ADMINISTRATIVE INFORMATION: This Office of Traffic Safety & Mobility Instruction (TSMI) is effective immediately.

PURPOSE: This TSMI is intended to provide general direction in terms of guidelines and responsibility for the installation, operation and maintenance of Rectangular Rapid Flashing Beacons (RRFB) on State highways.

BACKGROUND: The Federal Highway Administration (FHWA) granted interim approval for RRFBs on July 16, 2008 via Interim Approval (IA-11) Memorandum [HTML, PDF]. NYSDOT then requested and received statewide approval from FHWA for the Department and all jurisdictions on June 3, 2009.

A number of official Interpretations regarding RRFBs have been issued since the original Interim Approval.

- St. Petersburg Experimentation Final Report [HTML, PDF 1.3MB]
- Florida DOT & St. Petersburg Request for Issuance of Interim Approval (excerpt) [HTML, PDF 347KB]
- December 9, 2009, Official Interpretation #4-376 (I) on Overhead Mounting of RRFB [HTML, PDF 85KB]
- August 12, 2010, Official Interpretation #4(09)-5 (I) on RRFB Use with W11-15 Sign [HTML, PDF 49KB]
- January 9, 2012, Official Interpretation #4(09)-17 (I) on RRFB Light Intensity [HTML, PDF 67KB]
- June 13, 2012, Official Interpretation #4(09)-21 (I) on Clarification of RRFB Flashing Pattern [HTML, PDF 53MB]
- August 8, 2012, Official Interpretation #4(09)-22 (I) on Flashing Pattern for Existing RRFBs [HTML, PDF 42KB]
- September 27, 2012, Official Interpretation #4(09)-24 (I) on Dimming of RRFBs during Daytime Hours [HTML, PDF 496KB]
- October 9, 2013, Official Interpretation #4(09)-37 (I) on Definition of Dimming [HTML, PDF 627KB]
- October 22, 2013, Official Interpretation #4(09)-38 (I) on RRFB Flashing Extensions and Delays [HTML, PDF 731KB]
- July 25, 2014, Official Interpretation #4(09)-41 (I) on Additional Flash Pattern for RRFBs [HTML, PDF 738KB]

FHWA has reviewed the available data and considers the RRFB to be highly successful for the applications tested (uncontrolled crosswalks). The RRFB offers significant potential safety and cost benefits because it achieves very high rates of compliance at a very low relative cost in comparison to other more restrictive devices that provide comparable results, such as full midblock signalization.
Despite the success of the RRFB, approval is still in the interim stage until the next edition of the MUTCD is released. The Interim Approval contains guidance for the design and operational requirements of a RRFB. While there are no warrants regarding vehicular volumes, pedestrian volumes, accidents, or other quantifiable criteria, FHWA has deemed all other provisions of the MUTCD applicable to Warning Beacons shall apply to RRFBs.

There are only a few RRFB locations on State highways in New York with countless others on highways under local jurisdiction. There is growing interest to implement RRFBs and a set of guidelines regarding need assessment, planning, and the responsibilities for installation, operation and maintenance of RRFBs is desirable.

TECHNICAL INFORMATION:

Information regarding RRFBs can be found at the MUTCD website under Interim Approvals.

http://mutcd.fhwa.dot.gov/resources/interim_approval/ia11/fhwamemo.htm

In the Interim Approval document, FHWA provided guidance regarding the design and operational requirements of RRFBs. That information can be found in the Appendix of this TSMI.

Best Practices

While no National warrants currently exist for justifying the installation of a RRFB, other states and jurisdictions have begun to develop their own guidelines. The City of Boulder (CO) has produced the document:

Pedestrian Crossing Treatment Installation Guidelines (November 2011).

http://nacto.org/docs/usdp/boulder_crossing_guidelines_boulder.pdf

The guidelines are intended to provide a consistent procedure for considering the installation of crossing treatments where needed on a case-by case basis. Table 1, Criteria for Crossing Treatment at Uncontrolled Locations provides recommendations for installing RRFBs under given conditions involving roadway configuration, number of lanes crossed, traffic volumes and posted speed limits. In addition to RRFBs, High Intensity Actuated CrossWalker (HAWS) and standard three color signals are also examined.
The FHWA’s Safety Effects of Marked Versus Unmarked Crosswalks at Uncontrolled Location - Final Report and Recommended Guidelines, 2005 is the source document for Table 1 mentioned above (see page 54, Table 11). This data and table have been widely adopted nationally for this type of engineering guidance and is included within the Highway Design Manual Chapter 18 with some modification.

