

CITY OF LOS ANGELES
INTER-DEPARTMENTAL MEMORANDUM

Date: June 27, 2018

To: Honorable City Council
c/o City Clerk, Room 395, City Hall
Attention: Honorable Mike Bonin, Chair, Transportation Committee

From: Seleta J. Reynolds,  General Manager
Department of Transportation

Subject: **STATUS AND ACTION PLAN FOR RAPID RECTANGULAR FLASHING BEACONS (RRFBs), AND GUIDELINES TO STRATEGICALLY LEVERAGE LOCAL, STATE, AND FEDERAL FUNDING OPPORTUNITIES FOR CRITICAL SAFETY PROJECTS (CF 18-0096)**

SUMMARY

As directed by council motion (CF 18-0096), the Department of Transportation (DOT) has prepared this report in response to the concerns raised regarding the status of RRFBs and the ability to use them in the City, see Attachment A. This report also provides guidelines to strategically leverage local, state, and federal funding opportunities without unduly delaying critical safety projects.

RECOMMENDATION

That the City Council:

1. **RECEIVE AND FILE** this report.

PEDESTRIAN-ACTUATED FLASHING DEVICE

On July 6, 2008, the Federal Highway Administration (FHWA) adopted Interim Approval 11 (IA-11), allowing the use of RRFBs (Attachment B). The City of Los Angeles activated its first RRFB on June 6, 2013 at the intersection of Wentworth Street and Wheatland Avenue for an equestrian crossing. Subsequently, the City has installed dozens of RRFBs at uncontrolled pedestrian crossings as a cost-effective pedestrian safety treatment option.

On December 21, 2017, FHWA terminated IA-11 due to patent related lawsuits (Attachment C) and DOT put the installation of RRFBs on hold and investigated alternative low-cost treatments that provided similar benefits to the RRFB. On March 21, 2018, the FHWA adopted Interim Approval 21 (IA-21) which reinstated the Optional Use of Pedestrian-Actuated RRFBs at Uncontrolled Marked Crosswalks (Attachment D) and on April 9, 2018, the California Department of Transportation (Caltrans) received an approval from FHWA to use the Pedestrian-Actuated RRFBs on a blanket basis at uncontrolled marked crosswalk locations statewide in California (Attachment E).

DOT has reinstated the use of RRFBs for the projects that they initially put on hold. DOT intends to continue using RRFBs for future projects while evaluating alternatives, such as High-intensity Activated crossWalk (HAWK) beacons, to ensure design flexibility.

PRIORITIZATION STRATEGY ON CRITICAL SAFETY PROJECTS FOR STATE AND FEDERAL GRANT FUNDING OPPORTUNITIES

Prior to 1993, outside grant opportunities for safety projects were limited, and DOT was heavily dependent on general funds to build transportation-related safety projects. With the inception of competitive grant fund opportunities in 1993, DOT's ability to build transportation-related safety projects has grown substantially, and the department has implemented over 325 safety projects totaling over \$870 million. The department secured \$545 million in local, state, and federal grants by leveraging \$225 million in local match funds. The grants were obtained through various competitive grant funding opportunities such as Metro's bi-annual Call For Projects and Express-Lanes Net Toll Revenue Reinvestment Call for Projects, Caltrans' Highway Safety Improvement Program (HSIP), Active Transportation Program (ATP), Safe Routes to School (SRTS), and Federal Earmark programs.

State and federal funds make up the vast majority of the competitive grants, but they have extremely stringent funding requirements that result in longer project delivery timelines. The passage of ballot measures have yielded, funding sources (Measure R, Measure M and SB1) with less stringent funding requirements. In addition to being more readily available and easier to use, these new local funding sources have provided opportunities to better address increased demand for transportation safety projects.

To ensure critical safety projects are implemented expeditiously, the department uses the most flexible funding sources first and the funding sources that are more difficult are considered for less critical and longer-term safety projects.

