

Scala, Mary Joy

From: Oberdorfer, Paul
Sent: Tuesday, July 25, 2017 1:35 PM
To: Scala, Mary Joy
Cc: Stewart, Lance; Danny Lamie; Scott Dunn; Duncan, Brennen; Poncy, Amanda; Ikefuna, Alexander; Silman, Martin; Creasy, Missy
Subject: RE: Rectangular Rapid Flashing Beacon (RRFB) - White Paper for BAR Presentation

MJ,

I will prepare a site plan with photos as part of the presentation. The two locations on East Market Street are replacing the two existing crosswalks. I will see if we can generate a map of locations that could be potential installation sites in the future.

Paul

From: Scala, Mary Joy
Sent: Tuesday, July 25, 2017 1:30 PM
To: Oberdorfer, Paul
Cc: Stewart, Lance; Danny Lamie; Scott Dunn; Duncan, Brennen; Poncy, Amanda; Ikefuna, Alexander; Silman, Martin; Creasy, Missy
Subject: RE: Rectangular Rapid Flashing Beacon (RRFB) - White Paper for BAR Presentation

Thank you Paul.

In addition, what is your specific request at this time - only the two locations on East Market Street?
Can you provide a color photo of the actual proposed sign, and photos of the proposed street locations?

How many more installations in historic districts might the BAR expect – do you have a map that shows all the locations that potentially meet the stated criteria?

Thank you.

Mary Joy Scala, AICP

Preservation and Design Planner
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From: Oberdorfer, Paul
Sent: Tuesday, July 25, 2017 12:52 PM
To: Scala, Mary Joy
Cc: Stewart, Lance; Danny Lamie; Scott Dunn; Duncan, Brennen; Poncy, Amanda; Ikefuna, Alexander; Silman, Martin; Creasy, Missy
Subject: Rectangular Rapid Flashing Beacon (RRFB) - White Paper for BAR Presentation

Good afternoon Mary Joy,

Attached is the white paper that I will be discussing with the BAR on the installation of RRFB on Market Street. The Market Street installations will be representative of what to expect in road right-of-ways within historic districts. My intention is to provide a brief presentation of facts to the BAR so they understand the methodology used in identifying the appropriate selection of enhanced pedestrian crosswalks. Should I prepare a memo for the BAR or is the white paper sufficient?

Please let me know if you will need anything else for the next BAR on August 15.

Very truly yours,

Paul Oberdorfer
Public Works Director



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"Service to others is the rent you pay for your room here on earth."

~ Muhammad Ali

From: Mess, Camie
Sent: Monday, August 21, 2017 3:36 PM
To: Oberdorfer, Paul
Subject: BAR Actions-Rapid Flashing Beacons-Aug 15, 2017

August 21, 2017

Rapid Flashing Beacons in Historic Districts

Dear Applicant,

The above referenced projects were discussed before a meeting of the City of Charlottesville Board of Architectural Review (BAR) on August 15, 2017. The following action was taken:

The applicant requested a deferral.

Schwarz moved that the BAR accept the applicant's request for deferral. Gastinger seconded. The motion passed (7-0).

They felt the street was too small for such a large installation and the BAR requested a work session with the BAR, PLACE, the City traffic engineer, and Public Works to discuss other options.

If you have any questions, please contact me at 434-970-3398 or messc@charlottesville.org.

Sincerely yours,

Camie Mess
Assistant Historic Preservationist

Camie Mess
Assistant Historic Preservationist
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Rapid Flashing Beacons in Historic Districts

Background

Rectangular Rapid Flashing Beacons (RRFBs) in historic districts first came to staff's attention when they were installed in 2015 at the Corner. UVA took out all of their in-ground pedestrian lights, because of high maintenance costs and replaced them with lower-maintenance rapid flash beacons over that summer. Representatives of UVA's Office of the Architect, UVA Facilities, and UVA Parking and Transportation were involved with the planning and implementation of the new lights and signage.

Last year Public Works decided to replace all in-road warning lights at pedestrian crossings with the RRFBs, due to maintenance costs. Staff met with Lance Stewart, Facilities Maintenance Manager from Public Works, and Amanda Poncy, Bicycle and Pedestrian Coordinator, On September 6, 2016 to review options for pedestrian crossing safety. A summary of options discussed included:

- Actively pursue B.A.R. approval of the proposed rapid flasher system.
- Explore other technologies that may be less obtrusive. MJ is considering calling other cities with historic districts to find out what they do. Rashad, we'd appreciate it if you'd share info on any products you're aware of that we might consider.
- Sticking with the current make/model of in-ground lights is not in our opinion a viable option, for reasons cited below. However, Gigi and I will be researching alternatives (no luck so far, but we're not done yet) to see whether we can find something more durable, and following up with people who've used those products to ask how they've held up over time.
- Consider removing the in-ground lights and not replacing them. The crossing in front of the Library has bulb outs and warning posts on either side of the street. There's a good chance of some push back from the community if we were to do that, so our thought was to consider how we would approach a request to install some kind of system if there were no current system, accounting for road width, speed limit, and volume of vehicular and pedestrian traffic. This is not my area of expertise, so I would look to Amanda and Rashad to consider this possibility. The crossing in front of the garage is a different story in some ways, but the same in others.

Staff then queried other localities with historic districts (attached) to see what their experiences had been.

Application

Paul Oberdorfer, the new Director of Public Works, has submitted information prepared by the Timmons Group regarding Rectangular Rapid Flashing Beacons RRFBs, including comparisons with other types of pedestrian lighting equipment currently in use within the City.

Public Works plans to install RRFBs at two locations on East Market Street: near the library at 2nd Street NE, and near the parking garage at 6th Street NE. The applicant will submit additional information about those two specific locations, and a map that shows additional potential locations in historic districts.

Criteria, Standards, and Guidelines

Review Criteria Generally

Sec. 34-284(b) of the City Code states that,

In considering a particular application the BAR shall approve the application unless it finds:

- (1) That the proposal does not meet specific standards set forth within this division or applicable provisions of the Design Guidelines established by the board pursuant to Sec.34-288(6); and*
- (2) The proposal is incompatible with the historic, cultural or architectural character of the district in which the property is located or the protected property that is the subject of the application.*

Pertinent Standards for Review of Construction and Alterations include:

- (1) Whether the material, texture, color, height, scale, mass and placement of the proposed addition, modification or construction are visually and architecturally compatible with the site and the applicable design control district;*
- (2) The harmony of the proposed change in terms of overall proportion and the size and placement of entrances, windows, awnings, exterior stairs and signs;*
- (3) The Secretary of the Interior Standards for Rehabilitation set forth within the Code of Federal Regulations (36 C.F.R. §67.7(b)), as may be relevant;*
- (4) The effect of the proposed change on the historic district neighborhood;*
- (5) The impact of the proposed change on other protected features on the property, such as gardens, landscaping, fences, walls and walks;*
- (6) Whether the proposed method of construction, renovation or restoration could have an adverse impact on the structure or site, or adjacent buildings or structures;*
- (8) Any applicable provisions of the City's Design Guidelines.*

Pertinent Design Review Guidelines for Public Design and Improvements

A. Introduction

Public spaces define the spatial organization of the City, forming the basis for social, cultural, and economic interaction. The Downtown Pedestrian Mall is the centerpiece of the community. Charlottesville's historic parks, trails, boulevards, cemeteries, playgrounds, and other open spaces help balance the desired urban density and promote healthy living and quality of life. Public spaces accommodate multiple functions and provide social venues. The historic uses and organization of public spaces represent a timeline of cultural practices and values of the community. Significant features should be identified and respected when changes are proposed. New public spaces and improvements should reflect contemporary design principles and values.

