

## SECTION 654 MIDBLOCK CROSSWALK ENHANCEMENT ASSEMBLIES

### **654-1 Description.**

Furnish and install midblock crosswalk enhancement assemblies.

### **654-2 Materials.**

Use midblock crosswalk enhancement assemblies listed on the Department's Approved Product List (APL).

Midblock crosswalk enhancement assemblies are classified as the following types: In-Roadway Light Assemblies, Rectangular Rapid Flashing Beacon Assemblies (RRFB), and Pedestrian Hybrid Beacon Assemblies.

**654-2.1 In-Roadway Light Assemblies:** In-roadway light assemblies must meet the physical and operational requirements of the latest edition of the MUTCD, Chapter 4N.

In-roadway light assemblies shall be normally dark, initiate operation only upon pedestrian actuation via a pedestrian pushbutton, and cease operation at a predetermined time after the pedestrian actuation or, with passive detection, after the pedestrian clears the crosswalk. The duration of the predetermined period shall be programmable and capable of matching the pedestrian clearance time for pedestrian signals as determined by MUTCD procedures. The timer that controls flashing must automatically reset each time a pedestrian call is received.

In-roadway light assemblies must have a minimum luminance of 101 candelas and a minimum viewing angle of 20 degrees.

**654-2.2 Rectangular Rapid Flashing Beacon (RRFB):** RRFB must include two rapidly and alternately flashed rectangular yellow indications having LED-array based pulsing light sources. Each rectangular yellow indication must be a minimum of five inches wide by two inches high. RRFB installations shall comply with the use and technical conditions of FHWA MUTCD Interim Approval 21 – Rectangular Rapid-Flashing Beacons at Crosswalks. The two RRFB indications shall be aligned horizontally, with the longer dimension horizontal and with a minimum space between the two indications of approximately 7 inches measured from inside edge of one indication to inside edge of the other indication.

**654-2.2.1 RRFB Sign Assemblies:** RRFB assemblies must be used to supplement W11-2 (Pedestrian), S1-1 (School), or W11-15 (Trail) crossing warning sign and includes a diagonal downward arrow (W16-7p) plaque and a single column ground sign post. Use attachment hardware in accordance with Standard Plans, Index 700-010.

Optional mast arm and pole installation may be used if shown in the Plans. Follow the manufacturer's specifications on the number of RRFB units that are connected to the timer's output driver. Mast arm mounted RRFB assemblies include a W11-2 or S1-1 sign and attachment hardware. Pole mounted RRFB assemblies include a W16-7p sign and attachment hardware. Use attachment hardware in accordance with Section 659.

The outside edges of the RRFB indications, including any housings, shall not project beyond the outside edges of the W11-2, S1-1, or W11-15 sign.

**654-2.2.2 Beacon Flashing Requirements:** The light intensity of the yellow indications shall meet the minimum specifications of Society of Automotive Engineers (SAE) standard J595 for Class 1 (Directional Flashing Optical Warning Devices for Authorized Emergency, Maintenance, and Service Vehicles) dated January 2005. Ensure RRFB assemblies are capable of automatically dimming to reduce brightness of the LEDs at nighttime.

The flash rate of each individual yellow indication, as applied over the full on-off sequence of a flashing period of the indication, shall not be between 5 and 30 flashes per second. When activated, the two yellow indications in each RRFB shall have a flash rate of 75 flash cycles per minute using the following sequence: left side beacon on for 50 milliseconds (msec), both beacons off for 50 msec, right side beacon on for 50 msec, both beacons off for 50 msec, left side beacon on for 50 msec, both beacons off for 50 msec, right side beacon on for 50 msec, both beacons off for 50 msec, both beacons on for 50 msec, both beacons off for 50 msec, both beacons on for 50 msec, both beacons off for 250 msec.

**654-2.2.3 RRFB Operation:** RRFB shall be normally dark, initiate operation only upon pedestrian actuation via a pedestrian pushbutton, and cease operation at a predetermined time after the pedestrian actuation or, with passive detection, after the pedestrian clears the crosswalk. The duration of the predetermined period shall be programmable and capable of matching the pedestrian clearance time for pedestrian signals as determined by MUTCD procedures. The timer that controls flashing must automatically reset each time a pedestrian call is received.

All RRFBs associated with a single crosswalk (including those with an overhead or advance crossing sign, if used) shall simultaneously commence operation of their alternating rapid flashing indications and shall cease operation simultaneously.

RRFBs must include an instruction sign with the legend PUSH BUTTON TO TURN ON WARNING LIGHTS mounted adjacent to or integral with each pedestrian pushbutton.

A confirmation light directed at and visible to pedestrians in the crosswalk must be installed integral to the RRFB to give confirmation that the RRFB is in operation.

