconnections between the multimode phase selector and traffic cabinet wiring as well as provide additional outputs.

A multimode phase selector port may be configured to output GPS data at a user selectable baud rate in the NMEA 0183format. It will output the following messages depending on the baud rate:

- GGA - Global Positioning System Fix Data (2400 baud and higher)
- GSA - GPS DOP and active satellites (2400 baud and higher)
- GSV - Satellites in view (4800 baud and higher)
- RMC - Recommended Minimum Navigation Information (1200 baud and higher)

The following diagnostic tests are incorporated in the multimode phase selector:

- Power up built in test
- Communications port tests
- Preemption output test call
- Detector response test

The multimode phase selector shall be capable of call bridging.

When used with a GPS radio unit, the multimode phase selector shall relay a priority request to the next adjacent intersection based on the direction indicated by the vehicle's turn signals.

The multimode phase selector shall support evacuation mode for Low priority calls. The

multimode phase selector shall allow relative priority.

**907-639.02.3.2.1.1--Card Rack.** The required card rack shall provide simplified installation of a multimode phase selector into controller cabinets that do not already have a suitable card rack.

The card rack shall be factory wired with one (1) connector, located behind the card slot, and one (1) connector on the front of the card rack.

The card rack connector on the front shall provide for connections to the traffic controller. The Contractor shall verify card rack requirements with the Engineer prior to submitting this equipment.

One (1) version of the card rack shall contain a 24 VDC power supply to power the phase selector. The power supply shall be capable of being powered by 100-240 VAC 50-60 Hz.

Another version of the card rack shall pass 120 VAC through to the rear card rack connector. This version shall provide labeled terminal blocks for connecting the primary infrared detectors to a phase selector.

Additionally, there shall be an optional card rack with a built-in Electromechanical Relay for use in switching high current loads such as flashers and gate operators. The relay shall be capable of switching the following loads.

<u>Resistive:</u> 10 A, 240 VAC 10 A, 30 VDC	<u>General Use:</u> 7.5 A, 120 VAC 7.5 A, 240 VAC 7 A, 30 VDC 1/6 hp, 120 VAC 1/3 hp, 240 VAC
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**907-639.02.3.2.2--Blank.**

**907-639.02.3.2.3--Intersection Radio/GPS Module.** A GPS receiver and antenna shall obtain the intersection position from the GPS satellite system operated by the DOD. The time information from the GPS satellites shall be used to synchronize the frequency hopping of the 2.4 GHz radio and to time stamp the activity log. The GPS receiver and the GPS antenna shall reside inside of the Radio/GPS module.

A 2.4 GHz spread spectrum/frequency hopping radio shall provide the communications from the intersection to the vehicle as well as from intersection to intersection, or as shown in the plans.

As an alternate, the following Radio/GPS unit and Radio GPS antenna may be used in the intersection.

The Radio/GPS antenna shall be a hemispherical dome with a pair of 15-foot coax cables with factory terminated SMA connectors. One (1) of these connectors shall have a pin and the other will have a socket. This antenna shall include one (1) element for receiving the GPS signal and

one (1) element for transmitting and receiving the radio signal. This antenna, along with the radio/GPS module, may also be used in the intersection.

The radio shall have a maximum transmit power of not more than one (1) watt. The radio shall have an unobstructed range of at least 2,500 feet. The radio will meet FCC Part 15 rules. The radio and the radio antenna shall reside inside of the Radio/GPS module.

The Radio/GPS module shall be housed in an impact resistant polycarbonate housing that will include a water resistant wire entry point. It shall contain a water resistant access cover to facilitate cable termination.

The Radio/GPS module shall be designed for mounting at or near an intersection on mast arms and span wire poles. Additional hardware may be needed.

The Radio/GPS module shall communicate to the multimode phase selector via a Radio/GPS cable up to 250 feet in length.

**907-639.02.3.2.4--Radio/GPS Cable.** The Radio/GPS cable shall deliver sufficient power from the multimode phase selector to the Radio/GPS module and will deliver the necessary quality signal from the Radio/GPS module to the multimode phase selector over a non-spliced distance of 250 feet.