*Charlottesville has a rich history of public improvements, which include public buildings, bridges, streetscape landscaping and lighting, street furniture, monuments, public art, fountains, and signage. Many of these improvements have been made within the historic districts, and there will be the opportunity to create additional such amenities in future years. All changes or improvements require BAR review and approval, and **should be compatible with the general architectural features and character of an area or district.** Repairs and maintenance should match original materials and design, and should be accomplished in a historically appropriate manner.*

All public improvements should reflect the quality and attention to detail and craftsmanship of the overall historic districts' character.

D. Streets, Walks, & Curbs

- 1) Retain historic paving or curbing.*
- 2) If any historic paving or curbing is uncovered in future public projects, consider reusing it or parts of it in the new project.*
- 3) Make street paving consistent throughout districts.*
- 4) When widening existing streets provide sidewalks, street trees, and other elements that maintain the street wall and emphasize the human scale.*
- 5) Limit paved areas to streets, driveways and pedestrian areas.*
- 6) Consider using some type of distinctive crosswalks at key intersections or crossings.*
- 7) Avoid faux techniques or appearances in materials, such as stamped asphalt or concrete.*

- 8) *When sidewalks must be repaired, match adjacent materials in design, color, texture, and tooling.*
- 9) *Avoid variation in sidewalk and curb materials.*
- 10) *When sidewalks need replacement, use a paving unit, such as brick or concrete with a tooled or saw cut joint that relates to the scale of the districts.*
- 11) *Avoid excessive curb cuts for vehicular access across pedestrian ways.*
- 12) *Where curb cuts are necessary, they should be consistent with other curb cuts in the area.*
- 13) *Do not block sidewalks with street furniture elements.*
- 14) *Remove obsolete signs and poles.*

H. Traffic Signals & Utilities

- 1) *Consider installing signals on poles that are placed beside the street and are compatible with the pedestrian-scaled light fixtures.*
- 2) *Place utilities underground, or behind buildings, if possible.*
- 3) *Screen surface equipment.*
- 4) *Place necessary utilities, such as transformers and overhead wires, so that they are as visually unobtrusive as possible.*

Discussion and Recommendations

The BAR has jurisdiction over any exterior changes in their districts. Obviously, the City departments do a lot of work in historic districts, and much of that work consists of routine maintenance items. However, new signage, lighting, street furniture, removal of trees, new above-ground utility vaults, and painting unpainted masonry, for example, can have large impacts on the character of districts so the BAR is very interested in reviewing those changes.

The Fredericksburg planner made good points, that the whole intent of pedestrian safety lights is to be intrusive, and that we all want our historic districts to be busy, walkable places, so contemporary safety devices are a necessary by-product.

The BAR should confirm that the new RRFBs intended for public safety are consistent, as much as possible, with the Guidelines.

If the BAR wants to issue a COA for these two and future RRFBs, staff can do that administratively.

Scala, Mary Joy

From: Al Cox <Al.Cox@alexandriava.gov>
Sent: Wednesday, September 14, 2016 4:05 PM
To: Erik Nelson; Von Lindern, Aubrey (DHR); Sharon Angle; Allison Whitworth; Alison Teetor; Blank, Linda C.; Burton, Renee; bgoumas@suffolkva.us; Cynthia Liccese-Torres; Carolyn Murphy; Chen, Kimberly M. - PDR; Catherine Miliaras; dquesenberry@pulaskitown.org; Siebentritt, Heidi; Sutphin, Jason; jwhite@pulaskitown.org; Kali Casper; Kate S. Schwartz; Kathy C. Baker; kmorgan@petersburg-va.org; Murphy, Lauren; larry.dire@capecharles.org; Martin, Tom; Matthew Johnson; Ocel, Raymond; Parviz Moosavi; Rebecca Ballo; Mark Reed; Scala, Mary Joy; Sean Taylor; SBush@culpeperva.gov; McBride, Susan; Will Moore; Timothy Youmans; Josh Crump; Tom Scofield; wparrish@spotsylvania.va.us; William Saunders
Subject: RE: Question from a fellow CLG staffer

I agree with Eric that this would be a useful conference topic, particularly if we had some traffic engineers there. While we don't have rapid flasher signage within the district, we do have pedestrian countdown signals on all signalized intersections. The signals themselves have been fine but required two - four new poles at each of the intersections, so it is very cluttered. In addition we are in on-going discussions with our transportation planners about their desire to paint bike lanes green throughout the historic district and crossing the GW Parkway. As Eric said, these bike/ped safety features are designed to attract your attention and so, by definition, visually compete with the historic buildings.

We have recently received support from the City Attorney's office and the current Transportation Director to require a Certificate of Appropriateness for all infrastructure in the right-of-way. Our BAR just approved new but much more historically authentic street light designs but our neighbor notification requirements were overwhelming and very expensive because virtually every property in the district abuts the public right-of-way. How do others approve bus shelters, benches, bike racks and trash cans, etc.?

Al Cox, FAIA
Historic Preservation Manager
Department of Planning & Zoning
703 746-3830 direct
<http://alexandriava.gov/Preservation>

From: Erik Nelson [mailto:enelson@fredericksburgva.gov]
Sent: Thursday, September 08, 2016 9:18 AM
To: Von Lindern, Aubrey (DHR); Sharon Angle; Allison Whitworth; Alison Teetor; Al Cox; Blank, Linda C.; Burton, Renee; bgoumas@suffolkva.us; Cynthia Liccese-Torres; Carolyn Murphy; Chen, Kimberly M. - PDR; Catherine Miliaras; dquesenberry@pulaskitown.org; Siebentritt, Heidi; Sutphin, Jason; jwhite@pulaskitown.org; Kali Casper; Kate S. Schwartz; Kathy C. Baker; kmorgan@petersburg-va.org; Murphy, Lauren; larry.dire@capecharles.org; Martin, Tom; Matthew Johnson; Ocel, Raymond; Parviz Moosavi; Rebecca Ballo; Mark Reed; Scala, Mary Joy; Sean Taylor; SBush@culpeperva.gov; McBride, Susan; Will Moore; Timothy Youmans; Josh Crump; Tom Scofield; wparrish@spotsylvania.va.us; William Saunders
Subject: RE: Question from a fellow CLG staffer

The whole intent of pedestrian safety devices is to be intrusive. Having said that, our experience with VDOT today (as opposed to yesteryear) is that they are often very receptive to working through issues such as this. It would be worthwhile to reach out to your VDOT district office. It sounds like this would be a good topic for preservation conference. I was on a panel that talked about such things at the recent NAPC conference in Mobile and it would probably be worthwhile to have a similar discussion among Virginia jurisdictions. We all want our historic districts to be

busy, walkable places and contemporary safety devices are going to be a necessary by-product. I am confident VDOT would work with us.