The Boulder (CO) document has been deemed a best practice by the National Association of City Transportation Officials (NACTO) and it may be used as a resource when evaluating the need for a RRFB at a specific location. However, it should be used with caution on higher speed facilities (40 MPH or greater) as their experience with RRFBs is limited primarily to facilities of 35 MPH or less. Engineering judgment should still be the basis for any decision to implement a RRFB.

Some jurisdictions have enacted specific criteria for deciding if a RRFB is an appropriate solution at an uncontrolled location including the following:

1. Marked Crosswalk
2. Minimum Vehicular Volumes: 1500 VPD or 150 VPH
3. Minimum Pedestrian Volume Thresholds
   a. 20 Pedestrians per hour* in any one hour, or
   b. 18 Pedestrians per hour* in any two hours, or
   c. 15 Pedestrians per hour* in any three hours, or
   d. 10 School Aged Pedestrians traveling to/from school in any one hour

* Young, elderly, and disabled pedestrians count 2X towards volume thresholds
** School Crossing defined as a crossing location where ten or more student pedestrians per hour are crossing

4. Stopping Sight Distance (SSD) ≥ 8 times the Speed Limit
5. 300 ft (minimum) to the nearest protected crossing; 200 ft in urban areas based on engineering judgment
6. Posted Speed Limit of 30 to 45 MPH
7. Maximum # of lanes crossed: 4 lanes; with a raised median: 5 lanes.

For a RRFB to be appropriate, not all of the criteria need to be met. The use of RRFBs may not be appropriate at locations where there is a combination of both high traffic volumes and high pedestrian volumes. In these extreme conditions, there may be an increase in traffic accidents and/or traffic delay that make the use of RRFBs inappropriate. Therefore, the use of conventional pedestrian traffic signals or the HAWK signals may be more appropriate for these cases.
Design, Construction & Maintenance of RRFBs

The current policy regarding the installation and maintenance of a flashing beacon on a warning sign dates back to 1969.

Directive A09-275-1 Traffic Control Program: Warning Signs, Part V., Section E., (Pg 3 of 10), dated 5/6/69 states the following:

All flashing beacons, when used to supplement warning signs, are installed and maintained by the Department with the exception of those used with the School Series of Warning Signs and Signs for Private Entrances or Highway Crossings. In these latter situations, the flashing beacons are installed and maintained by and at the expense of a school district, private interest or local authority. Flashing beacons on the School Series of Warning Signs will be approved if requested; no special justification is required.

Since RRFBs are a hybrid version of a flashing beacon, it would be reasonable to maintain the same policy for RRFBs. As an organization, the Department is focusing more and more on bicyclists and pedestrians in projects, permits and decisions in general. Therefore, for RRFBs, there will be no distinction as to whether the device will supplement a school series warning sign or a non-school series warning sign. If a RRFB is installed, then it will be treated in the same manner as a flashing beacon on a non-school series warning sign (i.e. NYSDOT is responsible for all aspects).

RRFBs may be installed by the Department or via a local jurisdiction. If a RRFB is installed via a local jurisdiction, ownership of the RRFB shall be transferred to the Department once it is accepted and it will be operated and maintained like any other flashing beacon placed on a non-school series warning sign. No permit will be necessary to operate and maintain the device; only a Highway Work Permit (HWP) to install it.

Some additional design considerations should also be noted. Since RRFB’s are not a substitute for good crosswalk placement and design, all other rules for crosswalk placement and pavement marking apply (sight distance, advance stop/yield bar, lighting, clear pedestrian desire lines, etc.). The crosswalk is still the primary traffic control element that assigns ROW to the pedestrian. It should be noted that in the event a user does not activate the RRFB (assuming manual actuation), the crosswalk still assigns ROW to the pedestrian. RRFBs supplements the crosswalk, calling attention to the crosswalk warning signs. Best practices for crosswalk placement, pavement markings and lighting should be pre-requisites for RRFBs.