Therefore, to expedite the delivery of transportation-related safety projects, DOT is using the following guidelines:

TABLE A

Project Priority	Project Type	Implementation Duration	Targeted Funding Sources (Programs)
1	Critical safety projects which require immediate attention	Within 1 year	General Fund (DOT Annual Work Program), Measure R*, Measure M* and SB1
2	Short-term non-capital intensive safety projects, High Injury Network projects	Between 1 to 3 years	Measure R*, Measure M*, SB1, Proposition C
3	Capital intensive active transportation projects	Between 3 to 5 years	State ATP, Proposition C, Measure R*, Measure M*, SB1
4	Long-term capital-intensive safety projects, corridor improvements	Between 4 to 6 years	State HSIP, Proposition C, Measure R*, Measure M*, SB1
5	Special projects within other public agency jurisdiction***, projects requiring right-of-way	More than 6 years	Metro Call For Projects**, Proposition C, Federal Earmark, Measure R*, Measure M*, SB1

- * Local Return
- ** Dependent upon program funding availability.
- *** Requires time consuming outreach and coordination with other public agency, and may require additional project study reports.

FINANCIAL IMPACT STATEMENT

There is no additional fiscal impact to the General Fund, as the DOT Annual Work Program that uses the General Fund already exists.

ATTACHMENTS

- A: Motion (CF 18-0096)
- B: IA-11
- C: IA-11, termination memorandum
- D: IA-21
- E: IA:21, Caltrans blanket approval

ATTACHMENT A

TRANSPORTATION

MOTION

In Los Angeles, a pedestrian is killed on city streets every three days. In 2015, Mayor Garcetti issued an executive order to eliminate traffic fatalities within 10 years. Achieving Vision Zero requires a comprehensive and strategic approach to pedestrian safety that accelerates project delivery in our highest priority locations.

Currently, the City relies heavily on state and federal funding to leverage limited local resources and maximize the total available funding for safety projects. To maximize grant funding, the City combines the most competitive projects into federal grant applications, which in effect means that our most dangerous locations are addressed with the most difficult funding source, creating a high risk of project delays.

Furthermore, a recent decision by the Federal Highway Administration (FHWA) to prohibit the continued use of one of the most cost-effective pedestrian safety treatments, Rapid Rectangular Flashing Beacons (RRFBs), has created uncertainty for many planned and funded projects across the city and the potential for additional project delays. Resolution of this design issue is needed for safety projects to move forward expeditiously.

I THEREFORE MOVE that the Los Angeles Department of Transportation (LADOT) be directed to report back within 30 days on a recommended replacement pedestrian safety device for locations where LADOT had planned to install RRFBs.

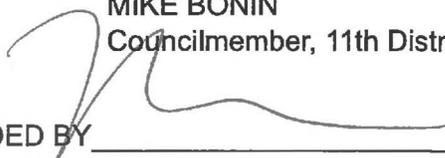
I FURTHER MOVE that LADOT report back within 90 days on options to continue strategically leveraging state and federal grant funding opportunities without unduly delaying critical safety projects.

PRESENTED BY



MIKE BONIN
Councilmember, 11th District

SECONDED BY



JAN 31 2018

ORIGINAL





Memorandum

Sent via Electronic Mail

Subject: **INFORMATION:** MUTCD – Interim Approval for
Optional Use of Rectangular Rapid Flashing Beacons (IA-11)

Date: July 16, 2008

From: Anthony T. Furst /s/ *Anthony T. Furst*
Acting Associate Administrator
for Operations

Reply to
Attn. of: HOTO-1

To: Associate Administrators
Chief Counsel
Acting Chief Financial Officer
Directors of Field Services
Federal Lands Highway Division Engineers
Resource Center Director
Division Administrators

Purpose: The purpose of this memorandum is to issue an Interim Approval for the optional use of Rectangular Rapid Flashing Beacons (RRFB) as warning beacons under certain limited conditions. Interim Approval allows interim use, pending official rulemaking, of a new traffic control device, a revision to the application or manner of use of an existing traffic control device, or a provision not specifically described in the Manual on Uniform Traffic Control Devices (MUTCD).

Background: The Florida Department of Transportation, in conjunction with the city of St. Petersburg, has requested that the Federal Highway Administration (FHWA) issue an Interim Approval to allow the use of RRFBs as warning beacons to supplement standard pedestrian crossing and school crossing warning signs at crossings across uncontrolled approaches. The RRFB does not meet the current standards for flashing warning beacons as contained in the 2003 edition of the MUTCD, Chapter 4K which requires a warning beacon to be round in shape and either 8 or 12 inches in diameter, to flash at a rate of approximately once per second, and to be located no less than 12 inches outside the nearest edge of the warning sign it supplements. The RRFB uses rectangular-shaped high-intensity LED-based indications, flashes rapidly in a wig-wag "flickering" flash pattern, and is mounted immediately between the crossing sign and the sign's supplemental arrow plaque.