Erik F. Nelson

Senior Planner
City of Fredericksburg
540 372-1179

From: Von Lindern, Aubrey (DHR) [<mailto:Aubrey.VonLindern@dhr.virginia.gov>]

Sent: Wednesday, September 07, 2016 4:13 PM

To: Sharon Angle; Allison Whitworth; Alison Teetor; Al Cox; Blank, Linda C.; Burton, Renee; bgoumas@suffolkva.us; Cynthia Liccese-Torres; Carolyn Murphy; Chen, Kimberly M. - PDR; Catherine Miliaras; dquesenberry@pulaskitown.org; Erik Nelson; Siebentritt, Heidi; Sutphin, Jason; jwhite@pulaskitown.org; Kali Casper; Kate S. Schwartz; Kathy C. Baker; kmorgan@petersburg-va.org; Murphy, Lauren; larry.dire@capecharles.org; Martin, Tom; Matthew Johnson; Ocel, Raymond; Parviz Moosavi; Rebecca Ballo; Mark Reed; Scala, Mary Joy; Sean Taylor; SBush@culpeperva.gov; McBride, Susan; Will Moore; Timothy Youmans; Josh Crump; Tom Scofield; wparrish@spotsylvania.va.us; William Saunders

Subject: Question from a fellow CLG staffer

Hi All,

Below is a question from a fellow CLG staffer. Please reply all with your answers/advice. Please see the photo attached and don't forget to REPLY ALL.

Have any of you addressed the issue of rapid flasher signage (attached photo) for pedestrian crosswalks in historic districts?

Do you know of any alternative methods that are more in scale with HDs and less obtrusive?

Thank you for your responses!

Aubrey

Aubrey Von Lindern, Architectural Historian
Certified Local Government Coordinator
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Prepared For:

RECTANGULAR RAPID FLASHING BEACON (RRFB) PROPOSED LOCATIONS

8/1/2017



TIMMONS GROUP
YOUR VISION ACHIEVED THROUGH OURS

To: Paul Oberdorfer, PE (City of Charlottesville)
From: Thomas Ruff, PE, PTOE
RE: Installation of Rectangular Rapid Flashing Beacons (RRFB) – City of Charlottesville, VA
Date: July 25, 2017
Copy: Lance Stewart (CC); Danny Lamie (TG); Scott Dunn (TG)

Introduction

At the request of the City of Charlottesville Department of Public Works (DPW), Timmons Group has prepared the following white paper to address the installation of Rectangular Rapid Flashing Beacons (RRFBs) within the public right-of-way as a visual alert to vehicular traffic at pedestrian crossings. The goal of this paper is to document the potential safety benefits of RRFBs, proper installation standards, and approximate construction/maintenance costs.

This work includes research and documentation on the recent history of RRFBs, including information from the Manual for Uniform Traffic Control Devices (MUTCD), the Federal Highway Administration (FHWA), the Institute of Transportation Engineers (ITE), and other engineering publications on the following:

- Current design recommendations;
- Safety benefits and impacts of installation;
- Recommended installation locations and parameters; and
- Installation/maintenance costs.

For comparison, a discussion is included covering other types of pedestrian lighting equipment currently in use within the City of Charlottesville.

Definition and Background

Rectangular Rapid Flashing Beacons, or RRFBs, are a form of light-emitting diode (LED) beacon approved by the FHWA for use as a warning beacon to supplement standard pedestrian crossings across uncontrolled approaches or on school zone pedestrian crossings. An RRFB is a warning beacon that consists of a pedestrian crossing sign (W11-2 or S1-1), a directional arrow plaque (W16-7p), and LEDs using an irregular, rapid flashing “flickering wig-wag” pattern that is similar to an emergency vehicle flasher. The LEDs within the RRFB remain dark until activated by either a pedestrian controlled active push-button system or by a passive detection system (video, infrared, pressure plate, or similar) for pedestrians/bicyclists.

Warning beacons are governed by Section 4L.03 of the MUTCD and can be utilized for the following applications:

- At obstructions in or immediately adjacent to the roadway;
- As supplemental emphases to warning signs;
- As emphasis for midblock crosswalks;
- As supplemental emphasis to regulatory signs; and
- In conjunction with a regulatory or warning sign that includes the phrase “WHEN FLASHING”.



Warning beacons governed by this section can include pedestrian hybrid beacons, high intensity activated crosswalks (HAWK), overhead beacons, pedestrian signals, and in-roadway flashing lights. While the MUTCD does not specifically mention RRFBs, the FHWA provided interim approval of RRFBs in July 2008 under the warning beacon section of the MUTCD and provided the following guidance:

- An RRFB shall only be installed for crosswalks across approaches that are uncontrolled or part of an uncontrolled intersection. RRFBs should not be used for crosswalks across approaches that are controlled by YIELD or STOP signs or at intersections that are controlled by traffic signals or roundabouts;
- For any approach on which an RRFB is installed, two (2) crossing warning signs (each with a RRFB) shall be installed at the crosswalk; one (1) on the right-hand side and one (1) on the left-hand side of the roadway. On a divided highway, the assembly can be installed within the median if practical;
- The RRFB indications on the assembly shall be aligned horizontally, with a minimum space between the two (2) indicators of approximately 7". A small light directed at, and visible to, pedestrians within the crosswalk may be installed with the RRFB to give confirmation that the RRFB is in operation; and
- The RRFB shall operate for a pre-determined period of time following each actuation. The time shall be based on MUTCD procedures for timing of pedestrian clearance times for pedestrian signals.

At this time, the FHWA has approved RRFBs for installation with amber colored LED lights only; no other LED light colors are permitted. The power source for an RRFB can be hard-wired to an existing utility or operated using a standalone solar panel.

Safety Benefits

An RRFB should be considered for installation at crosswalks where the following conditions are present:

- Uncontrolled approaches that have a crash history or observed conflict between vehicles and non-motorists;
- A high volume of crossing pedestrian/bicyclists at the intersection;
- Vehicles observed not yielding to pedestrians within the crosswalk; or
- Locations with high pedestrian delay due to few available gaps in traffic.

Motorists often fail to yield to pedestrians who have the right-of-way within marked crosswalks at uncontrolled locations. In a 2003 study in the City of St. Petersburg, FL, a review of almost 100 uncontrolled crosswalks determined that the motorist yielding to pedestrian compliance rate was less than 2% overall. After installation of RRFB systems at a select number of locations, the average motorist yielding to pedestrian compliance rate increased to 82% at the select location over a year-long review period.

Research presented at the Transportation Research Board (TRB) Annual Meeting in 2008 included two (2) studies on the effects of RRFBs when used to supplement standard pedestrian crossing warning signs at crosswalks. First, when going from a no-beacon arrangement to a two-beacon system, mounted on the supplementary warning sign on either side of the crosswalk, motorist yielding increased from 18% to 81%. There was a further increase in motorist yielding behavior with a four-beacon system reaching 88% yield. Second, a review of sites over a one (1) year period after implementation of RRFBs found that there was little to no decrease in the yielding behavior of motorists over the study period.

Further, the efficacy of the standard overhead beacon system was shown to be minimal at best at the test sites. There was only a small increase over the baseline with the activation of a standard beacon. An RRFB installed and evaluated at the same location as an overhead beacon system produced driver yielding percentages of approximately 89% (Frederick & Van Houten, 2008). The differences are likely due to the RRFB system being more visible and in the cone-of-vision of the driver, as opposed to the elevated standard overhead beacon. When included with other traffic calming techniques, the RRFB compares favorably with a mid-block traffic signal for pedestrian/bicycle safety. The only other devices that achieve this level of motorist yielding compliance have red indications (pedestrian traffic signals, stop signs, or similar).

When comparing RRFBs to in-roadway flashing light systems, in-roadway systems have better performance during nighttime and poor lighting conditions. However, research has noted that bright light conditions reduce the effectiveness of in-roadway systems. The in-roadway systems typically require additional maintenance to preserve visibility of the lights, while RRFBs perform consistently over all weather and lighting conditions.

