

ITEM 688

FLASHER ASSEMBLIES

688.1 Description. This Item shall govern for furnishing materials, equipment and all other incidentals necessary to assemble complete school zone flasher assemblies (school zone pager flasher assemblies) and warning flasher assemblies.

All materials and equipment furnished for installation under this contract shall be **new and unused, unless otherwise specified.**

Any Contractor having any questions concerning this project should contact Harris County at (713) 881-3210.

The Contractor shall submit all brochures for all materials.

688.2 The AC Operation. Units shall include the following components for the AC School Zone Pager Flashing Signals per flasher assembly (see next page):

PARTS FOR ELECTRICAL FLASHER - AC OPERATION		
QTY(UNIT 1)	UNIT	DESCRIPTION
1	EACH	4 1/2" OD x 19' Galvanized Steel Pole
2	EACH	12" Yellow Polycarbonate Single Section Housing (Less Lenses and gasket)
2	EACH	12" Yellow LED Optical Assemblies, AC Voltage
1	EACH	1 1/4" Weatherhead
10	LF	1 1/4" x 10' Rigid Galvanized Conduit
25	EACH	3/4" Stainless Steel Strap
13	EACH	3/4" Stainless Steel Strap Buckles
1	EACH	1 1/4" Offset Nipple
5	EACH	1 1/4" Locknut
5	EACH	1 1/4" Fiber Bushing
1	EACH	1 1/4" Hub (For Service Disconnect)
1	EACH	Service Disconnect
1	EACH	20 Amp Single Pole Breaker
1	EACH	Lightning Arrestor
3	EACH	1 1/4" x Close Nipple
2	EACH	Cabinet Mount assembly. (PELCO SE-1100)
1	EACH	Flasher Cabinet Assembly, Complete (NO TIME CLOCK FOR WARNING FLASHERS)
13	EACH	3/4" Single Hole Mount for Strapping, with Bolt
4	EACH	1 1/2" x 12" Aluminum Nipple
4	EACH	1 1/2" Aluminum Cross
4	EACH	1 1/2" Aluminum Collared Nipple
4	EACH	1 1/2" Locking Ring
8	EACH	1 1/2" Short Rosette Cap
4	EACH	1 1/2" Hub Plate
50	LF	#4 Wire
15	LF	#12, 2-conductor
10	LF	#8, Bare Copper Grounding Wire
1	EACH	Sign- See Attached Drawing
1	EACH	Ground Rod (8ft)
1	EACH	Ground Rod Clamp
1	EACH	Split Bell Base
1	EACH	Pole Cap

- A. Controller Cabinet. The battery cabinet shall be manufactured of sheet aluminum with a minimum thickness of 0.125 inches, or cast aluminum alloy. The cabinet shall be sized to provide adequate space for two group 29 batteries. The cabinet shall have louvers for ventilation and to prevent the accumulation of gasses. There shall also be rubber mats installed on the bottom of the cabinets and two 1/8" drain holes located in the bottom at opposite corners.

The door and its opening shall encompass and constitute the entire area of the face of the cabinet. It shall be hinged via a continuous hinge, which shall be riveted to the door and to the cabinet. The door shall be tightly secured via a latching device, which pulls the door snugly against a neoprene gasket affixed to the cabinet body forming a weather-tight seal. The latching device shall be equipped with a standard police door-locking device.

The cabinet shall be equipped with the necessary hardware to provide right top and bottom mountings to a pole with band on post

hubs, or 4-1/2" O.D. pole clamps as specified in the invitation for bids.