Research on the RRFB: The city of St. Petersburg has completed experimentation with the RRFB at 18 pedestrian crosswalks across uncontrolled approaches and has submitted their final report. In addition to "before" data, the city collected "after" data at intervals for 1 year at all sites and for 2 years at the first 2 implemented sites. For the first 2 sites, the city collected data for overhead and ground-mounted pedestrian crossing signs supplemented with standard round yellow flashing beacons, for comparison purposes, before the RRFBs were installed. The data show very high rates of motorist "yield to pedestrians" compliance, mostly in the high 80s to close to 100 percent, in comparison to far lower rates (in the 15 to 20 percent range) for standard beacons. The very high yielding rates are sustained even after 2 years in operation, and no identifiable negative effects have been found. The RRFB's very high compliance rates are previously unheard of for any device other than a full traffic signal and a "HAWK" hybrid signal, both of which stop traffic with steady red signal indications. The St. Petersburg data also shows that drivers exhibit yielding behavior much further in advance of the crosswalk with RRFB than with standard round yellow flashing beacons. These data clearly document very successful and impressive positive experience with the RRFBs at crosswalks in that city.

In addition to the St. Petersburg locations, experimentation is underway at 3 sites in Miami-Dade County, FL, 4 sites in Largo, FL, and 2 sites in Las Cruces, NM, and RRFBs are being installed at 3 sites in northern Illinois. Additionally, the District of Columbia has installed RRFBs at one crosswalk and plans to request experimentation with RRFB at several sites. Data from locations other than St. Petersburg is limited but does show results very similar to those found in St. Petersburg. A study of 2 RRFB locations in Miami-Dade County, FL, reported in a TRB paper, found that evasive conflicts between drivers and pedestrians and the percentage of pedestrians trapped in the center of an undivided road because of a non-yielding driver in the second half of the roadway were both significantly reduced to negligible levels. Data so far from the one RRFB site in DC shows driver yielding compliance rates increased from 26 percent to 74 percent after 30 days in operation and advance yielding distances also increased comparable to the St. Petersburg results.

FHWA Evaluation of Results: The Office of Transportation Operations 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. The components of RRFB are not proprietary and can be assembled by any jurisdiction with off-the-shelf hardware. The FHWA believes that the RRFB has a low risk of safety or operational concerns. However, because proliferation of RRFBs in the roadway environment to the point that they become ubiquitous could decrease their effectiveness, use of RRFBs should be limited to locations with the most critical safety concerns, such as pedestrian and school crosswalks across uncontrolled approaches, as tested in the experimentation.

At a recent meeting of the National Committee on Uniform Traffic Control Devices, the Signals Technical Committee voted to endorse the future inclusion of the RRFB for uncontrolled crosswalks into the MUTCD and recommended that FHWA issue an Interim Approval for RRFB. The FHWA believes this indicates a consensus in the practitioner community in support of optional use of RRFB. This Interim Approval does not create a new mandate compelling installation of RRFB but will allow agencies to install this type of flashing beacon, pending official MUTCD rulemaking, to provide a degree of enhanced pedestrian safety at uncontrolled crosswalks that has been previously unattainable without costly and delay-producing full traffic signalization.

Conditions of Interim Approval: The FHWA will grant Interim Approval for the optional use of the RRFB as a warning beacon to supplement standard pedestrian crossing or school crossing signs at crosswalks across uncontrolled approaches to any jurisdiction that submits a written request to the Office of Transportation Operations. A State may request Interim Approval for all jurisdictions in that State. Jurisdictions using RRFB under this Interim Approval must agree to comply with the technical conditions detailed below, to maintain an inventory list of all locations where the devices are placed, and to comply with Item F at the bottom of Page 1A-6 of the 2003 MUTCD, Section 1A.10 which requires:

"An agreement to restore the site(s) of the Interim Approval to a condition that complies with the provisions in this Manual within 3 months following the issuance of a Final Rule on this traffic control device. This agreement must also provide that the agency sponsoring the Interim Approval will terminate use of the device or application installed under the Interim Approval at any time that it determines significant safety concerns are directly or indirectly attributable to the device or application. The FHWA's Office of Transportation Operations has the right to terminate the interim approval at any time if there is an indication of safety concerns."

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.

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. (See attached example photo.)

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.

Any questions concerning this Interim Approval should be directed to Mr. Scott Wainwright at scott.wainwright@dot.gov or by telephone at 202-366-0857.



