RECTANGULAR RAPID FLASHING BEACON (RRFB)

Workshop Presentation for Fairfax County Board of Supervisors

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Topics Discussed

- RRFB Background
- Fairfax County and VDOT Partnership
- VDOT's Engineering Study Submittal and Review Process
- RRFBs in Different Contexts
- Future Guidance



History of the RRFB

2008: Initial FHWA Interim Approval (IA-11)

Allowed states to install the RRFB under experimental conditions

2016: VDOT IIM-TE-384

First VDOT guidance on uncontrolled crossings, including RRFB

2017: Patent issue caused FHWA to revoke IA-11

2018: Patent issue resolved and FHWA issued new Interim Approval (IA-21)

2022: VDOT IIM-TE-384.1 Update

2023: FHWA published 11th Edition of the MUTCD, which includes the RRFB

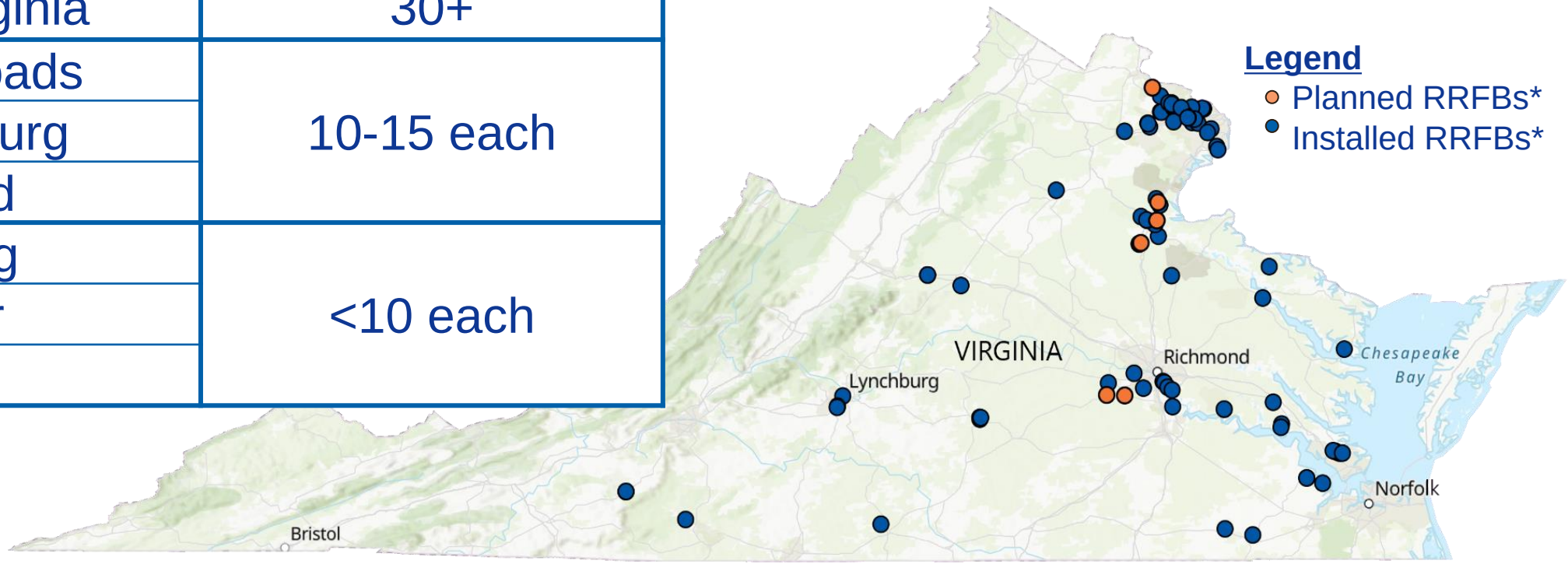
Role of RRFBs

- A marked crosswalk is a traffic control element that is required at locations where an RRFB is installed in addition to the marked crosswalk
- RRFBs are warning devices and do not control traffic; they enhance pedestrian conspicuity and increase driver awareness
- A driver must stop for a pedestrian in the crosswalk whether or not the RRFB is activated