A 2009 report by Pecheux, Bauer, and McLeod gave the results of an evaluation of RRFBs at two (2) sites in Miami, Florida. The study team used the following measures of effectiveness (MOEs) to assess the effect of the RRFB on pedestrian and driver behavior: the percentage of pedestrians trapped in the roadway, the percentage of drivers yielding to pedestrians, and the percentage of pedestrian-vehicle conflicts. The researchers found statistically significant improvements in all the studied MOEs.

Included in the research are references that RRFBs may not be as effective on high-speed (>35 MPH) or wider multilane streets. Some research indicates that multilane streets (4 or more lanes) can accommodate the installation of RRFBs and provide increased pedestrian safety. However, the additional lanes typical carry higher traffic volumes which increases the risk of pedestrian exposure and may impair vehicular and pedestrian sight distance with queuing vehicles across multiple lanes.

Recommended Installation Parameters

An RRFB must be installed on an unsignalized, uncontrolled approach. If an RRFB is installed at an intersection, the approach cannot be operated by a STOP or YIELD sign or traffic signals. Due to a reduction in effectiveness on high-speed streets and the impact of speed on pedestrian/bicycle safety, it is recommended that RRFBs be installed only on roadways with a posted speed limit less than or equal to 35 MPH.

An RRFB should be used in combination with a marked crosswalk, ADA compliant pedestrian curb ramps, advance warning signs or pavement markings, and overhead lighting. The installation location should be chosen where there are no other crosswalks or traffic control devices within 250' in advance or following the RRFB crosswalk location. The selected location preferably is a two-lane street, but can be situated on streets with on-street parking or a three-lane section; the effectiveness of RRFBs is diminished at locations with more than three lanes. RRFBs should not be used indiscriminately; overuse of RRFBs in the roadway environment could decrease the effectiveness of the RRFBs.

Adequate stopping sight distance for the approaching uncontrolled vehicles is paramount in assuring the safety of the crosswalk. Table 1 (following page) provides the stopping sight distance design information from the latest American Association of State Highway and Transportation Officials (AAASHTO) *A Policy on Geometric Design of Highways and Streets* (Green Book), published in 2011.

The stopping sight distance included in the AASHTO design guide provides the minimums required to provide for safe use of the roadway; providing additional sight distance will improve outcomes. Potential sight distance obstructions include parked vehicles, other vehicles in the roadway, trees/foliage, landscaping, buildings, traffic control devices, commercial signage, or the geometry of the roadway.

In addition to stopping sight distance, it is important to provide adequate advanced warning signage for all uncontrolled pedestrian crosswalks. When the stopping sight distance cannot be met and the RRFB system and associated signage is not visible for a sufficient distance to permit the driver to respond to the device, then an advance traffic control sign is required. Table 1 (below) also includes the minimum required distance that an advance traffic control sign should be placed if the minimum stopping sight distance requirements cannot be met.

Table 1:
Minimum Stopping Sight Distance and Advance Placement Distance

Design Speed (mph)	Stopping Sight Distance (ft)	Minimum Placement Distance for Advanced Signage (ft)
25	155	100
30	200	100
35	250	100
40	305	125
45	360	175
50	425	250
55	495	325
60	570	400
65	645	475

Source: AASHTO *A Policy on Geometric Design of Highways and Streets* (2011)

Engineering judgment should always be exercised when placing advanced warning signs, as the distances above can be adjusted for roadway features, other signing, and to improve visibility. The values in Table 1 above are meant to serve as an aid for placing signage. The placement of the warning sign should be such that the perception-reaction time is adequate to allow motorists to detect, recognize, decide, and react to the downstream crossing. Warning signs should not be placed too far in advance of an intersection, which may ultimately limit their effectiveness.

For any approach on which RRFBs are installed, two (2) W11-2 (pedestrian) or S1-1 (school) crossing warning signs, each with RRFB and W16-7p (diagonal arrow) plaque, shall be installed at the crosswalk; one (1) on each side of the roadway. It is recommended that a W11-2 or S1-1 crossing warning sign with a W16-9p (ahead) plaque be installed at all locations to provide additional information to drivers concerning the upcoming crosswalk.

In July 2016, VDOT issued Traffic Engineering Instructional & Informational Memorandum 384.0 (IIM-TE-384.0), which covers pedestrian crossing accommodations at unsignalized locations. The memorandum provides direction regarding marked crosswalk should installation, establishes guidance on both standard and high-visibility crosswalks, recommended crosswalk widths, removes most guidance for in-roadway warning lights (due to their limited use by VDOT), and includes discussions on the use of RRFBs and Pedestrian Hybrid Beacons (PHBs).

A copy of IIM-TE-384.0 is included at the end of this report as a reference for the City of Charlottesville in utilizing engineering judgement for installation of RRFBs. Within IIM-TE-384.0, Attachments A through D provide evaluation criteria for each potential RRFB location. The evaluation form takes into consideration traffic volumes, pedestrian crossing volumes, stopping sight distance, speed, and the geometric roadway configuration. The evaluation form is useful for decisions regarding uncontrolled crosswalk locations.

A copy of a recent VDOT standard plan for RRFBs is included at the end of this report as an example of what should be expected with the installation of each RRFB system. This standard should be referenced to ensure that all RRFB systems include similar features and that there is consistency among the installations.

For further information, within a 2010 report by Van Houten & Malenfant, *An Analysis of the Efficacy of Rectangular-shaped Rapid-Flash LED Beacons*, there is a warrant worksheet for installation of a pedestrian crosswalk at an uncontrolled location. The worksheet provides a set of criteria that can aide the City of Charlottesville in determining locations that are suitable for installation of an RRFB system other than the VDOT IIM-TE-384.0 method. It should be noted that the worksheet is not approved by the FHWA for official use and should not be used as the only justification for installation of a crosswalk or RRFB system. Engineering judgement should be utilized in all scenarios where a pedestrian crosswalk and RRFB system is being considered.

Cost Considerations and Comparisons

RRFBs offer an attractive alternative to traffic signals and hybrid signals as the equipment and installation cost (less than \$20,000) is significantly less expensive than other options. The operating costs are further reduced when solar power is used to operate the LED beacons.

In general, RRFB systems have limited to no right-of-way impacts, as they can be installed along the shoulder of the roadway near crosswalks and in locations similar to other traffic control signs. Concerns can occur where crosswalk locations and pedestrian curb ramps extend close to the edge of the right-of-way and pedestrians/bicyclists are required to exit the right-of-way to properly operate the RRFB system.

The FHWA estimates a cost of approximately \$10,000 to \$15,000 for purchase and installation of two units (one on either side of a crossing). This cost includes, for each unit, standalone solar panels for power, pad lighting, indication units with RRFBs on the back and front, signage on both approaches, and either the active or passive detection systems. Costs for some sources within the FHWA ranged from \$5,000 to \$50,000, with a median cost of approximately \$14,000.

Research found the average cost for in-road warning light systems was approximately \$15,000 to \$30,000. This cost covered installation of the units within the roadway, resurfacing the pavement, refurbishing the pavement markings, and installing a control unit with passive activation. The study notes that additional costs will be encountered at locations that utilize pedestrian call buttons to activate the system.

The City of Charlottesville DPW has completed six (6) installations of RRFB systems in-house, with the last installation having a budget of approximately \$18,000. This system was a solar-powered system with three-poles. Overall, this cost is in line with the FHWA information for a typical two-pole system.