Example of RRFB with W11-2 sign and W16-7p plaque at crosswalk across uncontrolled approach. [Photo courtesy of City of St. Petersburg, Florida]

FHWA:HOTO-1:SWainwright:ds:60857:7-2-08

cc: HOTO-1 HOTO-1(HKalla/SWainwright/BFriedman)
Mr. Roger Wentz, ATSSA Mr. Jim Baron, ATSSA
SafetyField
E84-401 Chron E84-401 Reader

DF(IA-11 Rectangular Rapid Flashing Beacon)

M:\MUTCD\INTERIM APPROVALS\IA-11 Rectangular Rapid Flashing Beacon\

IA-11 - RRFB Interim Approval Policy Memo.doc



U.S. Department
of Transportation
Federal Highway
Administration

Memorandum

Subject: **INFORMATION:** MUTCD – Interim
Approval for Optional Use of Rectangular
Rapid Flashing Beacons
(IA-11) —TERMINATION

Date: DEC 21 2017

From: Martin C. Knopp *Mart. CKG*
Associate Administrator for Operations

In Reply Refer To:
HOP-1

To: Federal Lands Highway Division Directors
Division Administrators

Purpose: Through this memorandum, the Federal Highway Administration (FHWA) officially rescinds the subject Interim Approval (IA) issued on July 16, 2008.

Background: Federal regulation, through the *Manual on Uniform Traffic Control Devices for Streets and Highways* (MUTCD),¹ prohibits the use of patented devices under an IA,² or official experimentation³ with patented devices. The MUTCD is incorporated by reference at 23 CFR, Part 655, Subpart F, and is recognized as the national standard for all traffic control devices in accordance with 23 U.S.C. 109(d) and 402(a).⁴

Action: The MUTCD prohibits patented devices from experimentation, IA, or inclusion in the MUTCD.⁵ The FHWA has learned of the existence of four issued U.S. patents, and at least one pending patent application, covering aspects of the Rectangular Rapid Flashing Beacons (RRFB) device originally approved under IA-11 of July 16, 2008.

For the aforementioned reasons, FHWA hereby rescinds IA-11 for all new installations of RRFB devices. Installed RRFBs may remain in service until the end of useful life of those devices and need not be removed.

Nothing in this memorandum should be interpreted as expressing an opinion as to the applicability, scope, or validity of any patent or pending patent application with regard to

¹ MUTCD 2009 Ed., Intro. ¶ 4 at I-1

² *Id.*; § 1A.10.

³ *Id.*

⁴ *See id.* at ¶ 02 at I-1.

⁵ *Id.* at ¶ 04.

the installation or use of RRFBs, generally, or for those currently in use. The FHWA, the U.S. Department of Transportation, and the U.S. express no opinion on the merits, and take no position on the outcome, of any litigation relating to the RRFB.

cc:

Associate Administrators

Chief Counsel

Chief Financial Officer

Directors of Field Services

Director of Technical Services



U.S. Department
of Transportation
Federal Highway
Administration

ATTACHMENT D

Memorandum

Correction issued 3/21/2018

Subject: **INFORMATION:** MUTCD – Interim Approval
for Optional Use of Pedestrian-Actuated
Rectangular Rapid-Flashing Beacons at
Uncontrolled Marked Crosswalks (IA-21)

Date: MAR 20 2018

From: Martin C. Knopp 
Associate Administrator for Operations

In Reply Refer To:
HOTO-1

To: Federal Lands Highway Division Directors
Division Administrators

Purpose: The purpose of this memorandum is to issue an Interim Approval for the optional use of Rectangular Rapid-Flashing Beacons (RRFB) as pedestrian-actuated conspicuity enhancements for pedestrian and school crossing warning signs under certain limited conditions. Interim Approval allows interim use, pending official rulemaking, of a new traffic control device, a revision to the application or manner of use of an existing traffic control device, or a provision not specifically described in the *Manual on Uniform Traffic Control Devices for Streets and Highways* (MUTCD). State and local agencies must request and receive permission to use this new Interim Approval, designated IA-21, from the Federal Highway Administration (FHWA) in accordance with the provisions of Section 1A.10 of the MUTCD before they can use the RRFB, even if prior approval had been given for Interim Approval 11 (IA-11), now terminated. The issuance of this new Interim Approval does not reinstate IA-11 either in whole or in part.

