

## 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.

**654-2.2 Rectangular Rapid Flashing Beacon Assemblies (RRFB):** RRFB assemblies 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.

**654-2.2.1 RRFB Sign Assemblies:** RRFB assemblies must be attached to a W11-2 (Pedestrian) or S1-1 (School) crossing warning sign with a diagonal downward arrow (W16-7p) plaque, a single column ground sign post, and attachment hardware in accordance with Standard Plans, Index 700-010. 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. The outside edges of the RRFB indications, including any housings, shall not project beyond the outside edges of the W11-2 or S1-1 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).

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 flash in one of the following patterns.

**654-2.2.2.1 "2/5" Pattern:** The flash rate shall be 70 to 80 periods of flashing per minute. Each beacon shall have alternating flash rates, but approximately equal periods of rapid pulsing 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 shall emit two slow pulses of light after which the yellow indications on the right side of the RRFB shall emit four rapid pulses of light followed by a long pulse.

**654.2.2.2.2 “WW+S” Pattern:** The flash rate shall be 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 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.

All RRFBs associated with a single crosswalk (including those with an 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 provide 10 days of continuous operation without sunlight. 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.

**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 Assembly:** The RRFB assembly includes a rectangular beacon and signs for each approach, sign support structure, cabinet, electronics, wiring, and pedestrian detector. Solar panels are included in the cost of the assembly, when shown in the Plans.

**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:

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| 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          |