

SECTION 16724

EMERGENCY VEHICLE PREEMPTION (EVP)

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. The system employs optical communication to identify the presence of designated emergency vehicles and causes the traffic signal controller to advance to and/or hold a desired traffic signal display selected from phases normally available. The matched set of components which make up the system will cause the existing traffic controller to be manipulated upon recognition of the signal from the vehicle. This communication is effective to the optical detectors at or near the intersection over a line-of-sight path of up to 1800 feet.

The system requires no attention of the vehicle operator other than a simple emitter "ON" switch located in the vehicle which is to remain "ON" until the end of the emergency run. The system shall operate on a first-come, first-served basis. The system is capable of overriding lower priority systems of similar nature while yielding priority to activity such as railroad, drawbridge, etc. The system shall interface with existing traffic signal controllers without compromising normal operation or existing safety provisions.

The EMERGENCY VEHICLE PREEMPTION (EVP) consists of optical emitter assemblies, optical detectors, optical detector cable, phase selectors, preempt module and card rack. The EVP Intersection Components are the optical detectors, optical detector cable, phase selectors, preempt module and card rack. Emitter assemblies will be supplied by the Contractor only when specifically called out on the plans.

1.02 SILENCE OF SPECIFICATIONS

The apparent silence of these specifications as to any detail, or the apparent omission from them of a detailed description concerning any point, shall be regarded as meaning that only the best commercial practice is to prevail and that only material and workmanship of the finest quality are to be used. All interpretations of these specifications shall be made on the basis of this statement. The bidder shall be an established supplier of the items bid.

1.03 MEASUREMENT AND PAYMENT

- A. Unit Prices.

1. This item will be measured by each intersection of the required optical detectors, optical detector cable, phase selectors, preempt module and card rack complete in place.

2. The work performed and materials furnished in accordance with this item and measured as provided under "Measurement" will be paid for at the unit price bid for "Emergency Vehicle Preemption". This price shall be full compensation for furnishing, installing and testing the system; and for all labor, tools, equipment and incidentals necessary to complete the work.

PART 2 PRODUCTS

2.01 MATERIALS

The items furnished and installed under this contract shall be new, unused of the latest product in production to commercial trade, and shall be of the highest quality as to materials used and workmanship. Manufacturer(s) furnishing these items shall be experienced in design and construction of such items and shall furnish evidence of having supplied similar items which have been in successful operation. The bidder shall be an established supplier of the items bid.

2.02 MATCHED SYSTEM COMPONENTS

The City of Houston EVP is comprised of four basic matched components. To ensure system integrity, operation and compatibility, the four basic components (optical emitter, optical detector, detector cable, phase selector) shall be from the same manufacturer. The bidder shall supply and install the optical detector(s), detector cable, and phase selector for each intersection called for on the plans.

The bidder of the Emergency Vehicle Preemption equipment shall provide with the bid written certification from the manufacturer that the system components were designed, manufactured and tested as a system of matched components and will meet or exceed the requirements of this specification and work with the existing City of Houston optical emitters.

2.03 SYSTEM OPERATION

- A. Priority control phase selection shall be activated by an optically transmitted signal of 14.035 HZ or 9.639 HZ, or upon the activation of a test switch.
- B. The traffic controller shall receive inputs from the preempt module upon activation of the appropriate signal from the phase selector.
- C. The system shall provide power for up to three optical detectors for each priority channel. The system shall maintain continuous communication between the optical emitter equipped vehicle and the traffic controller.

- D. The system shall allow the traffic signal controller to resume normal timing operation after the optical signals cease for an appropriate period.
- E. The system shall not attempt controller manipulation nor retain priority vehicle calls during periods of "intersection flash" or "railroad preempt" operations.