Background: The Florida Department of Transportation has requested that the FHWA issue an Interim Approval to allow the use of RRFBs as pedestrian-actuated conspicuity enhancements to supplement standard pedestrian and school crossing warning signs at uncontrolled marked crosswalks. The RRFB does not meet the current standards for flashing warning beacons as contained in the 2009 edition of the MUTCD, Chapter 4L, which requires a warning beacon to be circular in shape and either 8 or 12 inches in diameter, to flash at a rate of approximately once per second, and to be located no less than 12 inches outside the nearest edge of the warning sign it supplements. The RRFB uses rectangular-shaped high-intensity light-emitting-diode (LED)-based indications, flashes rapidly in a combination wig-wag and simultaneous flash pattern, and may be mounted immediately adjacent to the crossing sign.

Research on the RRFB: The City of St. Petersburg, Florida, experimented with the RRFB at 18 pedestrian crosswalks across uncontrolled approaches and submitted its final report in 2008. In addition to “before” data, the city collected “after” data at intervals for one year at all 18 sites and for two years at the first two implemented sites. For the first two sites, the city collected data for overhead and ground-mounted pedestrian crossing signs supplemented with standard circular yellow flashing warning beacons, for comparison purposes, before the RRFBs were installed. The data showed higher motorist yielding rates at crosswalks where the RRFBs had been installed in comparison to lower rates for standard warning beacons. The higher yielding rates were sustained even after two years of operation, and no identifiable negative effects were found. The St. Petersburg data also showed that drivers exhibit yielding behavior much farther in advance of crosswalks with RRFBs than with standard circular yellow flashing warning beacons.

In addition to the St. Petersburg locations, experimentation with RRFBs was also conducted at other uncontrolled marked crosswalks in Florida and other States. Data from locations other than St. Petersburg was limited, but did show results similar to those found in St. Petersburg.

The Texas Transportation Institute (TTI) conducted a Federally funded research project¹ that developed and tested a new flash pattern for the RRFB that was shown to be at least as effective as the flash pattern that was initially tested in St. Petersburg, Florida, and that showed that mounting the RRFB unit above the sign was at least as effective as mounting the RRFB unit below the sign. In this project, the results were generally favorable, however there was a wide range of yielding rates, with some as low as 19 percent. This broad range indicates that there might be certain factors or characteristics of locations at which the RRFB might not be effective.

A separate project² conducted by TTI examined data from multiple projects to determine various factors that influenced driver yielding rates at RRFB locations. In this project, the researchers found that intersection configuration, presence of a median refuge, crossing distance, approach to the crossing, and one-way vs. two-way traffic significantly affected the rate of driver yielding. Additional factors including posted speed limit, mounting of the beacons (overhead or roadside), and the type of crossing and sign—Pedestrian (W11-2) or School (S1-1) sign compared with the Trail Crossing (W11-15) sign—were also significant.

¹ Fitzpatrick, K., R. Avelar, M. Pratt, M. Brewer, J. Robertson, T. Lindheimer, and J. Miles. *Evaluation of Pedestrian Hybrid Beacons and Rapid Flashing Beacons*. Report No. FHWA-HRT-16-040, pp. 88-106. Texas Transportation Institute, College Station, Texas. July 2016.
<https://www.fhwa.dot.gov/publications/research/safety/16040/index.cfm>

² Fitzpatrick, K., M. Brewer, R. Avelar, and T. Lindheimer. *Will You Stop for Me? Roadway Design and Traffic Control Device Influences on Drivers Yielding to Pedestrians in a Crosswalk with a Rectangular Rapid-Flashing Beacon*. Report No. TTI-CTS-0010. Texas A&M Transportation Institute, College Station, Texas. June 2016.
~~<https://www.fhwa.dot.gov/publications/research/safety/16040/index.cfm>~~
<https://static.tti.tamu.edu/tti.tamu.edu/documents/TTI-CTS-0010.pdf>

FHWA Evaluation of Results: The Office of Transportation Operations reviewed the available data in 2008 and considered the RRFB to be highly successful for the applications tested (uncontrolled marked crosswalks). The RRFB offers significant potential safety and cost benefits because it achieves high rates of compliance at a low relative cost in comparison to other more restrictive devices that provide comparable results, such as full midblock signalization or pedestrian hybrid beacons.

The FHWA granted interim approval status to the RRFB on July 16, 2008, and designated that action as Interim Approval 11 (IA-11).

