

Section 16712
SOLAR POWERED SCHOOL ZONE
FIELD EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

The purpose of this specification is to provide details of Solar School Zone Flashing Beacon Field Equipment for new installations and replacement parts for existing installations. This cabinet will be designed to protect internal equipment from rain, dust, vandalism and other conditions found in harsh environments.

Field Equipment Includes: cabinets, battery chargers, batteries, solar panels, flashers, and other incidentals required for Solar Powered School Zone Field Equipment.

1.02 PRODUCTS INSTALLED BUT NOT FURNISHED

- A. Paging System. Unless otherwise specified in the bid items, the City of Houston will furnish pager equipment for installation in the School Zone Cabinet by the Contractor. Contractor shall arrange for pick up of pager equipment by contacting the City of Houston Representative at 2200 Patterson, Houston, Texas 77008 713/803-3012, in writing, a minimum of 14 days in advance of need.
- B. Signs. School Zone Beacon signs shall be furnished for installation by the Contractor. All School Zone signs shall remain covered until the installation is inspected and accepted by the City.

1.03 UNIT PRICES

- A. Measurement
Solar Powered School Zone Equipment shall be measured as described as follows:
1. SOLAR FLASHING BEACON ASSEMBLY, COMPLETE, IN PLACE -- This Item will be measured on the basis of EACH assembly complete in place, tested, and accepted. This item shall include one pole with cap and base, one cabinet assembly, two beacons, solar panel, two batteries, battery charger, flasher, and terminal strips, and all conductors, and incidentals necessary to provide a complete functional Solar Flashing Beacon assembly.
 2. SOLAR FLASHING BEACON, ASSEMBLY, COMPLETE, PARTS-- This item shall include one pole with cap and base, one cabinet

- assembly, two beacons, solar panel, two batteries, battery charger, flasher, and terminal strips. This item will be measured on the basis of EACH complete assembly furnished and accepted.
3. FLASHING BEACON CABINET ASSEMBLY -- will be measured as EACH unit furnished and accepted.
 4. AUTOMATIC BATTERY CHARGER -- will be measured as EACH unit furnished and accepted.
 5. BATTERIES, 12 VDC, FURNISHED -- will be measured as EACH unit furnished and accepted.
 6. SOLAR PANEL ARRAY, FURNISHED -- will be measured as EACH unit furnished and accepted.
 7. SIGNAL BEACONS, FURNISHED -- will be measured as each PAIR of beacons furnished.
 8. PAGING EQUIPMENT -- Each Paging Unit installed under this contract shall be measured as each unit installed, tested, and accepted by the City of Houston.
 9. SOLAR FLASHING BEACON ASSEMBLY, WITH TIME CLOCK, COMPLETE, IN PLACE -- This Item will be measured on the basis of EACH assembly complete in place, tested, and accepted. This item shall include one pole with cap and base, one cabinet assembly, one programmable flashing beacon time-based control unit, two beacons, solar panel, two batteries, battery charger, flasher, and terminal strips, and all conductors, and incidentals necessary to provide a complete functional Solar Flashing Beacon assembly.
- B. Payment The work performed and materials furnished shall be measured as indicated under "Measurement" and will be paid for at the unit price bid for each item, as specified in the work order. This price shall be full compensation for excavating, backfilling, for constructing, furnishing, installing, and testing Solar Powered School Zone Equipment. This price shall also be full compensation for; concrete and reinforcing steel; electrical conductors, connections, grounding rods, galvanized pipe, fittings, pole caps, pole bases, straps, foundations, anchor bolts, anchor plates (when required) and any other incidentals necessary to complete the work.

PART 2 PRODUCTS

2.01 MATERIALS

A. CABINET COMPONENTS

1. General: The cabinet door shall be constructed from 5052H32-sheet alloy and shall have a thickness of .125 inch. There shall be no vertical seams in the cabinet shell. All External welds shall be

made using the Heliarc method, whereas the wire welding method shall make internal welds. All welds shall be neatly formed and free from cracks, blowholes and other irregularities. The nominal outside dimensions shall be 26 inch (h) x 15.25 inch (w) x 15.75 inch (d). There shall also be a lip over-hang cross the top of the cabinet covering the top of the door to help in preventing moisture from getting into the cabinet.