2.04 SYSTEM COMPONENT SPECIFICATIONS

A. Optical Emitter Assembly

- 1. The assembly shall include an optical energy emitting unit for mounting to the exterior of the vehicle, an emitter control switch for mounting to the interior dash or instrument panel, and all necessary wiring and hardware for a typical installation.
- 2. The optical emitter assembly shall operate over an ambient temperature range of -30 degrees F (-34 degrees C) to up to 140 degrees F (+60 degrees C).
- 3. The optical energy emitting unit shall contain an internal regulated power supply to convert 12 VDC (positive or negative ground) vehicle battery power to high voltage required for the flashtube and meet the following electrical requirements:
 - a. Operational at 10 volts DC to 15 volts DC,
 - b. Have internal protection for a sustained input voltage of up to 25 volts DC,
 - c. Deliver sufficient optical energy to activate the optical detector from a distance of 1800 feet, and
 - d. Consume no more than 40 watts.
- 4. The optical energy emitting unit shall weigh not more than 4.5 pounds.
- 5. The optical energy emitting unit shall not exceed the following physical dimensions:
 - a. Length - 5.25 inches,
 - b. Width - 7.0 inches, and
 - c. Height - 6.63 inches.
- 6. The optical energy emitting unit shall be capable of producing precisely-timed pulses of high intensity light in response to a low voltage trigger signal from the crystal controlled emitter control switch.

7. The optical energy emitting unit shall be controlled by a single ON/OFF switch which requires no warm-up, setting, or adjustments by the vehicle operator. An indicator located adjacent to the ON/OFF switch shall identify that the crystal controlled timing circuitry is energized.
8. The emitter control switch shall produce crystal controlled low voltage trigger pulses to the optical energy emitting unit. For high priority/Class II applications, the frequency of the trigger pulses shall be 14.035 +/-0.255 HZ. For low priority/Class I applications, the frequency of the trigger pulses shall be 9.639 +/-0.119 HZ.

B. Optical Detector

1. The optical detector shall be a lightweight, weatherproof device capable of sensing and transforming pulsed optical energy into electrical signals for use by the phase selection equipment.
2. The unit shall be high impact polycarbonate construction with stainless steel and/or brass hardware.
3. The unit shall be designed for mounting at or near an intersection on a mast arm, pedestal, pipe, or span wire.
4. The unit shall accept optical signals from one or two directions and provide a single electrical output signal.
5. The unit shall include a design feature to allow aiming of the two optical sensing inputs for skewed approaches or slight curves.
6. The unit shall have a built-in terminal strip to simplify wiring connections.
7. The unit shall receive power from the phase selector and have internal voltage regulation to be operational from 16 to 40 volts.
8. The unit must be responsive to the optical emitter at a distance of 1800 feet.
9. The unit must deliver the necessary electrical signal to the phase selector via up to 1000 feet.
10. The unit shall employ a replaceable circuit board assembly and photocells to facilitate repair.

C. Optical Detector Cable

1. The cable must guarantee delivery of the necessary quality signal from the optical detector to the phase selector over a non-spliced distance of 1000 feet.
2. The cable must guarantee sufficient power to the optical detector over a non-spliced distance of 1000 feet.
3. The cable must be of durable construction to satisfy the following installation methods:
 - a. Direct burial,
 - b. Conduit and mast arm pull, and
 - c. Exposed overhead, supported by messenger wire.
4. The weight shall not exceed .04 lbs/ft.
5. The outside diameter shall not exceed 0.3 inches.
6. The insulation rating shall be 600 volts minimum.
7. The temperature rating shall be 80 degrees C minimum.
8. The cable shall have three conductors of AWG #20 (7x28) stranded, individually tinned copper, color coded insulation as follows:
 - a. Orange for delivery of optical detector power,
 - b. Blue for optical detector power return, and
 - c. Yellow for optical detector signal.
9. The conductors shall be shielded with aluminized polyester and have an AWG #20 (7x28) stranded and individually tinned drain wire to provide signal integrity and transient protection.
10. The shield wrapping shall have a 20% overlap to ensure integrity following conduit and mast arm pulls.

D. Phase Selector

1. All phase selectors shall be digitally controlled and be capable of providing high and low priority operations.
2. The unit shall be a plug-in, two-channel, dual priority device intended to be installed directly into a card rack wired into the traffic signal cabinet.
3. The unit shall be powered from 115 volts, 60 HZ mains and contain an internal, regulated power supply to support optical detectors.
4. The unit shall be capable of recognizing the following pulse rates as delivered by the optical detectors:
 - a. 9.639 HZ +/- .119 HZ as low priority (Class I), and
 - b. 14.035 HZ +/- .255 HZ as high priority (Class II).
5. The primary optical detector inputs and power outputs shall be on the card edge. Two additional detector inputs, per channel, shall be provided via a front panel connector.
6. One opto-isolated NPN output per channel shall be delivered to the appropriate channel pin on the card edge connector as follows:
 - a. HZ +/- .02 HZ 50% on duty square wave in response to a Class I call, and
 - b. A "Steady On" in response to a Class II call.
7. The unit shall utilize crystal control timing and optical pulse rate recognition circuitry to assure:
 - a. Accurate optical signal recognition for dual priority,
 - b. Synchronous logic,
 - c. Precise output pulse, and
 - d. Accurate call dropout time.
8. The unit shall have six recessed range controls per channel, three for low priority and three for high priority, to adjust optical sensitivity (emitter range).
9. The unit shall have a solid state "Power On" indicator.