Statewide RRFB Implementation Inventory

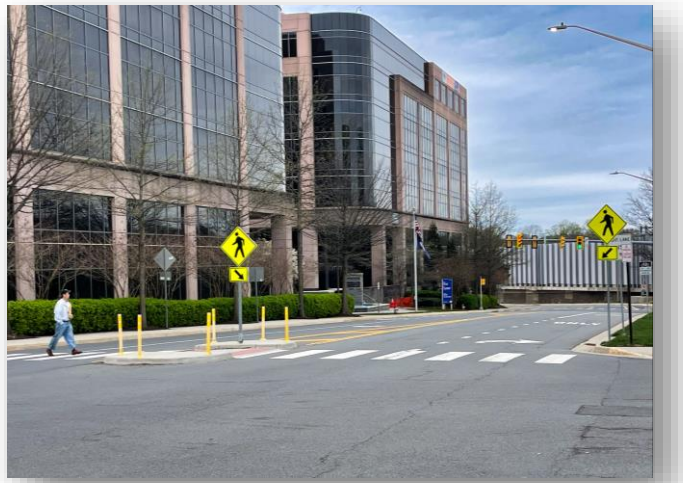
VDOT District	Approximate RRFB Locations Installed*
Northern Virginia	30+
Hampton Roads	10-15 each
Fredericksburg	
Richmond	
Lynchburg	<10 each
Culpeper	
Salem	



**Reflects the most recent data available as of March 2025. The number of locations may vary from other databases or reports due to the timing of data entry and updates.*

Partnership Between Fairfax and VDOT

Prosperity Avenue and Halstead II Lane: Median Refuge Island



South Lakes Drive and Tanbark Drive: RRFBs and Median Refuge Enhancements





Route 7 and I-495 Southbound On-Ramp: Advanced Warning Flashing Beacon and Crosswalk Realignment



Prosperity Avenue and Cross County Trail: RRFBs

Current Maintenance Agreement with FCDOT

Partnership to support on-going maintenance of RRFBs

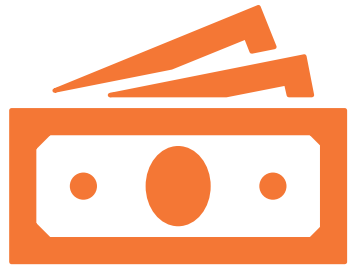
- **Fairfax County Responsibilities**
  - Preventative maintenance
  - Minor maintenance
- **VDOT Responsibilities**
  - Emergency response
  - Major replacement
  - Reimbursement by the County for costs

Maintenance Considerations

- Consider reliability and life-cycle cost of various features (passive detection, power source, crosswalk illumination, etc.)
- "Right-size" the infrastructure as maintenance dollars are limited
- Sample costs include knock-down, rewiring and addressing trouble calls