688.3 The DC Operation. Units shall include the following components for the DC Flashing Signals per flasher assembly:

PARTS FOR SOLAR FLASHER - DC OPERATION		
QTY(UNIT 1)	UNIT	DESCRIPTION
1	EACH	4 1/2" OD x 19' Galvanized Steel Pole
2	EACH	12" Yellow Polycarbonate Single Section Housing (Less Lenses and gasket)
2	EACH	12" Yellow LED Optical Assemblies, DC Voltage
25	LF	3/4" Stainless Steel Strap
12	EACH	3/4" Stainless Steel Strap Buckles
2	EACH	1 1/2" x 20" Offset Nipple
1	EACH	1 1/4" Hub (For Service Disconnect)
2	EACH	1 1/2" Aluminum Ell (SE-0457)
2	EACH	1 1/2" Threaded Tee's(SE-0458)
1	EACH	1 1/2" Sign Clamp (SH-0208) Comes in pairs
2	EACH	Cabinet Mount assembly. (PELCO SE-1100)
1	EACH	Flasher Cabinet Assembly, Complete (NO TIME CLOCK FOR WARNING FLASHERS)
13	EACH	3/4" Single Hole Mount for Strapping, with Bolt
6	EACH	1 1/2" x 12" Aluminum Nipple
4	EACH	1 1/2" Aluminum Cross
4	EACH	1 1/2" Aluminum Collared Nipple
4	EACH	1 1/2" Locking Ring
8	EACH	1 1/2" Short Rosette Cap
4	EACH	1 1/2" Hub Plate
15	LF	#12, 2-conductor
10	LF	#8, Bare Copper Grounding Wire
1	EACH	Sign – See Attached Drawing
1	EACH	Ground Rod (8ft)
1	EACH	Ground Rod Clamp
1	EACH	Split Bell Base
2	EACH	55 Watt Solar Panel
1	EACH	Charging Regulator, 12 VDC
2	EACH	Batteries, Gel filled 12 VDC
1	EACH	Solar Array Cap Mounting Assembly" Top of Pole Kit"

- A. The Regulator/Charger unit is a solid state device, which shall regulate the photovoltaic (PV) module electrical output to prevent battery overcharge. It shall be encapsulated for environmental protection. LED or LCD indicators shall be provided so that battery condition and/or amount of charge/discharge to or from the battery can be quickly determined.

The unit shall be supplied with a color-coded harness and a complete wiring diagram. Wires shall be a minimum 16 gauge stranded. Termination of the harness wiring to components mounted to pedestal poles, photovoltaic module, and signal beacons shall be accomplished via connectors. Female connectors shall be terminated for ease of installation and male connectors are to be supplied with each harness.

Battery terminals shall be 3/8 inch diameter round crimp terminals. Flasher termination shall be spade terminals. Regulator/charger

terminations shall be spade terminals. The harness shall be installed in the controller cabinet using chassis tie downs and riveted to the harness bracket. The harness shall have spiral tubing to protect wires from the control cabinet to the door.

The flashing operation of the unit shall be initiated and terminated by toggle switch.

The flasher shall be:

1. 12 volts D. C.
 2. Solid-state with no relays or electro-mechanical devices.
 3. 2-circuit with 50% duty cycle (per circuit) and shall provide 55 flashes per minute (+/- 5 flashes per minute) to each circuit in accordance with M.U.T.C.D. standards.
- B. Photovoltaic Modules. The photovoltaic module shall provide 12 VDC and be capable of recharging the system to full capacity, after 6 hours of continuous operation, in 3 hours +/- .5 hours during optimum sun conditions in December. The crystalline silicon solar module shall consist of cells that are permanently encapsulated between a tempered glass cover and layers of ethylene vinyl acetate (EVA) pottant with a polyvinyl fluoride (PVF) and aluminum foil back sheet to provide a moisture free environment. The module frame shall be made from extruded aluminum alloy and adequately sized to attach the desired number and size of solar panels. The mounting bracket shall have no less than (4) 3/4 inch stainless steel bolts, lock washers, and hex head c, nuts to secure the PV module to the frame. An ultra violet (UV) resistant, weatherproof junction box providing wire termination for up to #8 A WG wiring shall be provided with the PV module.
- The photovoltaic module mounting assembly shall be constructed of galvanized steel (ASTM A153 Class A) or aluminum, of adequate design and strength to provide a means of securely attaching the PV module frame to a pole at a permanent angle of 45 to 50 degrees. The pole mounting hardware shall accommodate poles ranging from a minimum 4-1/2" O.D. steel pole to a wood pole. The bracket shall be capable of 360 degree horizontal orientation with a means of locking the bracket at an inscribed angular position about the pole. Contractor shall supply proper equipment to ensure due south positioning and angle of solar panels.
- C. Battery. The manufacturer shall furnish the required number of batteries to meet this Item. The batteries shall be group 29, sealed, gel lead acid batteries. The batteries shall be 12-volt D.C. nominal and have minimum storage capacity of 105 ampere-hours. The deep cycle marine battery shall be maintenance free with internal c venting. The batteries shall be sized to allow twelve (12) days autonomy.
- D. Battery Cabinet. The battery cabinet shall be manufactured of sheet aluminum with a minimum thickness of 0.125 inches, or cast aluminum alloy. The cabinet shall be sized to provide adequate space for two group 29 batteries. The cabinet shall have louvers for ventilation and to prevent the accumulation of gasses. There shall

also be rubber mats installed on the bottom of the cabinets and two 1/8" drain holes located in the bottom at opposite corners.

The door and its opening shall encompass and constitute the entire area of the face of the cabinet. It shall be hinged via a continuous hinge, which shall be riveted to the door and to the cabinet. The door shall be tightly secured via a three point latching device, which pulls the door snugly against a neoprene gasket affixed to the cabinet body forming a weather-tight seal. The three point latching device shall be equipped with a locking device that is operated by a number two Carbon Key.

The cabinet shall be equipped with the necessary hardware to provide right top and bottom mountings to a pole with band on post hubs, or 4-1/2" O.D. pole clamps as specified in the invitation for bids.

A Harris County approved single battery/control cabinet may be used in place of the separate battery and control cabinets.

- E. Warranty. Photovoltaic modules shall have a limited warranty for a minimum period of 10 years. The balance of the equipment described herein shall be warranted for 3 years from the date of completion.
- F. Testing. Solar-powered flasher assemblies shall meet or exceed all applicable TMUTCD and/or ITE Standards and these Standard Specifications. In addition to testing or pre-shipment samples, complete testing of school zone flasher assemblies may be required at any time prior to acceptance.
- G. Documentation Requirements. Each solar-powered flasher assembly shall be provided with two each of the following documentation.
 - 1. Complete accurate schematic diagrams.
 - 2. Complete parts list including names of vendors for parts not identified by universal part numbers.
 - 3. Complete set of operator manuals.

688.4 Guarantee. The Contractor, by accepting this contract, guarantees all workmanship, materials and equipment performed or furnished and installed under this Item for a period of two year from date of completion and shall, at his entire expense and within said term of guarantee, repair, replace or adjust all faulty, broken, or maladjusted materials and/or equipment furnished and installed under this Item. All L.E.D. lamps shall be warranted for 5 years. The Contractor shall initiate emergency repair service operations on the job site a maximum of 4 hours after notification by Harris County of system failure or malfunction, and the Contractor shall pursue repair operations with all haste in order that signal down time will be kept to absolute minimum. In the event the Contractor fails to respond within 4 hours, Harris County will pursue the repair operations and forward the bills to the Contractor for reimbursement and inform his bonding company. Vandal damage and damage due to automobile accidents or acts of nature shall not be included under Contractor's guarantee.
Contractor shall sign inspection sheet on all warranty calls.

688.5 Substitute Materials. Set forth in these Standard Specifications are definite models, materials, etc. of particular manufacturer; however, items of equal appearance, durability, performance and design will be accepted upon approval of the Engineer. The successful bidder is required to submit to the County Engineer's Office, Traffic Signal Maintenance Section, engineering brochures and information on all materials he desires to furnish and install which are of different manufacturer or model number specified herein. The submittal is for approval or disapproval by the Engineer. In the event approval is not obtained, the specified items shall not be furnished and installed. The submittals shall be furnished not later than 2 days after bid opening.