**654-2.3 Pedestrian Hybrid Beacon Assemblies:** Pedestrian hybrid beacon assemblies must meet the physical and operational requirements of the latest edition of the MUTCD, Chapter 4F. The cabinet, signals, controller, pedestrian detectors, and other traffic control devices used to create a pedestrian hybrid beacon assembly must be listed on the APL.

**654-2.4 Cabinets, Housings, and Hardware:** Cabinets used as part of the midblock crosswalk enhancement assembly must meet the applicable criteria of Section 676.

All housings other than approved cabinets must be powder coat painted dull black (FED-STD-595-37038) with a reflectance value not exceeding 25 percent as measured by American Society for Testing and Material E1347. Cabinets and housings must prevent unauthorized access.

Pole-mount assemblies shall allow installation on 4-1/2 inch outer diameter posts.

Ensure all assembly hardware, including nuts, bolts, external screws, and locking washers less than 5/8 inch in diameter, are Type 304 or 316 passivated stainless steel. Stainless steel bolts, screws, and studs must meet ASTM F593. Stainless steel nuts must meet ASTM F594. All assembly hardware greater than or equal to 5/8 inch in diameter must be galvanized. Carbon steel bolts, studs, and threaded rod must meet ASTM A307. Structural bolts must meet ASTM F3125, Grade A325.

**654-2.5 Electrical Specifications:** Equipment must operate on solar power or a nominal voltage of 120 V alternating current ( $V_{AC}$ ). If the device requires operating voltages of less than 120  $V_{AC}$ , supply the appropriate voltage converter. Solar powered systems must be designed to operate for minimum of 100 activations per day and provide 10 days of operation without sunlight. Each activation must be 30 seconds in duration. Solar powered systems must

automatically charge batteries and prevent overcharging and over-discharging. Solar powered systems must include a charge indicator and AC/DC battery charger.

**654-2.6 Environmental Specifications:** All electronic assemblies shall operate as specified during and after being subjected to the transients, temperature, voltage, humidity, vibration, and shock tests described in National Electrical Manufacturers Association (NEMA) TS2, 2.2.7, 2.2.8, and 2.2.9. Electronics must meet Federal Communications Commission (FCC) Title 47, Subpart B, Section 15. The optical portion of the housing shall be sealed to provide an IP 67 rating.

### **654-3 Installation Requirements.**

Restore any areas impacted by the installation of the crosswalk enhancement assembly to original condition unless otherwise shown in the Plans. Install crosswalk enhancement assembly in accordance with the Americans with Disabilities Act Standards for Transportation Facilities.

### **654-4 Warranty.**

Ensure the midblock crosswalk enhancement assembly has a manufacturer's warranty covering defects for two years from the date of final acceptance in accordance with 5-11 and Section 608. Ensure the warranty includes providing replacements within 10 calendar days of notification for defective parts and equipment during the warranty period at no cost to the Department or the maintaining agency.

### **654-5 Method of Measurement.**

**654-5.1 General:** All midblock crosswalk assemblies will include all materials, equipment, and labor necessary for a complete and accepted installation.

**654-5.2 In-Roadway Light Assembly:** The in-roadway light assembly includes in-roadway lights, signs, sign support structures, cabinet, electronics, wiring, and pedestrian detectors for a complete crossing. Solar panels are included in the cost of the assembly, when shown in the Plans.

**654-5.3 Rectangular Rapid Flashing Beacon (RRFB) Assembly:** Post mounted assemblies include the rectangular beacon and signs for each approach, sign support structure, cabinet, electronics, wiring, and pedestrian detectors. Solar panels are included in the cost of the assembly, when shown in the Plans.

Pole mounted assemblies include the rectangular beacon and signs, pole mount bracket, cabinet, electronics, wiring, and pedestrian detector. Solar panels are included in the cost of the assembly when shown in the Plans. Poles will be paid for separately.

Mast arm mounted assemblies include the rectangular beacon and signs, attachment hardware, and wiring for a single direction unit for non-standard installations. Mast arms will be paid for separately.

**654-5.4 Pedestrian Hybrid Beacon Assembly:** The Contract unit price for each pedestrian hybrid beacon assembly will consist of all labor and materials necessary for a complete and accepted installation. The assembly includes the 3-section signal, hardware, and backplate. Pedestrian signals, cabinet, signs, mast arms, strain poles or other support structures, and signal cable will be paid under the applicable sections for each item.

### **654-6 Basis of Payment.**

Price and Payment will be full compensation for all work specified in this Section.

Payment will be made under:

Item No. 654-1	In-Roadway Light Assembly - per assembly
Item No. 654-2	Rectangular Rapid Flashing Beacon Assembly – per assembly
Item No. 654-3	Pedestrian Hybrid Beacon Assembly - per assembly