The City of Charlottesville DPW has provided the costs for the most recent in-house installation of both an RRFB system and an in-road warning lights system. These costs are summarized below in Table 2. As shown, not only is the installation cost much higher for the in-road system, but the annual costs of maintenance are higher. In addition, the failure rate is also significantly higher for the in-road system.

**Table 2:
Comparison of Costs – RRFB vs. In-Road Light Systems**

	Cost of Last Installation	Annual Labor Cost	Annual Materials Cost	Annual Utility Cost (If Hard-Wired)	Annual Service Calls
Rectangular Rapid Flashing Beacons	\$18,000 (2017)	\$300	\$1,200 - \$5,000	\$100	3
In-Road Warning Lights	\$45,000 (2011)	\$20,000	\$20,000 - \$30,000	\$200	30

Source: City of Charlottesville Department of Public Works

Further discussions with the City of Charlottesville DPW revealed that the higher costs and failure rate of the in-road system is partially due to the equipment and to the weather conditions in Charlottesville. The in-road system can be hard to troubleshoot because the lighting system is run utilizing a series circuit and if one light or component is out, the entire system shuts down. Due to the equipment being located within the travel way, a maintenance call typically requires 4 crew members and a minimum of 4 hours of work due to the need for traffic control. The equipment is rated to have waterproof connections but has proven to be unreliable. Given the moderate climate in Charlottesville, which receives rainfall at a higher rate than the national average, there are potential issues related to the waterproofing. In addition, snow removal efforts with plow equipment and chemical treatment can harm the in-road systems long-term functionality.

By comparison, the City of Charlottesville DPW has noted that the RRFB systems installed are significantly more reliable. Due to the location of the equipment out of the travel way, only 2 crew members are typically required for maintenance calls; of which the average duration per call is 2 hours. Reduced maintenance issues and lower maintenance costs are significant benefits to the RRFB system.

VDOT IIM-TE-384.0 provides additional recommendations concerning the use of in-roadway warning lights for pedestrian crosswalks. The memorandum recommends that RRFBs or other treatments be considered in lieu of in-roadway warning lights due to documented long-term maintenance costs.

Conclusions

The research indicates that there are clear safety and cost benefits associated with the introduction of the RRFB system. The usage of the RRFB system at uncontrolled crosswalks increased the motorist yielding to pedestrian rates significantly. One (1) reason for the effectiveness of the RRFB system is the salience of the rapid flashing beacon and the sequence of the flashing which creates a similar attention and reaction as emergency vehicles. In addition, the flashing sequence creates a direct correlation between the pedestrian signage and the flashing device, providing the driver with a visual orientation towards the crosswalk/signage and making it stand out from other visual clutter.

The correlation between the flashing beacon and the signage helps establish and maintain control of the sign over driver behavior. When activated, the signs are visible to all motorists and not only to those in the direct field of vision of the pedestrian. Based on the research presented, the RRFB has proven to be a viable and cost-effective alternative to existing features in the pedestrian safety arena.

The literature review of relevant research show that RRFBs provide safety enhancements for pedestrians by improving driver responsiveness in yielding at uncontrolled crosswalks and that the overall cost of the system is lower, on average, than other pedestrian warning beacon options. Further, the studies found that RRFBs produced an increase in yielding behavior at all 22 sites located in three (3) cities in the United States, with yielding results up to approximately 88%. Data collected over a 2-year follow-up period at 18 of these sites also documented the long-term motorist yielding to pedestrian rates produced by RRFBs. A comparison of RRFBs to a traditional overhead yellow flashing beacon, a side-mounted traditional yellow flashing beacon documented higher driver yielding associated with RRFBs that was statistically significant. Although not statistically significant, the RRFB performs better than the in-roadway flashing light systems at providing consistency over all weather and lighting conditions.

The information provided by the City of Charlottesville DPW provides additional support for the reduced costs associated with the RRFB system over the use of the in-roadway flashing light system. Not only are installation costs lower, but on-going annual maintenance is also lower for the RRFB system. Further, the documentation provided by DPW covering the past six (6) years illustrates the failure rate of the in-roadway system and the issues/costs associated with those failures.

Overall, the RRFB system provides a safe and cost-effective alternative for in-roadway flashing light systems at specific high-pedestrian locations. Further, recent VDOT guidelines have recommended that RRFBs or other treatments be considered in lieu of in-roadway warning lights due to their long-term maintenance costs.

The included supporting documentation provides the City of Charlottesville with information for determining whether a location should be considered for installation of an RRFB system and the typical equipment included within an RRFB installation.

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Case Studies

- San Francisco, California
 - http://www.pedbikesafe.org/PEDSAFE/casestudies_detail.cfm?CM_NUM=54&CS_NUM=97
- St. Petersburg Florida
 - http://www.pedbikesafe.org/PEDSAFE/casestudies_detail.cfm?CM_NUM=54&CS_NUM=99
- Elmwood Park, New Jersey
 - http://www.pedbikesafe.org/PEDSAFE/casestudies_detail.cfm?CM_NUM=54&CS_NUM=100
- Miami-Dade County, Florida
 - http://www.pedbikesafe.org/PEDSAFE/casestudies_detail.cfm?CM_NUM=54&CS_NUM=101

Manufacturer Contacts

- TAPCO
 - <https://www.tapconet.com/solar-led-division/rectangular-rapid-flash-beacons>
- McCain
 - <http://www.mccain-inc.com/products/signals/signal-accessories/rectangular-rapid-flashing-beacon>
- ELTEC
 - http://elteccorp.com/warning_systems/rfbl/

APPENDIX A

Supporting Documentation

VIRGINIA DEPARTMENT OF TRANSPORTATION

TRAFFIC ENGINEERING DIVISION

INSTRUCTIONAL & INFORMATIONAL MEMORANDUM

GENERAL SUBJECT: Pavement Markings Signs Pedestrians	NUMBER: IIM-TE-384.0
	SUPERSEDES: None
SPECIFIC SUBJECT: Pedestrian Crossing Accommodations at Unsignalized Locations	DATE: July 18, 2016
	SUNSET DATE: None
DIRECTED TO: District Location & Design Engineers Regional Operations Engineers/Directors Regional Traffic Engineers District Transportation & Land Use Directors Regional Operations Maintenance Managers Regional Traffic Operations Managers	APPROVAL: <div style="text-align: center;"> /original signed by/ Raymond J. Khoury, P.E. State Traffic Engineer Richmond, VA July 21, 2016 </div>

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Attachment C – Process Flow Charts for Determining Appropriate Pedestrian Crossing Accommodations at Unsignalized Locations

Attachment D – Data Collection Sheets for Pedestrian Crossing Accommodation Studies at Unsignalized Locations

PURPOSE AND NEED

The Commonwealth Transportation Board (CTB) adopted the Virginia Department of Transportation (VDOT) [Policy for Integrating Bicycle and Pedestrian Accommodations](#) in March 2004. That policy establishes that, "Bicycling and walking are fundamental travel modes and integral components of an efficient transportation network." As such, the CTB's adopted policy

31 requires that all VDOT highway construction projects shall be initiated with the presumption that
32 the facilities “will include accommodations for pedestrians, including pedestrians with
33 disabilities, along with motorized transportation modes in the planning, funding, design,
34 construction, operation, and maintenance of Virginia’s transportation network to achieve a safe,
35 effective, and balanced multimodal transportation system.”
36