688.6 Control Components. All electronic components within the cabinet shall be mounted to the back panel. The electronic components shall be easily installed or removed with simple hand tools.

Constructed so that each component may be readily replaced if needed.

The Operation units shall include the following components for all the School Zone Flasher Assemblies per system: a low profile disc antenna, a three-point latch for Cabinet Door Assembly (solar), and a 19' pole.

688.7 Solid State Time Clock. This section of the Item describes the minimum acceptable requirements for an electronic time clock that can automatically change the operation of a traffic signal at predetermined times.

The time clock shall have a day program for each day of the week.

The day program shall have a least six on and six off events per day. Each of these events shall consist of a time in hours and minutes and an output state (on or off). An on/off event shall control a clock output that activates a single pole, double throw relay circuit. "On" and "Off" shall refer to the normally open contact of the relay.

The time clock shall have 10 special event day program. Each special event day program shall be designated by the date in month, day, and year format. Each special event day program shall consist of all the same elements as a day program.

The time clock shall have a holiday feature that will slap a period specified by a starting date and an ending date. The starting and ending dates shall be entered in month/day of month format. If the ending date is earlier than the starting date then the slap period shall be from the starting date to the ending date of next year (e.g. December 24 to January 1). There shall be a minimum of 10 separate holiday programs.

The time clock shall have a digital time-of-day display in hours and minutes of 12 or 24 hour periods. A 12 hour clock shall have an AM-PM indicator. It shall also have a display, which clearly indicates the day of the week. The month and year shall be programmable but need not be displayed except when programming.

The display shall be visible from the face of the time clock, and each display light shall have a minimum size of 0.11 inches. Liquid Crystal Displays (LCD) are acceptable. The LCD's shall be visible over a temperature range from -10° C to + 74° C. All displays shall have a rated minimum lifetime of 10 years.

On/off events shall be easily programmable from the face of the clock via pushbuttons or keyboard entry. The time clock shall also be able to accept an upload program from a computer via RS-232 Port.

The clock shall be able to be set to the correct time of day to the nearest minute.

A separate indicator shall be provided to indicate whether the output is on or off.

The output shall have manual on/off control independent of the time clock programming.

The output shall remain in the last state programmed until the next programmed event changes the output state or the output is changed by the manual on/off control or if the current day program is disabled.

The time clock shall automatically switch to and from daylight savings time. This feature shall be enabled or disabled manually by keyboard entry.

The Time clock shall be capable of operating using either a 120 volt A.C. or 12 volt D.C. power supply.

Using an A.C. power supply, the time clock shall operate over a voltage range of 95 to 135 volts A.C. The nominal voltage shall be 120 volts A.C. at an operating frequency of 60 Hz +/- 3.0 Hz. The time-base shall be derived from the 60 Hz line frequency during normal operation. The time clock shall be designed to operate as specified at any ambient temperature range from -34° C to + 75° C. Normal operation accuracy shall be equal to the 60 Hz line frequency.

Using a D.C. power supply, the clock shall operate over a voltage range of 9.5 to 14.5 volts D.C. and maintain an accuracy of 0.02% over the entire ambient temperature range from -34° C to + 74° C.

The time clock shall have a power backup capacitor, which shall power the timer for at least 48 continuous hours during the loss of A.C. power. During loss of power, the time clock shall generate its own internal time-base. The clock accuracy while operating on the internal time-base shall be within 0.02% over the entire ambient temperature range from -34° C to +74° C.

During back-up operation, all displays and outputs shall be disabled.

The time clock shall operate correctly and accurately regardless of mounting orientation.