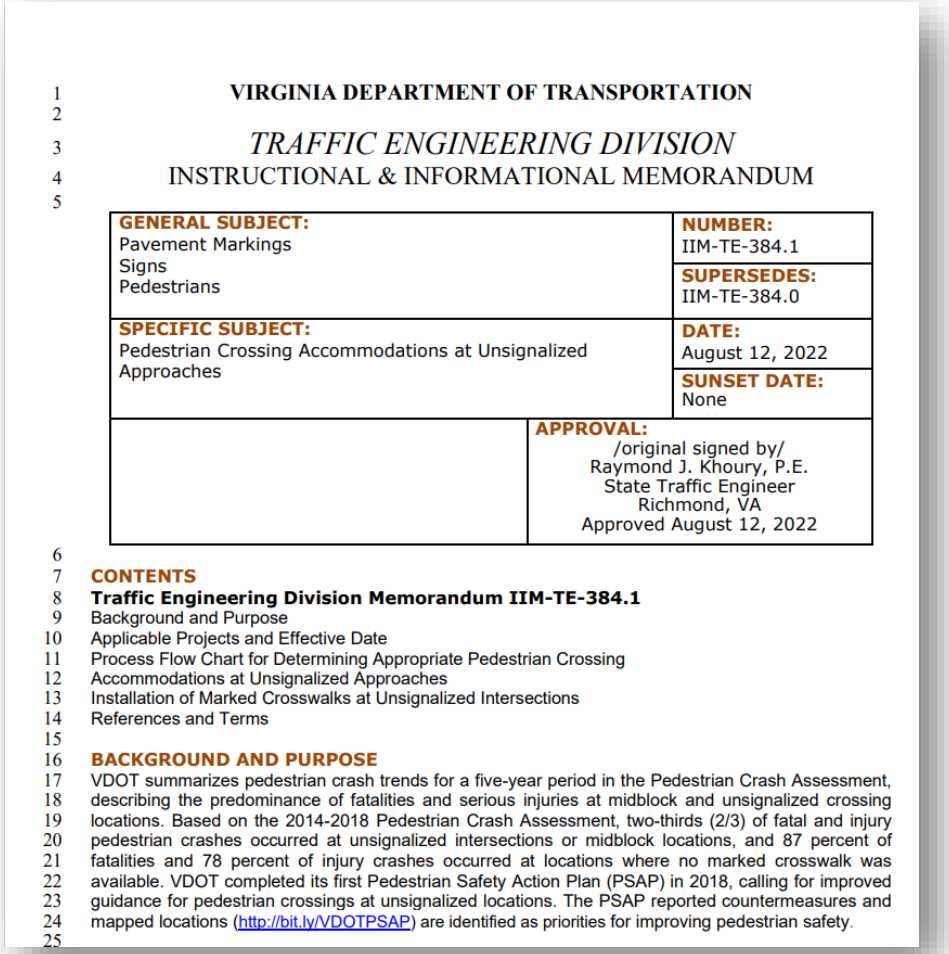
$59k

24-month cost for RRFB knock-downs at 4 locations



Current IIM-TE-384.1 Guidance in Virginia

- Provides guidance on installation of marked crosswalks at unsignalized intersections and mid-block locations
- Provides guidance on selection of which additional countermeasures should be considered along with the crosswalk
  - Based on traffic volume, speed, and roadway configuration



VIRGINIA DEPARTMENT OF TRANSPORTATION

TRAFFIC ENGINEERING DIVISION
INSTRUCTIONAL & INFORMATIONAL MEMORANDUM

GENERAL SUBJECT: Pavement Markings, Signs, Pedestrians	**NUMBER:** IIM-TE-384.1
	SUPERSEDES: IIM-TE-384.0
SPECIFIC SUBJECT: Pedestrian Crossing Accommodations at Unsignalized Approaches	**DATE:** August 12, 2022
	SUNSET DATE: None
	APPROVAL: /original signed by/ Raymond J. Khoury, P.E. State Traffic Engineer Richmond, VA Approved August 12, 2022

CONTENTS

Traffic Engineering Division Memorandum IIM-TE-384.1
Background and Purpose
Applicable Projects and Effective Date
Process Flow Chart for Determining Appropriate Pedestrian Crossing Accommodations at Unsignalized Approaches
Installation of Marked Crosswalks at Unsignalized Intersections
References and Terms

BACKGROUND AND PURPOSE

VDOT summarizes pedestrian crash trends for a five-year period in the Pedestrian Crash Assessment, describing the predominance of fatalities and serious injuries at midblock and unsignalized crossing locations. Based on the 2014-2018 Pedestrian Crash Assessment, two-thirds (2/3) of fatal and injury pedestrian crashes occurred at unsignalized intersections or midblock locations, and 87 percent of fatalities and 78 percent of injury crashes occurred at locations where no marked crosswalk was available. VDOT completed its first Pedestrian Safety Action Plan (PSAP) in 2018, calling for improved guidance for pedestrian crossings at unsignalized locations. The PSAP reported countermeasures and mapped locations (http://bit.ly/VDOTPSAP) are identified as priorities for improving pedestrian safety.

Current IIM-TE-384.1 Guidance in Virginia

- The IIM identifies four tiered categories each for undivided and divided roadways
- RRFB is one of five additional countermeasure groups:
  - Visibility Enhancements
  - Refuge Island
  - RRFB
  - Roadway Reconfiguration
  - Pedestrian Hybrid Beacon

Table 4: Recommendations for Considering Marked Crosswalks and Other Needed Pedestrian Improvements Across Unsignalized Approaches (Divided or One-Way Roads)

Table 4 includes reference to minimum and recommended countermeasures per Tier, and optional countermeasures that may be considered where the recommended is not appropriate to the context or site. Crossings located at Tier 3 or 4 locations require an engineering study to make final determination of countermeasures to be installed with the marked crosswalk.