37 Currently there is significant variation in how crosswalks are utilized in different locations
38 throughout Virginia. This Memorandum provides consistent, uniform guidance to designers for
39 determining when to install marked crosswalks, what type of crosswalk to install, and what other
40 traffic control devices or geometric improvements should potentially be considered in
41 conjunction with the marked crosswalk at unsignalized locations.
42

43 Pedestrians typically account for 10 - 15 percent of total highway fatalities in Virginia each year.
44 An assessment of 2012-2014 Virginia pedestrian crashes determined that **86%** of pedestrian
45 fatalities occurred at locations without a marked crosswalk¹. Additionally, about half of Virginia’s
46 pedestrian fatalities occur on Primary system roadways. Some of Virginia’s road segments lack
47 adequate pedestrian accommodations for crossing the road, despite being located in areas
48 where the surrounding land use generates (or has the potential to generate) crossing pedestrian
49 traffic. Pedestrian accommodations include marked crosswalks as well as any facility, design
50 feature, operational change, or maintenance activity that improves the environment in which
51 bicycles and pedestrians travel. Marked crosswalks, by themselves or in conjunction with other
52 traffic control devices and pedestrian accommodations, can provide important safety benefits for
53 crossing pedestrians.
54

55 However, studies² have demonstrated that marked crosswalks placed alone at uncontrolled
56 locations, and not in conjunction with geometric pedestrian safety improvements or other traffic
57 control devices, are not always recommended. High-visibility crosswalks (crosswalks marked
58 using longitudinal lines or bar pairs) perform better than standard crosswalks, but often are not
59 used in every situation due to higher installation and maintenance costs.
60

61 This Memorandum and the attached Standards replace the previous 2005 *Guidelines for the*
62 *Installation for Marked Crosswalks* document and the companion 2005 *Guidelines for the*
63 *Installation of In-Roadway Warning Lights* document, both of which were developed by the
64 Virginia Transportation Research Council (VTRC) for use by VDOT. It provides additional
65 guidance beyond what is in the [2009 Manual on Uniform Traffic Control Devices](#) (MUTCD) and
66 the [2011 Virginia Supplement to the MUTCD, latest version](#).
67

68 This document focuses on pedestrian crossing guidance for unsignalized intersection crossings
69 and mid-block crossings, and should be used in conjunction with a separate I&IM (currently
70 under development) which will establish guidance for pedestrian accommodations at signalized
71 intersections.
72
73

¹ Cole, Mark A., et. al. *Virginia Pedestrian Crash Assessment* (VDOT: 2015).

² Zegeer, Charles V., et. al. *Safety Effects of Marked Versus Unmarked Crosswalks at Uncontrolled Locations* (FHWA: 2009), <http://www.fhwa.dot.gov/publications/research/safety/04100/>

EFFECTIVE DATE

Future contracts: This Memorandum shall be effective for all contracts with an advertisement on or after December 1, 2016. The designer may also elect to apply this Memorandum to projects with an advertisement before that date.

Existing contracts: This Memorandum may be applied to projects constructed under existing contracts if the change is approved by the Project Engineer.

Land use permit for private developments: This Memorandum shall be effective for all projects where the final permit plans have not yet been submitted to VDOT. If agreed to by the permittee and VDOT, this Memorandum may also be applied to a previously-approved permit or to a permit currently under review.

Design-Build or PPTA projects: This Memorandum shall be effective for projects in which the design criteria package has not been completed for advertisement as of December 1, 2016. For current Design-Build or PPTA projects, this Memorandum should be implemented where feasible.

Existing marked crosswalks: Existing crosswalks may remain until the end of their useful service life. This Memorandum should be consulted when planning is underway for the roadway's next resurfacing or reconstruction. This Memorandum should also be used when there is a need to prepare a safety evaluation of existing marked crosswalks.

Existing locations without marked crosswalks: Regions should conduct a review of pedestrian accommodations and determine whether new marked crosswalks are needed in accordance with this Memorandum in conjunction with resurfacing or reconstruction projects. This Memorandum should also be used if the need arises to prepare a safety evaluation of a location not scheduled for resurfacing.

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ATTACHMENT A

Unsignalized Marked Crosswalk Standards

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Unsignalized Marked Crosswalk Standards

1.0 SUMMARY OF REVISIONS

The list below summarizes the major changes to the previous 2005 *Guidelines for the Installation for Marked Crosswalks* document and the companion 2005 *Guidelines for the Installation of In-Roadway Warning Lights* document.

- Establishes additional guidance on when marked crosswalks should or shall be installed at controlled or uncontrolled approaches (e.g. not controlled by a stop sign, yield sign, pedestrian hybrid beacon, or traffic signal) to unsignalized intersections, and at mid-block locations.
 - A separate I&IM (currently under development) details when pedestrian accommodations should be provided at signalized intersections.
- Establishes guidance/standards on when standard or high-visibility crosswalks (longitudinal lines or bar pairs) should be installed.
- Provides guidance on allowable high-visibility crosswalk marking styles.
- Establishes recommended crosswalk widths.
- Removes most guidance for In-Roadway Warning Lights due to their limited use by VDOT.
- Adds discussions on use of Rectangular Rapid Flashing Beacons (RRFBs) and Pedestrian Hybrid Beacons (PHBs).

2.0 BACKGROUND

A crosswalk is generally defined as the portion of roadway designated for pedestrians to use in crossing the street. Crosswalks may be marked or unmarked, as defined in the [Code of Virginia § 46.2-100](#). At intersections, a sidewalk or pedestrian walkway extension across a street can define a crosswalk in addition to crosswalks defined by marked lines in the roadway.

A “pedestrian facility” is a general term denoting locations made to accommodate or encourage pedestrian travel outside the vehicle travelway between road crossings. It typically refers to sidewalks, shared use paths, and curb cuts. It can also refer to wide paved shoulders, or unpaved traversable areas adjacent to the road with a prepared surface, that can be used by pedestrians. An unpaved shoulder with worn-out path in the grass/soil due to pedestrian activity is generally considered a “pedestrian facility”.

There are both advantages and disadvantages of marking crosswalks. Potential advantages of properly marked crosswalks include:

- Helping pedestrians find their way across complex intersections,
- Providing a visible reminder to motorists that pedestrians may be present,
- Directing pedestrians to the location of the recommended crossing path,
- Establishing the legal crosswalk where an unmarked crosswalk does not already exist,
- Reducing the likelihood that drivers will encroach the intersection or block pedestrian traffic when stopping for a STOP or YIELD sign, and/or
- Designating the location of approved school crossings or crossings along recommended school routes.

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A potential disadvantage of marked crosswalks is that they may create a “false sense of security” for pedestrians (cause the pedestrian to assume that the motorist can and will stop in all cases).

If unnecessary and unwarranted marked crosswalks are installed, drivers may not expect them and may ignore or disregard them, which diminishes the effectiveness of marked crosswalks. Excessive marked crosswalk installation can also lead to increased installation and maintenance costs.

3.0 RELATIONSHIP TO AMERICANS WITH DISABILITIES ACT REQUIREMENTS

3.1 Guidance

The 1990 federal Americans with Disabilities Act (ADA) requires that pedestrians with disabilities be accommodated in the design, planning, and maintenance of pedestrian facilities. The ADA requirements are based on the understanding that a wide range of people, including people with disabilities, will be using the pedestrian facilities and relying on them for their daily travel.

The need for ADA improvements to be programmed or constructed in conjunction with marked crosswalk improvements depends on whether the action is a **maintenance activity** or an **alteration**, as defined in the latest effective version of [IIM-TE-376](#).