2. The cabinet door opening shall be double flanged around all sides to form a uniform surface. This is to assure maxim contact with the door gasketing material.
3. All inside and outside edges of the cabinet shall be free of burrs.
4. All single position door restraint shall be provided to hold the door open at a maximum 90-degree angle. This is to prevent door movement in wind conditions.
5. Four (8) louvered vents (4 per side) shall be provided for adequate ventilation of internal components.

6. DOOR AND HARDWARE

- a. The Door will be a minimum of 80% of the front surface area and shall be hinged on the right side when facing the cabinet.
- b. The door shall be furnished with a gasket ½" x 2" closed celled neoprene that shall form a weather tight seal between the cabinet flange and the door. A 3/8" x 5/8" retainer shall be used to hold gasket in place.
- c. The door gasketing shall be sprayed with silicone lubricant so that it does not adhere to the cabinet body-sealing surface.
- d. The hinge shall be continuous and shall fasten to the cabinet and door by ¼-20 carriage bolts, washers an nylok nuts. The hinge will be made of .90 inch thick stainless steel and shall have a .25 inch diameter stainless steel hinge pin.

7. The Latching Mechanism shall be a three-point draw type and shall have the following characteristics:

- a. The center catch and cam shall be fabricated from .1875 inch thick steel and zinc plated.
- b. The latching rods shall not make direct contact with the inside of the cabinet surface, rather this mechanical interface shall be made by a nylon rollers on each of the latching rod ends.
- c. The lock shall be a Corbin #2 lock. Two keys will be furnished with each lock.
- d. On the front side of the door a cover shall be provided over the key slot to prevent debris from getting into the lock. This device shall be attached so that it can provide easy access for unlocking the cabinet.

- e. The latching handle shall have a provision for padlocking in the closed position. The padlocking position shall be at the extreme end of the latching handle to preclude the use of pipe by vandals to force the locking mechanism open.
8. An Operating Handle shall be furnished and shall have the following characteristics:
 - a. The handle will be stainless steel with a .750 inch diameter shank
 - b. The latching handle shall have a provision for padlocking in the closed position. The padlocking position shall be in the bottom middle of the latching handle to preclude the use of pipe by vandals to force the locking mechanism open.
 - c. There shall be no exposed hardware of any type mounting the latching handle to the door.
 - d. The handle shall have a lock hasp to allow the securing of the cabinet with a padlock.
 9. CABINET LAYOUT
 - a. Top Shelf: (Top Shelf shall be removable for easy access to batteries on the bottom). The shelf shall have predrilled holes to attach the control panel these holes will be ¼ inch in diameter and shall be centered 7 inches apart 3 inches from the front of the shelf. The top shelf shall have a minimum depth of 9 inches and shall span the entire width of the cabinet. In the back center of the top shelf a half moon shape hole with a diameter of 2 inches shall be in place for ease of bringing cables up to the controller panel. The front lip of the shelf shall be turned up a minimum of ¼ inch and shall be free from sharp edges and burrs. In addition ¼ x ¾ inch bolts with wing nut shall be supplied for attaching control panel to shelf. The top shelf shall be removable but made rigidly mounted with the use of simple tools.
 - b. The cabinet shall be provided with a battery shelf fabricated from 5052H32 aluminum having a thickness of .125 inch. The shelf shall be welded into the cabinet for maximum rigidity. A ½ inch of Styrofoam shall be supplied to cover the bottom, sides and back of the cabinet where the batteries will sit.
 10. Cabinet Finish: Unless otherwise specified, the outside surface of the cabinet shall have a smooth, uniform, polish aluminum finish.