Roadway Configuration (# is total N of lanes)	Roadway ADT and Speed Limit											
	1,500 to 9,000 VPD			9,000 to 12,000 VPD			12,000 to 15,000 VPD			More than 15,000 VPD		
	≤ 30 MPH	35 MPH	≥ 40 MPH	≤ 30 MPH	35 MPH	≥ 40 MPH	≤ 30 MPH	35 MPH	≥ 40 MPH	≤ 30 MPH	35 MPH	≥ 40 MPH*
2 Lanes with raised median	VE/TC	VE/RI	RRFB/RI	VE/TC	VE/RI	RRFB/RI	VE/RI	RRFB/RI	RRFB/RI	RRFB/RI	RRFB/RI	PHB
2 Lanes One-Way	VE/ADV	ADV/RRFB	RD/RRFB	VE/ADV	RD/RRFB	RD/PHB	ADV/RRFB	RD/RRFB	RD/PHB	RD/RRFB	RD/RRFB	RD/PHB
4 Lanes (two-way street with median)	RD/RRFB	RD/RRFB	RD/PHB	RD/RRFB	RD/RRFB	RD/PHB	RD/RRFB	RD/RRFB	RD/PHB	RD/RRFB	RD/PHB	RD/PHB
3 Lanes One-Way	RD/RRFB	RD/RRFB	RD/PHB	RD/RRFB	RD/PHB	RD/PHB	RD/PHB	RD/PHB	RD/PHB	RD/PHB	RD/PHB	RD/PHB
6+ Lanes (two-way street with median)	RD/RRFB	RD/PHB	RD/PHB	RD/PHB	RD/PHB	RD/PHB	RD/PHB	RD/PHB	RD/PHB	RD/PHB	RD/PHB	RD/PHB

Study Submittal and Review Process



Collect Data

- Collect traffic and pedestrian volumes
- Review existing site conditions & sight distances



Analyze Data

- Determine if crosswalk should be marked
- If needed, recommend additional enhancements



Submit Study

- Submit recommendation to VDOT for review
- Resubmittal may be necessary to address VDOT comments



Final Decision

- VDOT to provide final response upon all comments being addressed

Study Considerations for RRFBs

1. An engineering study needs to be conducted and approved.

2. If a study has not yet been conducted, funding and any communications about improvements should be generalized to a pedestrian improvement, not a specific countermeasure.

3. Consider the site context in selecting the treatment; RRFBs aren't the optimal countermeasure at all locations.

Factors Influencing Driver Yielding at RRFBs

Studies have shown drivers were…

Less likely to Yield:

- Higher vehicular volume (6 vehicles/ minute)
- Longer crossing distance
- On a two-way street
- Pedestrian on the near side

More likely to Yield:

- Presence of a median or refuge island
- Speeds 30mph or lower
- Non-peak travel times

Sources: TTI-CTS-0010.pdf and Factors associated with compliance rate at pedestrian crosswalks with Rectangular Rapid Flashing Beacon

Case Study #1 - Four-lane Divided Major Collector

- Existing high-visibility mid-block crosswalk with median cut-through
- Adequate sight distance for pedestrians and vehicles

AADT	6,500 VPD
Speed	35 MPH
Lanes	4-lanes divided w/ median

- Connects to a trail on the south side and a future trail on the north side of the crossing

Original Recommendation:

- Install RRFB and improve pedestrian facilities at crossing

✓ Approved

- Installation of RRFBs on each side of road and in median
- Improvements to median refuge and curb ramps

Case Study #2 - Four-lane Divided Major Collector

- Located at intersection with left and right turn lanes, longer crossing
- Mainline roadway with horizontal and vertical curves

AADT	7,480 VPD
Speed	40 MPH
Lanes	4-lanes divided w/ median

Original Recommendation:

- High-visibility crosswalk markings
- RRFB with pedestrian refuge island
- Advanced pedestrian warning signs

✕ Not Approved

- Crosswalk shall not be marked
- Concern for available pedestrian sight distance, for pedestrians to judge whether they could safely start crossing, due to horizontal curve
- Other signalized pedestrian crossings available to reach destinations

Future Guidance in Virginia

- **11th Edition of the MUTCD:** New Federal MUTCD and Virginia MUTCD will be adopted by January 2026 and will provide information on the design and operation of RRFBs.
- **IIM-TE-384.1:** Updates are expected to be released in the near future.
- **VDOT's NOVA District Clarifications:** District is developing a document to accompany IIM-TE-384 in assisting designers in countermeasure selection, including RRFBs.

NOVA District Specific Clarifications



VDOT NOVA District has been working closely with localities to develop a document to provide clarification on selection of countermeasures at unsignalized crossings, including RRFBs, within the District.



Fairfax County staff participated in a workshop on October 29, 2024, to provide input and feedback on current challenges and areas that could be clarified. Feedback is being incorporated into the document.

Thank You!