3.2 Maintenance Activities

Examples of maintenance activities related to crosswalks include:

- Striping a marked crosswalk at an unsignalized intersection if the crossing is already a crosswalk (albeit an unmarked one) as defined by the Code of Virginia,
- Changing the striping pattern of an existing marked crosswalk, and
- Signing improvements.

There is no requirement for ADA assessments or improvements when maintenance activities are performed.

When an existing unmarked crosswalk is converted to a marked crosswalk, it is recommended that the Region or District assess and functionally rate the existing curb ramps (if present) in accordance with IIM-TE-376. At locations where curb ramps are not present (Grade D) or are not fully functional (Grades B or C), future upgrades should be considered based on funding availability in accordance with the latest effective version of [IIM-TE-377](#).

3.3 Alterations

Examples of alterations related to crosswalks at unsignalized locations include:

- Rectangular Rapid Flashing Beacon (RRFB) or Pedestrian Hybrid Beacon (PHB) installation,
- Resurfacing of the crosswalk area, and

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- Establishing marked crosswalks at a location that would not currently be considered an unmarked crosswalk, such as at a midblock location.

When an alteration is being performed, the procedures required by IIM-TE-376 shall be followed.

4.0 APPLICABLE SECTIONS OF THE CODE OF VIRGINIA

[Section §46.2-100](#) of the Code of Virginia defines a crosswalk as “*that part of a roadway at an intersection included within the connections of the lateral lines of the sidewalks on opposite sides of the highway measured from the curbs or, in the absence of curbs, from the edges of the traversable roadway; or any portion of a roadway at an intersection or elsewhere distinctly indicated for pedestrian crossing by lines or other markings on the surface.*”

Note that the definition of “crosswalk” encompasses both marked and unmarked crosswalks. At locations where an unmarked crosswalk would not otherwise exist, and a crosswalk is present as a result of markings, the crosswalk only exists when the markings “distinctly indicate” the location of such crosswalk. This means that when such a marked crosswalk has degraded to the point where it is not sufficiently visible to the approaching motorist, it would no longer be considered a legal crosswalk. Moreover, marked crosswalks must meet the minimum requirements of the MUTCD (e.g., crosswalk width, line thickness, color) in order to be considered a marked crosswalk in Virginia.

[Section §46.2-904](#) states that bicyclists have all of the same rights and responsibilities as pedestrians within crosswalks.

[Section §46.2-923](#) states that pedestrians shall cross, wherever possible, only at intersections or marked crosswalks and shall not “carelessly or maliciously interfere” with traffic. If no marked crosswalks are available at an intersection, then pedestrians are not negligent if they cross by the most direct route at such an intersection.

[Section §46.2-924A](#) states that drivers must yield the right-of-way to pedestrians at:

- Any “clearly” marked crosswalks,
- Any unmarked crosswalks at “the prolongation of the lateral boundary lines of the adjacent sidewalk at the end of the block,” or
- Any intersection where the approach has a speed limit of 35 mph or below.

[Section §46.2-924B](#) sets forth the responsibilities of drivers and pedestrians. Pedestrians have the responsibility to avoid entering or crossing an intersection “in disregard of approaching traffic,” however they have the right-of-way over vehicles making turns. Drivers are required to “change their course, slow down, or stop” if necessary to permit pedestrians to cross.

[Section §46.2-924C](#) allows certain localities in Northern Virginia to establish ordinances imposing fines on drivers who fail to yield the right-of-way to pedestrians at locations where signs are installed and requires VDOT to establish criteria for this required signage in order to establish those fines. VDOT’s signing criteria is included as **Attachment B** to this Memorandum.

5.0 WHEN TO INSTALL MARKED CROSSWALKS AT UNSIGNALIZED INTERSECTIONS

5.1 General Guidance

As with any installation of traffic control devices, engineering judgment should be used for determining when installation of a crosswalk is justified. When considering whether to mark a crosswalk, the land uses adjacent to the roadway provide invaluable information to help indicate if the crosswalk is needed. Pedestrian-oriented land uses and transit stops will generate pedestrian crossings regardless of whether a marked crosswalk exists or not. When pedestrian-generating land uses exist adjacent to roadways where pedestrian crossings are legal, it is VDOT's responsibility to provide adequate safe pedestrian crossing opportunities and to direct pedestrians to those locations.

The presence of shared use paths can justify the installation of a marked crosswalk even if the adjacent land uses are not pedestrian-oriented.

Marked crosswalks should not be installed at the intersection of two low-speed roadways functionally classified as "local", such as at the intersection of two subdivision streets.

In addition, marked crosswalks should not be installed where neither "pedestrian facilities" (defined previously) nor pedestrian-oriented attractors/generators are present on both sides of the crossing. Examples of pedestrian attractors/generators include schools, university campuses, libraries, hospitals, senior centers, major shopping centers, recreational areas, large employment centers, rail stations, bus transfer centers, hotels, residential developments of at least moderate density, parking garages or large parking lots, etc. Pedestrian attractors/generators should be considered as a factor if they are within reasonable walking distance of the crossing.

If neither pedestrian facilities nor pedestrian-oriented land uses currently exist on both sides of the crossing, the designer should consult with the District Planner or locality to assess whether there is a potential for pedestrian activity in the near future, and if so design the location to allow for future crosswalk installation to the extent possible (such as by setting the marked stop line or yield line, if present, at a location where it won't conflict with a future marked crosswalk). Installing marked crosswalks in areas where there is minimal likelihood of existing or future pedestrian activity (based on adjacent land uses) is not recommended.

To the extent possible, marked crosswalks should match pedestrian desire lines by connecting pedestrian generators and attractors. In some rare circumstances, an unusually heavily used unsignalized crosswalk can adversely impact a roadway's vehicular capacity. In these rare cases, engineering judgment should be used to balance locating the crosswalk along pedestrian desire lines while avoiding a substantial impact to roadway vehicular capacity.

A flow chart illustrating the general decision-making process for installation of crosswalks at unsignalized locations is shown in Figure C1 of Attachment C.

Note that if there is a STOP sign or YIELD sign immediately downstream of the crossing (for example, where a Shared Use Path (SUP) runs parallel to the main road and crosses the side

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road such that drivers on the side road have the stop sign immediately downstream of the SUP), the approach is considered a controlled approach for the purposes of this IIM.

5.2 – When to Install Marked Crosswalks Across Stop-Controlled or Yield-Controlled Approaches

Marked crosswalks should be installed if pedestrian facilities or pedestrian-oriented attractors/generators exist on both sides of the crossing and any of the following statements are true, unless precluded by the recommendations in Section 5.1 or the Regional Traffic Engineer approves an exception to this recommendation:

- The crossing is part of a walking route approximately ¼ mile or less between a residential development of moderate or heavy density and a school or recreational area,
- The crossing is connected by pedestrian facilities to a rail transit stop or major bus transfer station within walking distance of approximately ¼ mile or less,
- The crossing is part of a shared use path or trail,
- The crossing is across a yield-controlled approach at an off-ramp junction or channelized right turn lane, or
- The crossing is within a downtown Central Business District area, and/or is in an area of known pedestrian activity and pedestrian-oriented land-use.

A flow chart illustrating the decision-making process for crosswalks at stop or yield-controlled locations is shown in Figure C2 of Attachment C.