The entire time clock shall be completely wired and equipped with an AMF 206036-1 (16 pin 206037-1 (16 pin female) connector. Each wire of the adapter cable shall be No. 18 AWG stranded copper 24 inches long. The connectors shall have pin and color assignments as follows:

PIN	FUNCTION	ADAPTOR-CABLE
1	A.C. POSITIVE	BLACK
2	A. C. NEUTRAL	WHITE
3	CHASSIS GROUND	GREEN
4	RELAY I NORMALLY OPEN	RED
5	RELAY I NORMALLY CLOSED	YELLOW
10	RELAY I COMMON	WHITE/YELLOW
11	D.C. POSITIVE	WHITE/RED
12	D.C. NEGATIVE	WHITE/BLACK

The output relay shall have a normally open, normally closed and common terminal, and these terminals shall be clearly identified. The relay contact shall be rated at a minimum of 10 Amps, resistive load, at either 12 volts D.C. or 120 volts A.C.

The time clock shall be enclosed in a dust resistant housing. The housing door shall expose all adjustments when it is open. The housing shall have an inverted "T" screw hole mount. The bottom two holes shall be 2-5/16 inches apart from center to center. The top hole shall be 5-3/4 inches from its center perpendicular to the line connecting the bottom holes at their centers. The top hole shall be 1 to 1-1/2 inches from the top of the box. The maximum overall outside dimension of the clock's housing shall be 10-1/4 inches high by 6-1/4 inches wide by 7-1/2 inches deep.

The time clock shall be completely solid state with the exception of the output relay.

A power loss indication shall be provided. The indication shall be activated upon restoration of A.C. power, or activated only if the A.C. power interruption is of sufficient length to allow the capacitor to discharge or adversely affect the time keeping and memory. The indication shall be reset with a pushbutton switch or by keyboard activation.

When A.C. power is restored, the clock shall resume operation with the event that would be currently in effect had there been no power failure.

All components shall be amply rated with regard to heat dissipating capacity and rated voltage so that with maximum ambient temperature and maximum applied voltage, material shortening of life or shift in value shall not occur. The design life of the components under 24 hours per day operating conditions in their circuit application shall not be less than 10 years.

Components shall be mounted on printed circuit boards. All printed circuit boards shall be made from NEMA grade-10 epoxy glass or equivalent, with two ounces or more copper track. Any wire jumpers included on circuit boards shall be placed in plated through holes that are specifically designed to contain them. Jumpers that are tack soldered to circuit traces or are added to correct board layout errors are not acceptable.

The time clock shall be designed so that the printed circuit boards can be taken apart without desoldering.

All components shall be mounted in such a way that replace anyone defective component can be accomplished using only simple tools.

All components (including transistors, resistors, diodes, capacitors, and integrated circuits) shall be available to Harris County through at least two Contractors of solid state devices. Successful bidders may be required to supply a list of sources for those components which Harris County cannot verify the existence of multiple vendors.

The time clock shall provide a fuse and a transient protection device such as a variator, on the incoming power line to protect the time clock from line voltage surges as described in NEMA Standards Publication TS 1-1989, paragraph TS 1-2.1.8.

The vendor shall provide one spare set of proprietary components including IC's and programmed PROM's for every ten time clocks purchased with a minimum of one set per order.

All IC's with 14 or more pins and all proprietary components shall be mounted in high reliability, high contact force sockets. The sockets shall have thermoplastic bodies meeting Ut Specification 94V-O. Any other IC sockets supplied shall also meet the above requirements.

The clock adapter cable shall be delivered neatly wired into the cabinet.

688.8 Warranty. Photovoltaic modules shall have a limited warranty for a minimum period of 10 years. The balance of the equipment described herein shall be warranted for 3 years from the date of completion.

688.9 Testing. Flasher and school zone flasher assemblies shall meet or exceed all applicable Texas M.U.T.C.D. and/or I.T.E. Standards and these Standard Specifications. In addition to testing or pre-shipment samples, complete testing of school zone flasher or flasher assemblies may be required at any time prior to acceptance.

