Special Specification 6372
Rectangular Rapid Flashing Beacons (RRFB)

1. DESCRIPTION

Furnish and install Rectangular Rapid Flashing Beacons (RRFB), as directed and in accordance with all plans and specifications.

2. MATERIALS

Furnish new materials in accordance with the following requirements:

2.1. Cabinet. Unless otherwise approved by the Engineer, provide cabinets manufactured of 0.125” sheet aluminum. The nominal outside dimensions of each cabinet must be 14 in. wide by 16 in. high by 12 in. deep with the door closed. All dimensions may be plus or minus 3 in. Provide a one (1) compartment type cabinet with a neoprene gasket seal for a weather seal. Provide wire screened insect proof louvers on each side for ventilation. Provide louvers that are designed to not allow any rain to enter the cabinet. Provide two screened insect proof drain holes on the bottom of the cabinet. The door must be a single unit with a continuous piano hinge riveted to the door and the cabinet. The door must incorporate a neoprene gasket which, when closed, forms a snug weather tight seal. Unless approved otherwise, the door lock will be a standard police lock, reinforced with a steel plate. Provide a minimum of one brass key with each cabinet. The keyhole must have a metal keyhole cover, to prevent the entry of water and dust and allow easy access.

Equip each cabinet with the necessary rigid mounts for a 4 in. ID pole with a 4.5 in. OD pole clamp. All necessary hardware for proper mounting will be included. Provide a wiring diagram and schematics for the cabinet assembly.

2.2. Control Panel. Provide a control panel containing the electronics (circuit breaker, surge protection device, flasher, and a 120 VAC to 12 VDC power supply) mounted in the cabinet using bolts. Design the control panel for quick and easy removal. The back panel and flashing beacons must be connected through a main wiring harness via a circular pin connector (CPC) or other approved method. All modular components must be connected in such a manner that they are easily removed for replacement or maintenance.

2.2.1. Circuit Breaker. Provide a single pole thermal circuit breaker installed on the "line" or service side of the cabinet. The circuit breaker must be rated for 20 Amps at 120 Volts AC. The breaker must be a Square "D" QUO 150 Series, GE THQC 1150L, Westinghouse QC1050, or equivalent.

2.2.2. Flasher. The flasher must be solid state, 2 circuit device which controls the flashing sequence of the beacon. It must be capable of operating at up to 40 Watts per circuit over a range of 11.4 VDC to 30 VDC. The flasher must provide the flash rate as required below. The flasher will be capable of operating in a temperature range of -30 °F and +165 °F.

2.2.3. Surge Protection Device. Unless approved otherwise, provide a suitable surge protection device (SPD) capable of protecting up to 120 VAC, 60 amp service, have no follow current, respond in 5 nanoseconds, and will allow automatic recovery. The SPD must have a minimum peak surge current rated for 10kA/mode/phase total. (Example: Edco SPA-100T, Hesco HE100.) The surge arrestor will be of a size adequate to fit the enclosure. It will operate from -30°F to +165°F.

2.2.4. Countdown Timer. Provide a system that provides the countdown timer function required for proper operations. The time delay relay (or function) will operate from -30°C to +60°C.
2.2.5. **Wireless Communications.** RRFB must be capable of operating hardwired or through wireless communications. When wireless communications are required, all associated units (i.e. on the opposite sides of the road as well as the unit in the median (when included) will communicate wirelessly. The radio transmitter and receiver will use an unlicensed frequency. The wireless communication system will work to ensure that the lights will flash for a period that will allow pedestrians to safely cross the street. The amount of time will be determined by the engineer. The initiation of the signal for the flashers to commence flashing will be by pedestrian push button. Each time a pedestrian pushes a button, the countdown timers will reset to the preset count down time; thus allowing the beacons to flash for a full cycle for this pedestrian. The radio will consist of a frequency hopping spread spectrum transceivers operating in the non-licensed 900 MHZ frequency range and at a maximum 1 watt transmit power in accordance with Part 15.247 FCC rules. The radio will operate with an input of 10-30 VDC and from -30 °F to + 140 °F.

2.2.6. **Hardwired Systems.** When required by the plans, the system must be capable of operation using one cabinet mounted at a location shown on the plans. Conductor for the 12 VDC circuits to the RRFB’s and pushbutton detector must be as required in the plans.

2.3. **Rectangular Rapid Flashing Beacon (RRFB) Light Bar.** The RRFB must comply with FHWA Interim Approval Memorandum dated July 16, 2008. The light bar will contain a minimum of three rectangular rapid flashing beacon indications, 2 on each side, and 1 rectangular rapid flashing beacon on the end that is visible to pedestrians in the crosswalk per direction. Each of the two yellow indications of an RRFB must have 70 to 80 periods of flashing per minute and must have alternating, but approximately equal, periods of flashing light emissions and dark operation. “During each of its 70 to 80 flashing periods per minute, the yellow indications on the left side of the RRFB should emit two slow pulses of light after which the yellow indications on the right side of the RRFB must emit four rapid pulses of light followed by a long pulse” as specified by the FHWA. The beacons as a minimum must be approximately 5 in. wide x 2 in. high. The light bar must provide an additional side mounted LED array on the end facing the pedestrian crosswalk. The light bar will operate with an input of 10-14 VDC.

The LEDs used in the light bar must meet the SAE J595 requirement for peak luminous intensity (candelas) for Class 1 over the 10 -14 VDC range. The vendor must submit third party certification that the LEDs have been tested and certified as Class 1.

The RRFB light bar will be assembled and wired as a unit. It will consist of a mounting bracket, a bottom shell that attaches to the mounting bracket, and a housing unit. The housing may consist of a top shell that attaches to the bottom shell. Mount the housing to the pole with U-bolts.