The FHWA was later informed that the concept of the RRFB had been patented by a private company. Because patented traffic control devices are not allowed to be included in the MUTCD, are not allowed to be given interim approval status, and are not allowed to be a part of an official experiment, the FHWA terminated Interim Approval 11 on December 21, 2017.

The FHWA has confirmed that the patents on the RRFB device that was the subject of Interim Approval 11 have been expressly abandoned and the concept of the RRFB is now in the public domain. Because of this action, the RRFB is once again eligible for interim approval status and the FHWA is issuing this new Interim Approval for the RRFB.

Interim Approval 11 (IA-11) remains terminated. Agencies that previously had been approved to use RRFBs under IA-11 are not covered by this new Interim Approval to install new RRFBs. If agencies that had approval under IA-11 wish to continue to install new RRFBs, then they must submit a new request to the FHWA and agree to comply with the terms and conditions of IA-21.

This Interim Approval does not create a new mandate compelling installation of RRFBs, but will allow agencies to install this traffic control device, pending official MUTCD rulemaking, to provide a degree of enhanced pedestrian safety at uncontrolled marked crosswalks.

Conditions of Interim Approval: The FHWA will grant Interim Approval for the optional use of the RRFB as a pedestrian-actuated conspicuity enhancement to supplement standard pedestrian crossing or school crossing signs at uncontrolled marked crosswalks to any jurisdiction that submits a written request to the Office of Transportation Operations. A State may request Interim Approval for all jurisdictions in that State. Jurisdictions using RRFBs under this Interim Approval must agree to the following:

- Comply with the Technical Conditions detailed in this memorandum;
- Maintain an inventory list of all locations at which the RRFB is installed; and
- Comply with all the conditions as listed in Paragraph 18 of Section 1A.10 of the MUTCD.

In addition, any agency that receives this approval must acknowledge agreement with the following:

- That an agency will furnish its list of locations where implemented if requested by FHWA;
- That FHWA has the right to rescind this Interim Approval at any time; and
- That issuance of this Interim Approval does not guarantee that the provisions, either in whole or part, will be adopted into the MUTCD.

1. General Conditions:

- a. Each RRFB unit shall consist of two rapidly flashed rectangular-shaped yellow indications with an LED-array-based light source, 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 pedestrian-actuated conspicuity enhancement.
- b. An RRFB shall only be used to supplement a post-mounted W11-2 (Pedestrian), S1-1 (School), or W11-15 (Trail) crossing warning sign with a diagonal downward arrow (W16-7P) plaque, or an overhead-mounted W11-2, S1-1, or W11-15 crossing warning sign, located at or immediately adjacent to an uncontrolled marked crosswalk.
- c. Except for crosswalks across the approach to or egress from a roundabout, an RRFB shall not be used for crosswalks across approaches controlled by YIELD signs, STOP signs, traffic control signals, or pedestrian hybrid beacons.
- 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 pedestrian-actuated conspicuity enhancement to supplement a W11-2 (Pedestrian), S1-1 (School), or W11-15 (Trail) crossing warning sign with an AHEAD (W16-9P) or distance (W16-2P or W16-2aP) plaque. If an additional RRFB is installed on the approach in advance of the crosswalk, it shall be supplemental to and not a replacement for the RRFBs at the crosswalk itself.

3. Sign/Beacon Assembly Locations:

- a. For any approach on which RRFBs are used to supplement post-mounted signs,

at least two W11-2, S1-1, or W11-15 crossing warning signs (each with an RRFB unit and a 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-hand side of the highway.

- b. An RRFB unit shall not be installed independent of the crossing warning signs for the approach that the RRFB faces. If the RRFB unit is supplementing a post-mounted sign, the RRFB unit shall be installed on the same support as the associated W11-2, S1-1, or W11-15 crossing warning sign and plaque. If the RRFB unit is supplementing an overhead-mounted sign, the RRFB unit shall be mounted directly below the bottom of the sign.

4. Beacon Dimensions and Placement in the Sign Assembly:

- a. Each RRFB shall consist of two rectangular-shaped yellow indications, each with an LED-array-based light source. The size of each RRFB indication shall be at least 5 inches wide by at least 2 inches high.
- b. The two RRFB indications for each RRFB unit shall be aligned horizontally, with the longer dimension horizontal and with a minimum space between the two indications of at least 7 inches, measured from the nearest edge of one indication to the nearest edge of the other indication.
- c. 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 that it supplements.
- d. As a specific exception to Paragraph 5 of Section 4L.01 of the 2009 MUTCD, the RRFB unit associated with a post-mounted sign and plaque may be located between and immediately adjacent to 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 or distance plaque) or within 12 inches above the crossing warning sign, rather than the recommended minimum of 12 inches above or below the sign assembly. (See the example photo that is shown below.)

