



# FEDERAL HIGHWAY ADMINISTRATION PROVEN SAFETY COUNTERMEASURES



OFFICE OF SAFETY  
**Proven Safety Countermeasures**



**Safety Benefits:**  
RRFBs can reduce crashes up to:  
**47%**  
for pedestrian crashes.<sup>4</sup>  
  
RRFBs can increase motorist yielding rates up to:  
**98%**  
(varies by speed limit, number of lanes, crossing distance, and time of day).<sup>3</sup>



RRFBs used at a trail crossing.  
Source: LJB

**Rectangular Rapid Flashing Beacons (RRFB)**  
A marked crosswalk or pedestrian warning sign can improve safety for pedestrians crossing the road, but at times may not be sufficient for drivers to visibly locate crossing locations and yield to pedestrians. To enhance pedestrian conspicuity and increase driver awareness at uncontrolled, marked crosswalks, transportation agencies can install a pedestrian actuated Rectangular Rapid Flashing Beacon (RRFB) to accompany a pedestrian warning sign. RRFBs consist of two, rectangular-shaped yellow indications, each with a light-emitting diode (LED)-array-based light source.<sup>1</sup> RRFBs flash with an alternating high frequency when activated to enhance conspicuity of pedestrians at the crossing to drivers.

For more information on using RRFBs, see the Interim Approval in the *Manual on Uniform Traffic Control Devices (MUTCD)*.<sup>1</sup>

**Applications**  
The RRFB is applicable to many types of pedestrian crossings but is particularly effective at multilane crossings with speed limits less than 40 miles per hour.<sup>2</sup> Research suggests RRFBs can result in motorist yielding rates as high as 98 percent at marked crosswalks, but varies depending on the location, posted speed limit, pedestrian crossing distance, one- versus two-way road, and the number of travel lanes.<sup>3</sup> RRFBs can also accompany school or trail crossing warning signs.  
RRFBs are placed on both sides of a crosswalk below the pedestrian crossing sign and above the diagonal downward arrow plaque pointing at the crossing.<sup>1</sup> The flashing pattern can be activated with pushbuttons or passive (e.g., video or infrared) pedestrian detection, and should be unlit when not activated.

**Considerations**  
**Agencies should:<sup>2</sup>**

- Install RRFBs in the median rather than the far-side of the roadway if there is a pedestrian refuge or other type of median.
- Use solar-power panels to eliminate the need for a power source.
- Reserve the use of RRFBs for locations with significant pedestrian safety issues, as over-use of RRFB treatments may diminish their effectiveness.

**Agencies shall not:<sup>2</sup>**


- Use RRFBs without the presence of a pedestrian, school or trail crossing warning sign.
- Use RRFBs for crosswalks across approaches controlled by YIELD signs, STOP signs, traffic control signals, or pedestrian hybrid beacons, except for the approach or egress from a roundabout.

**For more information on this and other FHWA Proven Safety Countermeasures, please visit <https://safety.fhwa.dot.gov/provencountermeasures/> and [https://safety.fhwa.dot.gov/ped\\_bike/step/docs/techSheet\\_RRFB\\_2018.pdf](https://safety.fhwa.dot.gov/ped_bike/step/docs/techSheet_RRFB_2018.pdf).**


1 MUTCD Interim Approval 21 – RRFBs at Crosswalks.  
2 “Rectangular Rapid Flash Beacon” in PEDSAFE: Pedestrian Safety Guide and Countermeasure Selection System. FHWA, (2013).  
3 Fitzpatrick et al. “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, (2016).  
4 NCHRP Research Report 841 Development of Crash Modification Factors for Uncontrolled Pedestrian Crossing Treatments, (2017).



FHWA-SA-21-053



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**Proven Safety Countermeasures**




**Safety Benefits:**  
**Median with Marked Crosswalk**  
**46%**  
reduction in pedestrian crashes.<sup>2</sup>  
  
**Pedestrian Refuge Island**  
**56%**  
reduction in pedestrian crashes.<sup>2</sup>


**Medians and Pedestrian Refuge Islands in Urban and Suburban Areas**  
A **median** is the area between opposing lanes of traffic, excluding turn lanes. Medians in urban and suburban areas can be defined by pavement markings, raised medians, or islands to separate motorized and non-motorized road users.  
A **pedestrian refuge island** (or crossing area) is a median with a refuge area that is intended to help protect pedestrians who are crossing a road.

Pedestrian crashes account for approximately 17 percent of all traffic fatalities annually, and 74 percent of these occur at non-intersection locations.<sup>1</sup> For pedestrians to safely cross a roadway, they must estimate vehicle speeds, determine acceptable gaps in traffic based on their walking speed, and predict vehicle paths. Installing a median or pedestrian refuge island can help improve safety by allowing pedestrians to cross one direction of traffic at a time.  
Transportation agencies should consider medians or pedestrian refuge islands in curbed sections of urban and suburban multilane roadways, particularly in areas with a significant mix of pedestrian and vehicle traffic, traffic volumes over 9,000 vehicles per day, and travel speeds 35 mph or greater. Medians/refuge islands should be at least 4-ft wide, but preferably 8 ft for pedestrian comfort. Some example locations that may benefit from medians or pedestrian refuge islands include:

- Mid-block crossings.
- Approaches to multilane intersections.
- Areas near transit stops or other pedestrian-focused sites.




Example of a road with a median and pedestrian refuge islands.  
Source: City of Charlotte, NC



Median and pedestrian refuge island near a roundabout. Source: [www.pedbikeimages.org](http://www.pedbikeimages.org) / Dan Burden

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1 National Center for Statistics and Analysis. (2020, March). Pedestrians: 2018 data (Traffic Safety Facts, Report No. DOT HS 812 850). National Highway Traffic Safety Administration  
2 Desktop Reference for Crash Reduction Factors, FHWA-SA-08-011, September 2008, Table 11.



FHWA-SA-21-044

## LOCAL EXAMPLE WITH RECTANGULAR RAPID FLASHING BEACONS

Existing Condition Example: Route D at 23<sup>rd</sup> St

- \* Long crossing - all 4 lanes
- \* No dedicated crosswalk lighting
- \* Signs and beacons less visible to drivers
- \* Crossing at intersection means those on foot must look at all four legs of the intersection to cross safely

Proposed Condition Example: Natural Bridge Ave east of Lambdin Ave

- \* Short crossing - 1 lane at a time
- \* Crosswalk lighting provided
- \* Pedestrian center refuge
- \* Increased visibility for pedestrians, signs, and flashing beacons
- \* Crossing locations pulled away from side street intersections for simplicity and safety
- \* Curbs tend to slow vehicle speeds