B. SOLAR PANEL

1. The Photovoltaic Module shall provide 12 VDC and be capable of recharging the system to full capacity, after 6 hours of continuous operation, in three (3) hours +/- .5 hours during optimum sun conditions in December. The minimum acceptable wattage output of the solar panel will be 100 watts. Solar Array sizing calculations and the parameters used shall be required. Each solar cell shall be bypass diode protected to prevent power loss if a module is temporarily shaded. 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. Units without foil back sheets must have Underwriter Laboratory (UL) approval. 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 use tamper proof hardware to secure the PV module to the frame. An ultraviolet (UV) resistant, weatherproof junction box providing wire termination for up to #8 AWG wiring shall be provided with the PV module.

C. BATTERY FOR SOLAR POWERED FLASHING BEACONS

1. The Battery (s) shall have a nominal voltage of 12 VDC. The battery (s) shall be sized to allow four (4) days of autonomy and provide sufficient power to support remote support remote communications at an increased power consumption rate of 1 ampere hour per day. The battery (s) shall conform to the following criteria.

Operating temperature range:

1. Discharge: -26 degrees F to + 140 degrees F.
2. Charge: -4 degrees F to +122 degrees F.

Vents: Pressure relief vents permanently attached.

Sealed Construction: Will not spill or leak.

Flag Terminals: Hold clearances for ¼" bolt.

2. Battery (s) shall be housed in the battery cabinet specified in the above specification. The battery (s) shall carry a prorated warranty for a minimum of five (5) years.
3. Programmable Control Unit – Programmable time-based control units, when required as listed in the bid items, shall be RTC Model CPR2100 Controller, or equal.

D. BATTERY CHARGER

1. The Charging Unit shall be 100% solid state and be designed for use as a battery charger in photovoltaic (solar) energy systems. The charger shall be mounted on the control panel.
 - a. The charger shall supply maximum solar panel current to the battery until battery is fully charged (trickle charge will not be accepted). Battery voltage will be used to determine when charging is to resume. The resumption threshold shall compensate for temperature. The charge current must be tested at least one (1) time per hour.
 - b. The charger shall supply a charging current of up to 10 Amps DC to the batteries.
 - c. The charger shall be a modular design and shall be easily replaced with the use of simple tools. There shall be no terminal strip connections on the charging unit it must be a plug in design. Any meters being used shall be housed in the charging unit.
 - d. Metering devices used shall be for checking the battery voltage and solar panel input voltage . One meter built into the charging unit will be used for both operations, an external switching device shall be used to check both measurements.
 - e. No terminal strip connections are to be on the front of the control panel, all connections will be made on the back of the control panel.
 - f. Charger shall incorporate a low voltage disconnect that shall prevent battery damage due to extreme discharge.

E. FLASHING UNIT

1. The Flashing Unit shall be a modular design with a plug being utilized for connecting to the external flashing outputs. The external outputs shall be made on the back of the control panel. The flasher shall be easily replaced with the use of simple tools.
 - a. The flasher shall be a 12 volt DC charger and shall operate in a range +/-volts.
 - b. The flasher shall have a minimum 2 circuits and shall be rated for a minimum of 50 watts per circuit.
 - c. The operating temperature range shall be from -20 C to + 75 C.
 - d. The flasher shall be capable of working both Halogen or LED bulbs.

- e. The physical size of the flasher unit shall be no larger than 5.50" (L) x 3" (W) x 2" (D).
- f. The housing shall be a minimum 18 Ga. Steel.
- g. The flasher shall have a programmable flash rate from 50-70 flashes per minute.

F. SIGNAL BEACONS

1. The School Zone Beacon Assembly shall operate with two (2) signal beacons. The beacons shall flash alternately (bouncing ball type). The beacons (signal heads, reflectors, amber lenses, and lamps) and mounting hardware shall be supplied as part of this bid.
2. All Flashing Beacons shall be 12' polycarbonate amber lens with tunnel visor hood and use ban on mounting or approved equal.
3. Lamps shall be 12VDC, 35-watt halogen with a minimum life of 2,000 hours continuous duty and mounted at the appropriate focal point to provide the maximum intensity for the 12" signal head.