Coaxial cable will not be permitted for this cable.

The Radio/GPS cable shall deliver sufficient power from the vehicle control unit to the Radio/GPS module and will deliver the necessary quality signal from the Radio/GPS module to the vehicle control unit over a non-spliced distance of 50 feet.

The cable shall be of durable construction to satisfy the following installations:

- Direct burial.
- Conduit and mast arm.
- Exposed overhead (supported by messenger wire)

The outside diameter of the cable shall not exceed 0.4 inches. The insulation rating of the cable shall be 300 volts minimum.

The temperature rating of the detector cable will be -40°F to +194°F.

The conductors shall be AWG #20 (7x28) stranded and individually tinned. The cable shall be shielded and have a drain wire to provide signal integrity and transient protection.

When the aluminum enclosure version of the Radio/GPS module is used, the Radio/GPS cable assembly shall use a 15-pin connector that will mate with the connector on the Radio/GPS module.

**907-639.02.3.2.5--Electrical and Environmental Requirements.** All equipment supplied as part

of the priority control system intended for use in the controller cabinet shall meet the following electrical and environmental specifications spelled out in the NEMA Standards Publication TS 2-2003, Part 2: v02.06:

- Line voltage variations per NEMA TS 2-2003, Paragraph 2.1.2.
- Power source frequency per NEMA TS 2-2003, Paragraph 2.1.3.
- Power source noise transients per NEMA TS 2-2003, Paragraph 2.1.6
- Temperature range per NEMA TS 2-2003, Paragraph 2.1.5
- Humidity per NEMA TS 2-2003, Paragraph 2.1.5
- Shock test per NEMA TS 2-2003, Paragraph 2.2.9.
- Vibration per NEMA TS 2-2003, Paragraph 2.2.8
- Non-Destructive Transient immunity NEMA TS 2-2003, Paragraph 2.1.8.
- Input-output terminals NEMA TS 2-2003, Paragraph 2.1.7.
- FCC Part 15 Subpart B Class A EMC Standard
- Canada ICES-003, Issue 4:2004 Class A EMC Standard
- EN50293: 2000 Electromagnetic Compatibility–Road Traffic Signal Systems – Product Standard.
- EN 61326-1:2006 EMC Standard.
- EN 55011:2007 +A2:2007 EMC Standard.

**907-639.02.4--Type 3 Emergency Vehicle Preemption with Remote Cabinet Monitoring.**

**907-639.02.4.1--Vehicle Equipment.** The Vehicle Device shall conform to the following requirements:

- The device shall function correctly between -34°C and +74°C.
- The device shall be capable of being mounted inside a vehicle either under a seat or strapped under the dashboard. The unit will come with all wiring needed to connect the system to the vehicle.
- The device shall interface to a non-invasive road sensor for environmental measurements via either RS485 or Bluetooth connection.
- The device shall be provided with appropriately rated and keyed connectors that allows the device to be exchanged by unplugging connectors, without tools.
- The device shall incorporate an integrated GPS and/or cell modem.
- The configuration of the device shall be accomplished by accessing the internal web server with a browser. It shall be possible to configure the device without any special software.
- The device shall incorporate an integrated GPS which will allow the device to geo-locate itself on the map, without configuration.
- The device shall operate without requiring static IP address. The only configuration required at the device is to enter the URL of where the TSPRMS central software is hosted.
- In the event that the cell service is interrupted or is not available, the device shall store any events that occur in internal memory, and forward these events automatically to the cabinet monitoring system when the cell service is restored. In this way, a complete record of events at the device can be maintained even if cell service is interrupted for a period.
- The device shall utilize HTTP and HTTPS protocols, and XML data structures, for

communications with the cabinet monitoring system. In this way the data will be open for future expansion and competition. The use of secret proprietary protocols is not permitted.