- 688.10 Documentation Requirements. Each flasher assembly shall be provided with two each of the following documentation.
- A. Complete accurate schematic diagrams.
 - B. Complete parts list including names of vendors for parts not identified by universal part numbers.
 - C. Complete set of operator manuals.
- 688.11 Special Equipment and Materials
- A. Lightning Arrestor. Shall be 2 pole, 3 wire, 175v per pole for 120/240 service. Lightning arrestor shall be installed on the main disconnect box (Joslyn J9200-10, General Electric 9L15ECB001, or approved equal).
 - B. Main Breaker. Shall be a minimum 20 amp breaker for the flasher.
 - C. Hardware. All hardware used in this construction shall be galvanized; all conduits shall be galvanized rigid steel conduits as per Item 677 "Electrical Conduits for Traffic Signal Installation". All junction boxes and/or condulets shall have a cover and gasket and shall be located approximately 24" above natural ground for accessibility as shown on the drawings.
 - D. Signal Cables. All traffic signal cable shall be copper insulated jacketed cable in accordance with Item 679 "Insulated Jacketed Traffic Signal Cable". The number and size of conductors shall be as directed by the manufacturer to service the required signals and according to the National Electric Code or as shown on the drawings. All wires for luminaires shall be minimum 2 conductor #12 wire.
- 688.12 Signal Heads. All flashing beacons (2 per sign) shall be 12" Yellow Polycarbonate amber lenses with visor hood, band-on mounting or approved equal, designed according to Item 690 "Traffic Signal Heads". Beacons to flash alternately (bouncing ball type).
- The number and size of conductors shall be as directed by the manufacturer to service the required signals and according to the National Electric code or as shown on the drawings.
- 688.13 Pedestal Pole. Poles shall be 19' x 4-1/2" O.D. pedestal poles and shall be designed in accordance with the drawings.
- 688.14 School Zone Signs. Shall be school zone signs (24" x 48") as shown on drawings.
- 688.15 Warning Signs. Shall be "Slow When Flashing" signs (48" x 48") or as shown on drawing sheet(s).
- 688.16 Signs. All required construction signs and regulatory signs shall be in accordance with the "Texas Manual on Uniform Traffic Control Devices for Streets and Highways" as shown on the drawings.

- 688.17 Other Specifications Requirements. Harris County with Mutual Contractor approval reserves the right to extend the quantity by up to 100 percent within 18 months from the date of Purchase Order, at the same price, terms and conditions. For additional quantities Harris County will issue a work order to the Contractor with the number of School Zone Pager System Flasher Assembly (not less than 4 School Zone Pager System Flasher Assembly per shipment) and the delivery schedule shall be 45 calendar days from work order date for 4 School Zone Pager System Flasher Assembly and 60 calendar days. The School Zone Pager System Flasher Assembly shall be shipped with all components contained within the assembly.
- 688.18 Test and Acceptance of ITS Assembly. The Contractor shall setup and demonstrate to Harris County the system 5 calendar days from the date of award. A Factory Representative shall be present with Harris County to inspect and test the system.
- 688.19 Basis of Payment. The basis of payment shall be lump sum bid or unit price bid as they appear on the bid sheets for the completed contract, which bids shall be for full compensation for all costs of labor, materials, tools, equipment, tests, adjustments, and all other incidentals necessary to construct the complete traffic signal system according to specifications and drawings and to the satisfaction of the Engineer.

There are line code(s), description(s), and unit(s) for this Item.

NOTE: This Item requires drawings that shall be incorporated into the contract documents.

NOTE: This Item requires other Standard Specifications

Item 677 "Electrical Conduits for Traffic Signal Installation"
Item 679 "Insulated Jacketed Traffic Signal Cable"
Item 690 "Traffic Signal Heads"

END OF ITEM 688