PART 3 EXECUTION

3.01 CONSTRUCTION

A. CABINET MOUNTING

1. The cabinet shall be arranged for side of pole mounting. Two sets of holes shall be predrilled to accommodate two Pelco SE 1100 mounting brackets. The top set shall accommodate the wire inlet to the cabinet. These mounting brackets shall be supplied as part of the complete cabinet package.

B. CONTROL PANEL

1. The control panel shall be 12 inches high by 14 inches wide and have a 4 inch lip at the bottom for the purpose of fastening to the upper shelf. The panel will set up for the charging unit and flashing unit to mount on the panel, also mounted on the panel will be the paging unit.

- C. Solar Panel Mounting Hardware. The photovoltaic module mounting assembly shall be constructed of galvanized steel (ASTM A-153 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 a steel 4 ½" pole. The bracket at an inscribed angular position about the pole. Mounting Hardware may mount on the side of the pole or on the top of the pole as long as the bracket is of adequate strength to withstand the weight and wind stresses.

D. PHYSICAL AND ELECTRICAL INTERFACE

1. A Physical and Electrical Interface needs to be maintained for the connection of the pager unit. This interface will need to be a terminal strip on the rear of the control panel. This terminal strip will be where the harness will hook up for the pager unit. The terminal Strip will need to be clearly labeled DC+,DC-, Earth Ground, Relay N/O, Relay Common.
2. A Physical and Electrical Interface will have to be maintained between the solar panel, batteries, and signals, both 9.1.1 and 9.1.2 can be utilized on (1) terminal block to save space. All labeling shall be silk-screened.

3.02 TESTING

- A. Solar Powered School Zone Beacons Assemblies shall meet or exceed all applicable Texas Manual on Uniform Traffic Control Devices and /or Institute Transportation Engineers standards and these specifications. In addition to testing of pre-shipment samples, complete testing of school zone beacon assemblies may be required at any time prior to acceptance ITE specified signal lamp intensity shall be maintained

3.03 TRAINING

Training requirements are listed below. The City shall furnish the training classroom and the Project Manager shall schedule the training sessions.

- A. Assembly. One (8) hour training class on field assembly training shall be provided as Requested by the city Project Manager, for the City's installation contractors and City of Houston's Department of Public Works and Engineering Traffic Management and Maintenance Division personnel. The instructional training shall be for up to twenty (20) Persons at the request of the Project Manager.

- B. Maintenance. One training class consisting of eight (8) hours of Maintenance training shall be provided for up to twenty (20) persons, as requested by the city Project Manager.

- C. Paging Equipment Installation. The Contractor shall be required to attend six(6) hours Training, furnished by City Staff or the City's Vendor on the proper Installation and Maintenance of the City's School Zone Paging System Field Equipment. The training will be scheduled by the Project Manager and all field personnel involved in the installation of school zone paging equipment, are required to attend. Make-up training will be paid for by the Contractor.

3.04 CERTIFICATION

- A. Certification. A Vendor Representative shall provide to the City's Project Manager in writing that the City's Installation Contractors has been trained to successfully assemble, program and operate the beacon assemblies in accordance with manufacturer's specifications and operating manual.

3.05 DOCUMENTATION

- A. Each Solar Powered School Zone Assembly both complete and as parts, shall be provided with the following documentation:
 - 1. Complete accurate schematic diagrams
 - 2. Complete parts list including names and part numbers for vendors, for parts not identified by universal numbers.
 - 3. Operating and Maintenance Manual including simple programming instructions and a programming guide.

- 3.06 WARRANTY All equipment, except batteries, shall be warranted free from defects in Material and workmanship for three (3) years from date delivered to the City of Houston warehouse. Batteries shall be warranted as specified in the specifications.

END OF SECTION