- The device shall support Ethernet, cellular and license free radio communication.
- The device shall have the option of being supplied with an enhanced GPS, which provides GPS coordinates based on dead-reckoning even when the GPS signal is shielded from the vehicle such as under an overpass; in a tunnel or in between tall buildings in a city. The dead reckoning system shall include accelerometers, gyroscopes and a distance measure that will provide accuracy of better than 20 feet in 1000 feet, when there is no information from the GPS satellites. The enhanced GPS shall optionally be connected to the vehicle OBD-II port; the J1939 ECU port (for heavy vehicles) or a wheel tick sensor as the project requires. The enhanced GPS shall self-calibrate the wheel tick input.

**907-639.02.4.2--Intersection Equipment.** It is a requirement that the Emergency Vehicle Preemption with Remote Cabinet Monitoring system operate independent of the brand/type of intersection controller deployed at the intersection. The Contractor shall install a small field device into each intersection cabinet which connects to the terminal strip in the cabinet (via a provided wiring harness) and makes the system function independent of controller operation. A 19" Rack Mounted option shall be available if required in the plans.

The system Field Device shall conform to the following requirements:

- The Device shall function correctly between -34°C and +74°C.
- The nominal size of the Device shall be 19" x 7.455" by 1.719", and shall be suitable for placing in Traffic Signal Cabinets specified in Section 632 of the attached specification.
- The Device shall be provided with appropriately rated connectors that allow the Device to be exchanged by unplugging connectors, without tools.
- The Device shall incorporate an integrated GPS and cell modem (when required).
- The configuration of the Device shall be accomplished by accessing the internal web server with a browser. It shall be possible to configure the Device without any special software.
- The Device shall be powered via a standard 120V input power.
- The Device shall allow for the routing of the controller configuration packets to and from the controller (either by Ethernet or serial communications) for the three types of controller that are utilized by the Department. In this way it shall be possible to configure the controller, and utilize the controller specific software to interrogate the controller, and the system shall provide the communications pipe which allows this to be accomplished.
- The Device shall utilize field initiated communications. This allows for a low cost cellular data plans to be used, with infrequent polling. However, when an abnormal event occurs and is detected by the Device, then the Device will immediately initiate the transfer of a data packet to the system to enable real-time alerting of response personnel to take place.
- The Device shall, within the size limitations above, include a battery and battery charging/monitoring circuit, to allow the system to function correctly even when all power to the intersection has failed. The battery shall continue to power the Device for a minimum of five (5) hours after all power has failed to the intersection.
- The Device shall incorporate an integrated GPS which will allow the Device to geo-locate itself on the map, without configuration.

- The Device shall operate without requiring a static IP address. The only configuration required at the Device is to enter the URL of where the system central software is hosted.
- In the event that the cell service is interrupted or is not available, the Device shall store any events that occur in internal memory, and forward these events automatically to the system when the cell service is restored. In this way, a complete record of events at the device can be maintained even if cell service is interrupted for a period.
- The Device shall utilize HTTP and HTTPS protocols, and XML data structures, for communications with the system. In this way the data will be open for future expansion and competition. The use of secret proprietary protocols is not permitted.

**907-639.02.4.3--Client User Interface.** The user interface software shall provide, at a minimum, features to meet the following requirements:

**907-639.02.4.3.1--General.** The user interface shall be web based and able to be viewed using a browser. Internet Explorer, Chrome and Firefox browsers shall be supported, as well as Safari on an iPad. Systems that use remote desktop or similar to view a thick-client user interface will not be acceptable. The user interface shall require a user name and password to log on.

**907-639.02.4.3.2--Map Display.** The system shall include a scrollable, zoomable map display, with the intersections and emergency vehicles shown as representative icons on the map.

The alarm status of the intersection shall be clearly indicated on the icon on the map, so that the user can see at a glance which intersections are in alarm.

The map display shall also include a list of intersections, with the number and priority of alarms indicated on the list. Intersections in high priority alarm shall be moved to the top of the list, followed by medium priority, low priority and then finally by intersections not in alarm.