2.4. **Pole and Base.** Unless specified otherwise, the pole will be a schedule 40 spun aluminum 4” ID (4.5” OD) x 16’ H. Provide a pole cap with the pole. Provide a pedestal pole base in accordance with DMS-11140, “Pedestal Pole Base”. If available with the base provided, include a pole collar assembly. Provide pedestal pole bases from manufacturers prequalified by the department.

2.5. **Sign.** Up to two (2) sets of signs will be supplied with each pole. Unless required otherwise, each set of signs will include (1) W11-2 pedestrian sign (36 in. X 36 in.) and (1) W16-7p arrow placard (30 in. X 18 in.). Provide sign sheeting as required on the plans. Sign mounting hardware for the signs will be included.

2.6. **Pedestrian Push Button.** Mount a pedestrian push button on the pole to activate the flashing beacons. The button will be an ADA compliant push button with the plaque on the push button reading “PUSH BUTTON TO TURN ON WARNING LIGHTS”.

2.7. **Drilled Shaft.** Unless specified otherwise, the drilled shaft foundation will be 24 in. and follow the TxDOT Standard.

2.8. **Electrical Conductors.** Item 620 “Electrical Conductors”

2.9. **Traffic Signal Cables.** Item 684 “Traffic Signal Cables”
3. CONSTRUCTION

3.1. **Fabrication.** Provide poles and bases in accordance with Item 687, “Pedestal Pole Assemblies.” Provide mild steel anchor bolts in accordance with Item 449, “Anchor Bolts.” Use galvanized bolts, nuts, and washers.

3.2. **Galvanizing.** Galvanize all fabricated parts in accordance with Item 445, “Galvanizing.” Repair galvanizing for any steel part or member damaged in assembly, transit, or erection, or for any steel part or member welded after galvanizing, in accordance with Item 445.3.D, “Repairs.”

3.3. **Installation.** Install foundations in accordance with Item 656, “Foundations for Traffic Control Devices.” Unless otherwise shown on the plans, stake the assembly locations for verification by the Engineer.

Install pole, breakaway base, connectors, wiring, signal beacons, sign, and foundation as shown on the plans or as directed. Install the flasher controller assembly as shown on the plans. Install watertight breakaway electrical fuse holders in all line and neutral conductors at the breakaway base. Use established industry and utility safety practices to erect assemblies near overhead or underground utilities. Consult with the appropriate utility company before beginning such work.

3.4. **Electrical Requirements.**

3.4.1. **Electrical Services.** Make arrangements for electrical services and install and supply materials not provided by the utility company as shown on the plans. Unless otherwise shown on the plans, install 120-volt, single-phase, 60-Hz AC electrical service.

3.4.2. **Conduit.** Install conduit and fittings of the sizes and types as shown on the plans. Conduit of larger size than that shown on the plans may be used with no additional compensation, providing that the same size is used for the entire length of the conduit run. Extend conduit in concrete foundations 2 to 3 in. above the concrete. Seal the ends of each conduit with silicone caulking or other approved sealant after all cables and conductors are installed.

3.4.3. **Wiring.** Provide solar panels and batteries sized to allow system to work as needed 24 hr. per day based on the 20 yr. projected traffic count of the location. Unless otherwise noted, system must be provided with solar panels by the manufacturer. Unless otherwise noted, batteries must be provided by the manufacturer, and should be installed in a box mounted on a pole underneath the solar panel.

3.4.4. **Grounding and Bonding.** Ground and bond conductors in accordance with the NEC. Ensure the resistance from the grounded point of any equipment to the nearest ground rod is less than 1 ohm.

3.4.5. **Preservation of Sod, Shrubbery, and Trees.** Replace sod, shrubbery, and trees damaged during the Contract.

3.4.6. **Removal and Replacement of Curbs and Walks.** Obtain approval from the Engineer before cutting into or removing walks or curbs not shown on the plans to be removed or replaced. Restore any curbs or walks removed equivalent to original condition after work is completed, to the satisfaction of the Engineer.

3.5. **Test Period.** Operate completed RRFB installations continuously for at least 30-days in a satisfactory manner. If any Contractor-furnished equipment fails during the 30-day test period, repair or replace that equipment. This repair or replacement will start a new 30-day test period. Replace materials that are damaged or have failed before acceptance. Replace failed or damaged existing system components when caused by the Contractor. The Department will relieve the Contractor of maintenance responsibilities upon passing a 30-day performance test of the RRFB system and acceptance of the contract.

4. **MEASUREMENT.**

This Item will be measured by each rectangular rapid flashing beacon installed.
5. PAYMENT.

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 “Installation of Rectangular Rapid Flashing Beacons,” of the type (one-way wireless, one-way hardwired, two-way wireless, two-way hardwired) specified. This price is full compensation for furnishing, installing and testing the completed installation, including complete control cabinet(s) with associated equipment, pedestrian push buttons, rectangular rapid flashing beacon light bar(s), pedestal poles, transformer bases, mounting hardware; preservation and replacement of damaged sod, shrubbery and trees; removal and replacement of curbs and walks; equipment, labor, tools and incidentals. The Department will pay for electrical energy consumed by the roadside flashing beacon.

New electrical services will be paid for under Item 628, “Electrical Services.” New signs will be paid for under Item 636, “Aluminum Signs.” New drilled shaft foundations for traffic signal poles will be paid for under Item 416, “Drilled Shaft Foundations.” New conduit will be paid for under Item 618, “Conduit.” New electrical conductors will be paid for under Item 620, “Electrical Conductors.” New ground boxes will be paid for under Item 624, “Ground Boxes.” New traffic signal cables will be paid for under Item 684, “Traffic Signal Cables.”