The Department will be responsible for the operation and maintenance of the RRFB as well as any costs associated with energizing the device. Responsibility for funding the installation is a Regional decision and not part of this policy.
SUMMARY:

1. There are no National warrants for the installation of RRFBs. However, FHWA’s Interim Approval for Optional Use of Rectangular Rapid Flashing Beacons (IA-1) provides some general guidelines.

2. The City of Boulder (CO) has produced the document: Pedestrian Crossing Treatment Installation Guidelines (November 2011). This is considered a best practice and may be used as a resource when evaluating the need for a RRFB at a specific location. Refer to Table 1, Criteria for Crossing Treatment at Uncontrolled Locations.

3. Engineering judgment should be the basis for any decision to implement a RRFB. Other jurisdictions have developed their own minimum criteria for considering a RRFB at an uncontrolled location which include:
   a. Marked Crosswalk
   b. Minimum Vehicular Volumes: 1500 VPD or 150 VPH
   c. Minimum Pedestrian Volume Thresholds
      1. 20 Pedestrians per hour* in any one hour, or
      2. 18 Pedestrians per hour* in any two hours, or
      3. 15 Pedestrians per hour* in any three hours, or
      4. 10 School Aged Pedestrians traveling to/from school in any one hour

         * Young, elderly and disabled pedestrians count 2X towards volume thresholds
         ** School Crossing defined as a crossing location where ten or more student
            pedestrians per hour are crossing
   d. Stopping Sight Distance (SSD) ≥ 8 times the Speed Limit
   e. 300 ft (minimum) to the nearest protected crossing; 200 ft in urban areas based on
      engineering judgment
   f. Posted Speed Limit of 30 to 45 MPH
   g. Maximum # of lanes crossed: 4 lanes; with a raised median: 5 lanes.

4. For RRFBs, there will be no distinction as to whether or not the device will supplement a school series warning sign or a non-school series warning sign. If a RRFB is warranted, then it will be treated in the same manner as a flashing beacon on a non-school series warning sign (i.e. NYSDOT is responsible for all aspects). RRFBs may be installed by the Department or via a local jurisdiction. Responsibility for funding the installation of a RRFB is a Regional decision and not part of this policy.

5. RRFBs are meant to supplement crosswalks and are no substitute for using best practices for crosswalk placement, markings and lighting.
REFERENCES:

http://mutcd.fhwa.dot.gov/resources/interim_approval/ia11/fhwamemo.htm

http://nacto.org/docs/usdg/boulder_crossing_guidelines_boulder.pdf
FHWA: Safety Effects of Marked Versus Unmarked Crosswalks at Uncontrolled Location - Final Report and Recommended Guidelines, 2005


New York State DOT Directive A09-275-1 Traffic Control Program: Warning Signs, Part V. Section E., (Pg 3 of 10), dated 5/6/69

Countermeasure Strategies for Pedestrian Safety – Rectangular Rapid Flashing Beacons
http://www.pedbikeinfo.org/training/webinars_PSAP_countermeasurestrategies.cfm

CONTACT: Direct questions regarding this issuance to the Office of Traffic Safety & Mobility, Operations Bureau at (518) 457-1793.
APPENDIX

Excerpts from “Interim Approval for Optional Use of Rectangular Rapid Flashing Beacons (IA-11)”

http://mutcd.fhwa.dot.gov/resources/interim_approval/ia11/fhwamemo.htm

1. General Conditions:
   a. An RRFB shall consist of two rapidly and alternately flashed rectangular yellow indications having LED-array based pulsing light sources, and shall be designed, located, and operated in accordance with the detailed requirements specified below.
   b. The use of RRFBs is optional. However, if an agency opts to use an RRFB under this Interim Approval, the following design and operational requirements shall apply, and shall take precedence over any conflicting provisions of the MUTCD for the approach on which RRFBs are used:

2. Allowable Uses:
   a. An RRFB shall only be installed to function as a Warning Beacon (see 2003 MUTCD Section 4K.03).
   b. An RRFB shall only be used to supplement a W11-2 (Pedestrian) or S1-1 (School) crossing warning sign with a diagonal downward arrow (W16-7p) plaque, located at or immediately adjacent to a marked crosswalk.
   c. An RRFB shall not be used for crosswalks across approaches controlled by YIELD signs, STOP signs, or traffic control signals. This prohibition is not applicable to a crosswalk across the approach to and/or egress from a roundabout.
   d. In the event sight distance approaching the crosswalk at which RRFBs are used is less than deemed necessary by the engineer, an additional RRFB may be installed on that approach in advance of the crosswalk, as a Warning Beacon to supplement a W11-2 (Pedestrian) or S1-1 (School) crossing warning sign with an AHEAD: (W16-9p) plaque. This additional RRFB shall be supplemental to and not a replacement for RRFBs at the crosswalk itself.

3. Sign/Beacon Assembly Locations:
   a. For any approach on which RRFBs are used, two W11-2 or S1-1 crossing warning signs (each with RRFB and W16-7p plaque) shall be installed at the crosswalk, one on the right-hand side of the roadway and one on the left-hand side of the roadway. On a divided highway, the left-hand side assembly should be installed on the median, if practical, rather than on the far left side of the highway.
   b. An RRFB shall not be installed independent of the crossing signs for the approach the RRFB faces. The RRFB shall be installed on the same support as the associated W11-2 (Pedestrian) or S1-1 (School) crossing warning sign and plaque.

4. Beacon Dimensions and Placement in Sign Assembly:
   a. Each RRFB shall consist of two rectangular-shaped yellow indications, each with an LED-array based light source. Each RRFB indication shall be a minimum of approximately 5 inches wide by approximately 2 inches high.
   b. The two RRFB indications shall be aligned horizontally, with the longer dimension horizontal and with a minimum space between the two indications of approximately seven inches (7 in), measured from inside edge of one indication to inside edge of the other indication.
Appendix – continued

c. 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.

d. As a specific exception to 2003 MUTCD Section 4K.01 guidance, the RRFB shall be located between the bottom of the crossing warning sign and the top of the supplemental downward diagonal arrow plaque (or, in the case of a supplemental advance sign, the AHEAD plaque), rather than 12 inches above or below the sign assembly.

5. Beacon Flashing Requirements:

a. When activated, the two yellow indications in each RRFB shall flash in a rapidly alternating "wig-wag" flashing sequence (left light on, then right light on).

b. As a specific exception to 2003 MUTCD Section 4K.01 requirements for the flash rate of beacons, RRFBs shall use a much faster flash rate. Each of the two yellow indications of an RRFB shall have 70 to 80 periods of flashing per minute and shall have alternating but approximately equal periods of rapid pulsing light emissions and dark operation. During each of its 70 to 80 flashing periods per minute, one of the yellow indications shall emit two rapid pulses of light and the other yellow indication shall emit three rapid pulses of light.

c. 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, to avoid frequencies that might cause seizures.

d. The light intensity of the yellow indications shall meet the minimum specifications of Society of Automotive Engineers (SAE) standard J595 (Directional Flashing Optical Warning Devices for Authorized Emergency, Maintenance, and Service Vehicles) dated January 2005.

6. Beacon Operation:

a. The RRFB shall be normally dark, shall initiate operation only upon pedestrian actuation, and shall cease operation at a predetermined time after the pedestrian actuation or, with passive detection, after the pedestrian clears the crosswalk.

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

c. If pedestrian pushbuttons (rather than passive detection) are used to actuate the RRFBs, a pedestrian instruction sign with the legend PUSH BUTTON TO TURN ON WARNING LIGHTS should be mounted adjacent to or integral with each pedestrian pushbutton.

d. The duration of a predetermined period of operation of the RRFBs following each actuation should be based on the MUTCD procedures for timing of pedestrian clearance times for pedestrian signals.

e. A small light directed at and visible to pedestrians in the crosswalk may be installed integral to the RRFB or push button to give confirmation that the RRFB is in operation.

7. Other:

a. Except as otherwise provided above, all other provisions of the MUTCD applicable to Warning Beacons shall apply to RRFBs.