The icons shall change to be able to clearly indicate if an intersection is offline.

Clicking on the icon on the map shall expose a box with the current parameters of the intersection shown.

The default map display position and zoom shall be configurable by user, so that the user's view will default to show the intersections that the user is responsible for managing.

The map view shall have the ability to show traffic overlays on the map.

The map view shall be able to show vehicle trails when the vehicles have been in an emergency or not active.

**907-639.02.4.3.3--Regional Intersection and Vehicle Grouping.** The System shall provide for intersections and vehicles to be logically grouped into regional groupings (for example, north; south; Fire 1; Fire 2)



The System user logon shall be configurable so that if a maintenance or operational person is responsible for, say, the north intersections and emergency vehicles then when that user logs on, the user has visible only the intersections that belong to the group that the user is authorized to view.

**907-639.02.4.3.4--Intersection Detail Display.** Intersection detail display shall be possible to drill down, either from the map icon or from the list, to a device level detail for the intersection, which as a minimum shall display the following parameters:

- The alarm status, with priority indicated, and a text description of the alarm (if an alarm is present for this device).
- The time since the last communication with the device
- The following parameters (real time now values, minimum for the day values, maximum for the day values, and average for the day values)
  - The AC mains voltage (value)
  - The battery back-up voltage (value)
  - The cabinet temperature (value)
  - The cabinet humidity (value)
  - The presence of AC power (OK or Fail)
  - The flashing status of the intersection (OK or Flashing)
  - Stop Time status (OK or Stop Time Active)
  - The cabinet door status (Open or Closed)
  - The intersection fan status (Fan On or Fan off)
- It shall be possible to view graphs of each of the value parameters in graphical form, over the recent two week period. This includes at a minimum real time graphs of:
  - The AC mains voltage
  - The battery back-up voltage
  - The cabinet temperature
  - The cabinet humidity

**907-639.02.4.3.5--Diagnostics and Log Display.** From the device level detail, it shall be possible to further drill down to get the raw data; the error logs; and the communications logs to allow a technician to fault-find problems on the System.

It shall also be possible to:

- filter the logs by Device; by Device Type and/or by Group as well as between dates.
- print these selected logs to a local printer or a PDF file.
- export these logs to Excel on the local computer for further analysis.

**907-639.02.4.3.6--Alarms.** The System shall have a comprehensive alarm generation capability.

It shall be possible to configure alarms to be generated on any parameter becoming out of tolerance, including analog values, digital values and enumerated values.

Alarms shall be configurable to be of Low, High or Critical Priority.

The alarm priority shall be displayed throughout the System, on all displays, using color codes such as red-critical; yellow – high; and amber-low to indicate the priority of the alarm.

The current active alarms shall be accessible for view via an expandable window, to see which alarms are active and when the alarm occurred. The highest priority alarms shall rise to the top of the list.

**907-639.02.4.3.7--Alerts.** The System shall have comprehensive alerting capability, to enable the response personnel to be notified when an abnormal situation has occurred.

It shall be possible to configure alerts to one or more personnel for each alarm. This will cause, as selected, an SMS and/or an email to be sent to the person when an alarm occurs.

The alert shall be configurable to optionally send via email and/or via SMS a message when an alarm clears.

The intention is that the System provides the alerts to the user in near real time. The SMS and email shall be issued within 30 seconds of the occurrence of event which results in an alert being issued.

**907-639.02.4.3.8--Reports.** It shall be possible to view reports on the screen, in the browser of the System, and if desired print the report to a printer or a PDF file.

**Alarm Activity Report.** The System shall include a report which shows the alarms activity for a period. The Alarm Report shall indicate the time the alarm occurred; by color the priority of the alarm; whether it is still active; and if not active then the time that the alarm cleared. It shall be possible to filter the alarms by Device Type; by Device and/or by Device Group as well as by date time to be able drill down into a large alarm list to be able to view, for example, the alarm activity for a particular intersection or controller type over a three month period.