5. Beacon Flashing Requirements:

- a. When actuated, the two yellow indications in each RRFB unit shall flash in a rapidly flashing sequence.
- b. As a specific exception to the requirements for the flash rate of beacons provided in Paragraph 3 of Section 4L.01, RRFBs shall use a much faster flash rate and shall provide 75 flashing sequences per minute. Except as provided in Condition 5f below, during each 800-millisecond flashing sequence, the left and right RRFB indications shall operate using the following sequence:

The RRFB indication on the left-hand side shall be illuminated for approximately 50 milliseconds.

Both RRFB indications shall be dark for approximately 50 milliseconds.

The RRFB indication on the right-hand side shall be illuminated for approximately 50 milliseconds.

Both RRFB indications shall be dark for approximately 50 milliseconds.

The RRFB indication on the left-hand side shall be illuminated for approximately 50 milliseconds.

Both RRFB indications shall be dark for approximately 50 milliseconds.

The RRFB indication on the right-hand side shall be illuminated for approximately 50 milliseconds.

Both RRFB indications shall be dark for approximately 50 milliseconds.

Both RRFB indications shall be illuminated for approximately 50 milliseconds.

Both RRFB indications shall be dark for approximately 50 milliseconds.

3/21/2018

Both RRFB indications

~~The RRFB indication on the right-hand side shall be illuminated for approximately 50 milliseconds.~~

Both RRFB indications shall be dark for approximately 250 milliseconds.

- c. The flash rate of each individual RRFB indication, as applied over the full flashing sequence, 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 during daytime conditions shall meet the minimum specifications for Class 1 yellow peak luminous intensity in the Society of Automotive Engineers (SAE) Standard J595 (Directional Flashing Optical Warning Devices for Authorized Emergency, Maintenance, and Service Vehicles) dated January 2005.
- e. To minimize excessive glare during nighttime conditions, an automatic signal dimming device should be used to reduce the brilliance of the RRFB indications during nighttime conditions.
- f. Existing RRFB units that use the flashing sequence that was specified in the Interim Approval 11 memorandum and a subsequent interpretation (the RRFB indication on the left-hand side emits two slow pulses of light after which the RRFB indication on the right-hand side emits four rapid pulses of light followed by one long pulse of light) should be reprogrammed to the flash pattern specified above in Condition 5b as part of a systematic upgrading process, such as when the units are serviced or when the existing signs are replaced.

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 RRFB units associated with a given crosswalk (including those with an advance crossing sign, if used) shall, when actuated, simultaneously commence operation of their rapid-flashing indications and shall cease operation simultaneously.
- c. If pedestrian pushbutton detectors (rather than passive detection) are used to actuate the RRFB indications, a PUSH BUTTON TO TURN ON WARNING LIGHTS (R10-25) sign shall be installed explaining the purpose and use of the pedestrian pushbutton detector.
- d. The duration of a predetermined period of operation of the RRFBs following each actuation should be based on the procedures provided in Section 4E.06 of the 2009 MUTCD for the timing of pedestrian clearance times for pedestrian signals.
- e. The predetermined flash period shall be immediately initiated each and every time that a pedestrian is detected either through passive detection or as a result of a pedestrian pressing a pushbutton detector, including when pedestrians are detected while the RRFBs are already flashing and when pedestrians are detected immediately after the RRFBs have ceased flashing.
- f. A small pilot light may be installed integral to the RRFB or pedestrian pushbutton detector to give confirmation that the RRFB is in operation.

7. Accessible Pedestrian Features:

- a. If a speech pushbutton information message is used in conjunction with an RRFB, a locator tone shall be provided.
- b. If a speech pushbutton information message is used in conjunction with an RRFB, the audible information device shall not use vibrotactile indications or percussive indications.
- c. If a speech pushbutton information message is used in conjunction with an RRFB, the message should say, "Yellow lights are flashing." The message should be spoken twice.

Any questions concerning this Interim Approval should be directed to Mr. Duane Thomas at duane.thomas@dot.gov.