10. The unit shall have a "Class I" and "Class II" solid state indicator for each channel which performs as follows:
 - a. Flash during call validation, and
 - b. Be steady-on during valid call and test switch operations.
11. The unit shall have a test switch for each channel to deliver Class I or Class II signal pulse rates to verify proper function at both optical emitter flash rates, first-come, first-served operation, and Class II override capability.
12. The unit shall have a selectable call dropout time of 5 seconds or 10 seconds.
13. The unit shall properly identify a high priority (Class II) demand with any combination of up to 10 high and low priority emitter signals being received simultaneously and asynchronously on either channel.
14. The unit shall not exceed the following physical dimensions:
 - a. Length (including handle) - 7.91 inches,
 - b. Width - 1.11 inches, and
 - c. Height - 4.50 inches.

E. Traffic Controller Preemption Module

1. A traffic controller preemption module shall be supplied in addition to the four basic matched components. This module shall interface between the phase selector(s) and the traffic signal controller to provide dual priority preempt operation.
2. The preempt module shall be a plug-in, microprocessor controlled, 4 input, 13 output, dual priority device.
3. The preempt module shall recognize steady-on (high priority) over-pulsing (low priority) inputs from the phase selector and assign control on first-come, first-serve and, high priority over low priority basis.
4. The preempt module shall recognize input signals from one or two dual priority phase selectors for up to four separate channels of emergency vehicle preemption.
5. The preempt module shall have a delay timer adjustable from 0 to 15 seconds in one second increments. The delay timer, when properly set, will guarantee a minimum

green time for the phase or phases being served prior to initiating the preempt operation.

6. The preempt module shall use the standard input functions available on any NEMA type traffic signal controller and shall not cause the controller to abbreviate its programmed yellow or all red clearance times.
7. When the phase selector deactivates its output, the preempt module shall place vehicle calls on all phases of the traffic signal controller and then allow the controller to resume its regular phase sequence.
8. The preempt module shall provide a separate output for "coordination free" to release the traffic signal controller from coordination control during the operation of the EMERGENCY VEHICLE PREEMPTION.
9. The preempt module shall have a separate input that when active shall cause the preempt module to turn off all outputs to allow for railroad or drawbridge operation.

F. Card Rack

1. The card rack shall be a shelf-mounted device designed to accommodate two phase selectors and a preempt module.
2. The rack shall be constructed of 5052 aluminum of .062" thickness and shall not exceed 7.38" W x 4.71" H x 7.13" L. All of the aluminum components consisting of the sides, top, bottom, and front panel shall be clear anodized.
3. The optical detector cable shall terminate on two terminal strips, 4-position, feed-through solder type. The color code and function of each wire shall be clearly silk screened adjacent to each terminal.
4. The front panel of the card rack shall be hinged to provide easy access to the inside of the rack. Machine screws shall be used to secure the front panel when in the closed position.
5. The card rack shall be equipped with a quick disconnect type connector and 6' harness, wired to accommodate the installation of the card rack in a traffic signal cabinet.

PART 3 EXECUTION

3.01 GUARANTEE

- A. A minimum guarantee for both materials and workmanship shall be provided by the Contractor for the products bid as specified. The guarantee (warranty) period shall begin the day the City officially accepts the item. Any guarantee work is to be completed within 15 days after receipt of notice of material deficiencies.
1. Warranties and Guarantees
 - a. Any and all equipment furnished shall be covered by manufacturer's guarantee or warranty for a period of twelve (12) months commencing on final acceptance date with respect to parts, workmanship, and performance of the product.
 - b. The Contractor shall bear all expenses connected with the return of any equipment which the City deems necessary to return to the Contractor for proper adjustment or repairs during the guarantee period.

END OF SECTION