**User Activity Report.** The System shall include a report which shows user activity for a given period, to enable an audit of a user's response to an alarm to be made. The report shall show which screens the user viewed; when the screen was viewed, and the IP address of the computer from which the screen was viewed.

**Preempt System Operational Availability Report.** The System shall include a report which shows the overall operational availability of the Department intersections. The intersection is available when not in an alarm condition such as flashing or power fail. The availability report shall be detailed for each intersection for the period (say 1 month) and summarized by group (region) and for each controller type. Using this report it shall be possible to determine if system availability is trending up or down for the overall intersection system; by region and/or by controller type. It shall also be possible to compare the system availability by region; and also to compare system availability by controller type.

**Fault Occurrence By Controller Type Report.** The System shall include a report which shows the number and type of faults that have occurred in each intersection, which can be summarized by

region and/or by controller type. This report will allow the user to compare the frequency of faults by region and by controller type.

Response Time for Fault Repair Report. The System shall include a report which shows the response time to clear faults, for a given time frame (say 1 month). This report will allow the user to determine the number of faults, and the total and average time to clear the fault. This report will allow the response times by region to be compared.

Vehicle Trip Report. The System shall include a report which shows all the emergency vehicle trips and include information on start time, end time, total travel time, average speed and destination point. The report shall provide the user the ability to select a start date and end date. This report will show response times to emergency call outs and how quickly the vehicle arrived.

**907-639.02.4.3.9--Vehicle Trails.** The maps display shall show live information of the preempt status of the emergency vehicles on the system.

The user shall have the option to select which class of emergency vehicles to display on the map via the information overlay menu.

The information overlay will provide the option to select the number of hours of live data the operator would like to see. This ranges from 1 hour to 24 hours. The user shall have the ability to select that the trails will fade away as the data becomes older.

The information overlay shall provide the ability for user to display the device names on the map, for easy identification of both intersections and emergency vehicles.

Operators will have the ability to display legends that explain the emergency vehicle trails color codes, including idle, preempt service requested, left turn indicator, and right turn indicator so that it is easy to see the behavior of the emergency vehicle.

**907-639.02.4.3.10--Vehicle Playback.** The System shall include the ability to playback the activity of the emergency vehicles, so that retrospective fault finding of the preempt system can be carried out.

Playback shall support the same controls for panning and zooming the map, as well as using the information overlay to select the type of data being displayed on the playback menu.

Users shall have the additional functionality of controlling which devices are displayed by selecting the checkboxes on a selection panel on the left of the map.

The playback screen should provide the user with the option to select a date range via a drop down date selector menu. The menu will provide a full calendar and the option to select the exact start time and end time for the playback.

The bottom section of the map screen shall display the timestamp based on the location within playback.

The user shall have controls that allow one click access to start from the beginning, rewind, play, fast-forward, and scroll to end.

The user shall have the option to use a slider that is operated by click and drag to the time of interest in the playback.

**907-639.02.4.3.11--Remote Power Cycle.** The System shall include the ability to remotely cycle power to the outlets on the back of the field device. In this way it shall be possible to cycle power to ancillary connected equipment such as network switches, cameras and similar equipment.

The user interface shall display the status of the outlets, and provide confirmation via an associated input whether the sockets are energized or not.

**907-639.02.4.4--Electrical and Environmental Requirements.** All equipment supplied as part of the priority control system intended for use in the controller cabinet shall meet the following electrical and environmental specifications spelled out in the NEMA Standards Publication TS 2-2003, Part 2: v02.06:

- Line voltage variations per NEMA TS 2-2003, Paragraph 2.1.2.
- Power source frequency per NEMA TS 2-2003, Paragraph 2.1.3.
- Power source noise transients per NEMA TS 2-2003, Paragraph 2.1.6
- Temperature range per NEMA TS 2-2003, Paragraph 2.1.5
- Humidity per NEMA TS 2-2003, Paragraph 2.1.5
- Shock test per NEMA TS 2-2003, Paragraph 2.2.9.
- Vibration per NEMA TS 2-2003, Paragraph 2.2.8
- Non-Destructive Transient immunity NEMA TS 2-2003, Paragraph 2.1.8.
- Input-output terminals NEMA TS 2-2003, Paragraph 2.1.7.
- FCC Part 15 Subpart B Class A EMC Standard
- Canada ICES-003, Issue 4:2004 Class A EMC Standard
- EN50293: 2000 Electromagnetic Compatibility–Road Traffic Signal Systems – Product Standard.
- EN 61326-1:2006 EMC Standard.
- EN 55011:2007 +A2:2007 EMC Standard.