Figure 1. Example of an RRFB dark (left) and illuminated during the flash period (center and right) mounted with W11-2 sign and W16-7P plaque at an uncontrolled marked crosswalk.

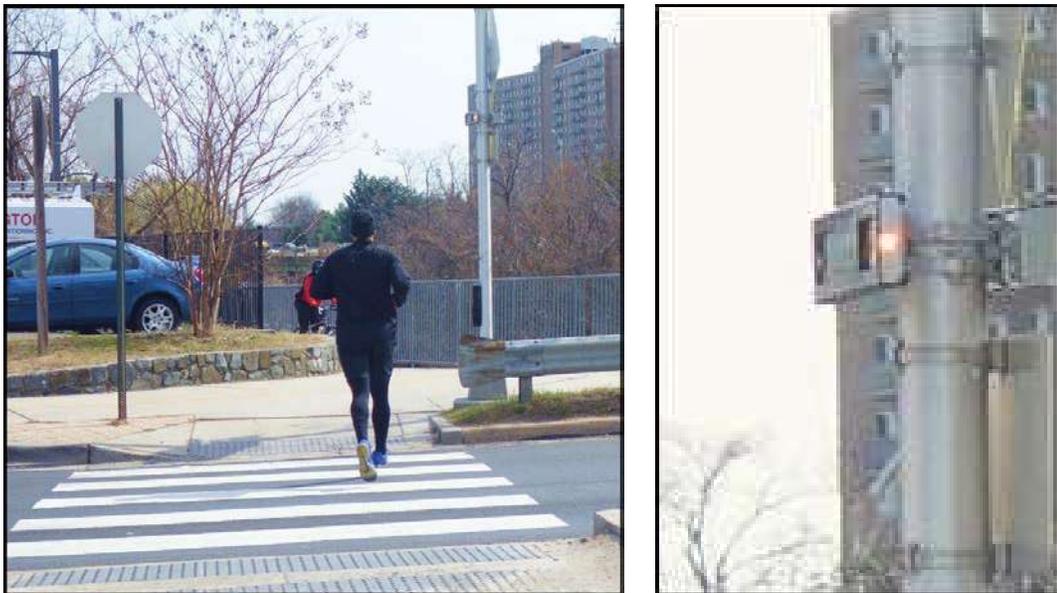


Figure 2. View of pilot light to pedestrian at shared-use path crossing with median refuge. Enlargement of pilot light at right.



Figure 3. Example of pedestrian pushbutton and R10-25 sign with pilot light for pedestrian actuation.

cc:

Associate Administrators

Chief Counsel

Chief Financial Officer

Directors of Field Services

Director of Technical Services

ATTACHMENT E



U.S. Department
of Transportation
**Federal Highway
Administration**

1200 New Jersey Avenue, SE
Washington, D.C. 20590

APR 9 2018

In Reply Refer to:
HOTO-1

Mr. Duper Tong
Senior Transportation Engineer
California Department of Transportation
Division of Traffic Operations
P.O. Box 942873, MS-36
Sacramento, California 94273-0001

Dear Mr. Tong:

Thank you for your letter of March 22 requesting approval to use Pedestrian-Actuated Rectangular Rapid-Flashing Beacons (RRFBs) on a blanket basis at uncontrolled marked crosswalk locations statewide in California. Your request is made under the provisions of Section 1A.10 of the 2009 edition of the *Manual on Uniform Traffic Control Devices for Streets and Highways* and the Federal Highway Administration's Interim Approval memorandum (IA-21) dated March 20, 2018 for the optional use of RRFBs.

Your request is approved. This approval is granted on a blanket basis for all locations in California at which the California Department of Transportation or local highway agencies install RRFBs under the technical conditions contained in IA-21.

Please develop and periodically update a list of all locations where RRFBs are installed in California. Local jurisdictions that install RRFBs under this Interim Approval should inform your office of such installations so you can maintain a comprehensive list of locations.

For recordkeeping purposes, we have assigned your request the following number and title: "IA-21.13 –Rectangular Rapid-Flashing Beacons at Crosswalks – CA DOT (Statewide)." Please refer to this number and title in any future correspondence.

Thank you for your interest in improving pedestrian safety. If we can be of further assistance on this matter, please contact Mr. Duane Thomas at duane.thomas@dot.gov.

Sincerely yours,

Mark R. Kehrl
Director, Office of Transportation
Operations