**907-639.02.5--Confirmation Light.** This indication is intended for use at traffic signal installations that employ Emergency Vehicle Preemption (EVP) systems which utilize confirmation lights to notify the emergency vehicle operators that the designated preemption display is active and from which approach direction the call activating the display was received. The indication shall be an incandescent, tungsten-halogen or light emitting diode (LED) lamp. The confirmation light lamp shall be rated for outdoor use and shall have the illumination equivalent of a 95W incandescent lamp.

**907-639.02.5.1--Confirmation Light Lamp Holder.** The confirmation light lamp holder shall meet the following.

- (a) Be precision die-cast aluminum with heat sinks and ribbing to maximize heat dissipation.
- (b) Be a medium base lamp holder that accepts PAR38 lamps up to 250W incandescent or Tungsten-Halogen, and will also accept LED style lamps.
- (c) Have a premium porcelain socket with double reinforced screw shell and spring loaded center contact.
- (d) Be suitable for wet locations.
- (e) Have a gasket that consists of a thick silicone rubber seal backed up by a durable heat barrier and anchored in place with a metal lock ring to ensure unit stays weather tight in any position, above or below horizontal.
- (f) Have a nominal ½-inch NPT threaded adjustable arm, locknut preinstalled, and pre-lubed to facilitate mounting.
- (g) Have cast-in quadrants with serrated teeth to lock unit in place once aimed.
- (h) Have extra-long wire pigtails for easy splicing.
- (i) Shall be UL Listed.

**907-639.02.5.2--Confirmation Light Mounting.** The confirmation light may be mounted as an assembly with the appropriate optical detector, utilizing conventional conduit and fittings in accordance with Section 722 of the Standard Specifications. When mast arm mounted, all wiring shall be routed internally to the mounting assembly.

**907-639.02.6--Rotating Beacon.** The rotating beacon indication is intended for use in traffic signal systems that employ EVP systems that utilize rotating beacons to notify the emergency vehicle operators that a preemption call has been received.

**907-639.02.6.1--General Construction.** The rotating beacon shall be constructed with a non-corroding polycarbonate base with combination mount with a flat base and 1-inch pipe mounting. The lens shall have an elliptical dome shape and shall provide a high light transmission and light output. The outer surface shall be smooth to minimize the accumulation of dust and dirt. A gasket seal shall be provided between the dome lens and the base. The rotating beacon assembly shall be nominally six and one-half inches (6½”) tall and five and one-half inches (5½”) wide at its maximum width. The rotating beacon shall have a single light source and shall provide the rotating effect by a rotating refractor within the assembly. The dome lens shall be BLUE in color.

**907-639.02.6.2--Rotating Beacon Mounting.** The rotating beacon shall be mounted at locations and at heights above the pole bases as shown on the plans. The rotating beacon shall be mounted in a vertical position, employing a single traffic signal bracket in accordance with Section 722, of the Standard Specifications on the bottom of the rotating beacon. When mounted on a steel pole with internal wiring, all wiring shall be internal to the bracket and the pole.

**907-639.03--Construction Requirements.**

**907-639.03.1--Railroad Preemption.** The Contractor shall secure all items that are required to complete the installation. The Contractor shall coordinate with the railroad company for the connection of the Railroad Signal Preemption to the railroad controller's contact closure termination point as indicated in the Plans. The Contractor shall contact the railroad company

prior to starting any construction to obtain any requirements for the connection.

During construction, the Contractor shall meet all railroad requirements to provide the connection including:

- Boring, Jacking, or Trenching of casing pipe, conduit, roll pipe, or any other required materials.
- Conduit connections into cabinet.
- Contact closure cable connections on termination blocks.

When required by the railroad company and any agreements, the Contractor shall furnish a Flagger to accommodate work within the railroad right of way. The Contractor shall schedule all work to minimize time within the right of way.

**907-639.03.2--Type 1, Type 2, and Type 3 Emergency Vehicle Preemption.**

**907-639.03.2.1--Vehicle Equipment.** Equipment shall be the responsibility of the local maintaining agency for all necessary equipment and installation.

**907-639.03.2.2--Intersection Equipment.** The Contractor shall install, configure, and demonstrate a fully functional Emergency Vehicle Preemption System as shown in the Plans. The Contractor shall install all equipment according to the manufacturer's recommendations. The Type 1 intersection equipment including, the multimode phase selector, intersection optical detector, associated optical detector cabling, and card rack shall be installed per the manufacturer's recommendations or as outlined in the plans and/or contract documents. The Type 2 and Type 3 intersection equipment including, the multimode phase selector, intersection Radio/GPS module, associated Radio/GPS cabling, card rack and Remote Monitoring Field Device shall be installed per the manufacturer's recommendations or as outlined in the plans and/or contract documents. All installation requirements of the equipment manufacturer shall be followed unless otherwise directed by the Engineer. All necessary equipment shall be mounted in the cabinet and configured according to the Plans, Contract Documents, and manufacturer's recommendations. The completed installation shall present a neat and positive appearance and shall not in any way interfere with the proper operation of the traffic signal system installation of which it is part.

**907-639.04--Method of Measurement.** Railroad Signal Preemption, Type 1 Optical Detector, Multimode Phase Selector, Type 2 Radio/GPS Module, and Type 3 Intersection Device will be measured per each. Type 1 Optical Detector Cable and Type 2 Radio/GPS Cable will be measured by the linear foot, which measurement will be computed horizontally and vertically along the pole, conduit or messenger cable which the electric cable is placed, from center to center of the several installations comprising the circuits. No extra length will be allowed within conduit for vertical changes in elevation of the conduit. No extra length will be allowed for cable inside signal heads, drip loops, or sag in aerial supported cable. The terminals for the measurements of lengths will be considered specifically as the center of the pull boxes, poles, signal heads or controller cabinets.

Confirmations Light and Rotating Beacon will be measured per each.

**907-639.05--Basis of Payment.** Railroad Signal Preemption, Type 1 Optical Detector, Multimode Phase Selector, Type 2 Radio/GPS Module, [Type 3 Intersection Device](#), Type 1 Optical Detector Cable, and Type 2 Radio/GPS Cable, measured as prescribed above, will be paid for at the contract price per each or linear foot, which price shall be full compensation for coordinating and accommodating railroad requirements, providing hardware, sealing; testing, cabling, connections, documentation, configuration, flagger, training, materials, labor, tools, equipment, and all other incidentals necessary to complete the work and provide a fully functional preemption system.

Confirmations Light and Rotating Beacon, measured as prescribed above, will be paid for at the contract unit price per each, which price shall be full compensation for furnishing, installing, connection and testing all materials; for pulling through conduit, mast arms and poles for attaching to messenger cable; for final cleanup; and for all labor, equipment, tools and incidentals necessary to complete the work.

Payment will be made under:

- 907-639-A: Railroad Signal Preemption - per each
- 907-639-B: Type 1 Optical Detector - per each
- 907-639-C: Type 1 Optical Detector Cable - per linear foot
- 907-639-D: Multimode Phase Selector - per each
- 907-639-E: Type 2 Radio/GPS Module - per each
- 907-639-F: Type 2 Radio/GPS Cable - per linear foot
- 907-639-G: Confirmation Light - per each
- 907-639-H: Rotating Beacon - per each
- 907-639-J: [Type 3 Intersection Device](#) - per each