5.3 – When to Install Mid-Block Marked Crosswalks or Marked Crosswalks Across Uncontrolled Approaches

An engineering study shall be performed before crosswalk markings are installed across uncontrolled locations (which includes both crosswalks at mid-block locations and crosswalks across uncontrolled intersection approaches). Data collection templates to facilitate crosswalk engineering studies are provided in Attachment D of this memorandum.

The satisfaction of the criteria within this section does not in and of itself require the installation of a marked crosswalk across an uncontrolled location.

Crossings of uncontrolled roadway approaches shall not be marked unless all of the following are met:

- 1) The crossing is on a direct route between significant pedestrian generator(s) and attractor(s), where engineering judgment determines that the crosswalk would likely see a minimum of 20 pedestrians/bicyclists using the crosswalk in an hour. That threshold may be reduced to 10 pedestrians per hour if the crossing is expected to be used by a high number of vulnerable pedestrians (pedestrians who are disabled, age 65 and over, or age 15 and under), or if the reduced volume is met for three consecutive hours.
- 2) The location is 300 feet or more from another marked crosswalk across the same road, or engineering judgment determines that sufficient demand and pedestrian desire lines exist to justify both crosswalks.

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- 3) Drivers will have an unrestricted view of the entire length of the crosswalk, including the waiting areas at either end of the crosswalk. If possible, this unrestricted view should be equal to or exceeding the Stopping Sight Distance (SSD) requirements shown in **Table 1** and as per the latest effective version of VDOT's Road Design Manual. If the SSD requirements cannot be met and the crosswalk cannot be relocated to a place where SSD requirements will be met, warning signs shall be used. (Warning signs may be omitted on downtown urban streets with speed limit < 35 mph if justified by documented engineering judgment.)
- 4) The required engineering study determines that the introduction of a marked crosswalk will not produce an unacceptable safety hazard.

A flow chart illustrating the decision-making process for crosswalks at uncontrolled locations is shown in Figure C3 of Attachment C.

Marked crosswalks across uncontrolled approaches should be avoided at locations that are unlit (roadway lighting not present) and higher speed (40 mph or greater) unless a high visibility crosswalk marking style and appropriate advance warning devices are utilized.

Table 1 – Stopping Sight Distance Requirements Approaching Mid-Block Crosswalks or Crosswalks at Uncontrolled Intersection Approaches (feet)

Operating Speed *	Level Grade	Downgrades			Upgrades		
		-3%	-6%	-9%	+3%	+6%	+9%
25 mph	155	158	165	173	147	143	140
30 mph	200	205	215	227	200	184	179
35 mph	250	257	271	287	237	229	222
40 mph	305	315	333	354	289	278	269
45 mph	360	378	400	427	344	331	320
50 mph	425	446	474	507	405	388	375
55 mph	Crosswalks should not be marked across uncontrolled approaches with operating speed of 55 mph or greater.						

(Source: VDOT Road Design Manual, Chapter 2D. This table is provided for convenience and is current as of June 2016. Any subsequent revisions to the Road Design Manual override the values provided in this table.)

*Operating speed can refer to actual 85th percentile speed, if speed data is available. Otherwise, operating speed can be estimated as the posted speed limit plus 7 mph, or based on documented engineering judgment. For operating speeds not in 5 mph increments, users should interpolate from this table to find the minimum SSD requirements.

As per Section 3B.18 of the 2009 MUTCD, if a marked crosswalk is installed, pedestrian crossing warning signs should be installed in advance of non-intersection crosswalks and on-street parking should be prohibited where it will impede adequate visibility of the crosswalk and waiting areas.

The R1-5 "Yield Here to Pedestrians" sign may be used in advance of a marked mid-block crosswalk across a multi-lane (i.e. two or more travel lanes per direction) uncontrolled approach to direct vehicles to yield in advance of the crosswalk. This is done to minimize the risk of a vehicle in one lane from blocking the view of a crossing pedestrian from a vehicle approaching in the other lane. If used, the R1-5 sign should be placed 20 to 50 feet in advance of the

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crosswalk as per Section 2B.11 of the 2009 MUTCD and FHWA's [Official Interpretation 2\(09\)-861](#). Yield line ("shark's teeth") pavement markings may be used in conjunction with the R1-5 sign, as per Section 3B.16 of the 2009 MUTCD.

If a marked crosswalk is to be installed across an uncontrolled approach, **Table 2** should be used to determine if additional enhancements may be necessary to facilitate safe crossing at uncontrolled locations. A flow chart illustrating the use of Table 2 is shown in Figure C4 of Attachment C.

Treatments to inhibit pedestrian crossings (such as landscaping or fences) should only be considered where existing crosswalks are located within 300 feet and an additional crossing would create an unsafe condition, or where pedestrian demand exists but the natural pedestrian desire line results in unsafe crossings, such as locations where visibility (for pedestrians or motorists) is obstructed and the obstruction cannot be reasonably removed.

IIM-TE-384 – Attachment A **Unsignalized Marked Crosswalk Standards**

Table 2. Recommendations for Considering Marked Crosswalks and Other Needed Pedestrian Improvements Across Uncontrolled Approaches

Roadway Configuration	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	≥ 45 MPH	≤ 30 MPH	35 MPH	40 MPH	≥ 45 MPH	≤ 30 MPH	35 MPH	40 MPH	≥ 45 MPH	≤ 30 MPH	35 MPH	40 MPH	≥ 45 MPH
2 Lanes (undivided two-way street or two-lane one-way street)	A	A	B	B	A	A	B	B	A	A	B	B	B	B	B	C
3 Lanes with refuge island OR 2 Lanes with raised median*	A	A	B	B	A	B	B	B	A	A	B	B	B	B	B	C
3 Lanes (center turn lane)	A	A	B	B	A	B	B	B	A	B	B	C	B	C	C	C
4 Lanes (two-way street with no median)	A	B	C	C	B	B	C	C	B	C	C	D	C	C	C	D
5 Lanes with refuge island OR 4 lanes with raised median*	A	A	B	B	A	B	B	C	B	B	C	C	B	B	C	D
5 Lanes (center turn lane)	A	B	C	C	B	B	C	C	C	C	C	D	C	C	C	D
6 Lanes (two-way street with* or without median)	A	B	D	D	B	B	D	D	D	D	D	D	D	D	D	D

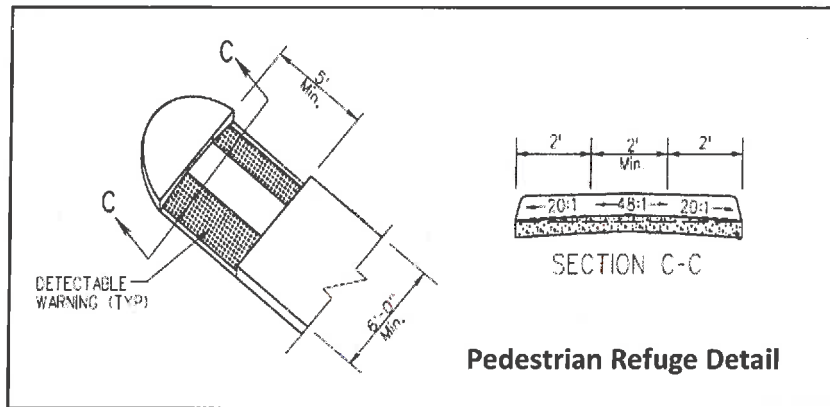
Source: Guidance for Installation of Pedestrian Crosswalks on Michigan State Trunkline Highways (Michigan Department of Transportation, 2014)

Condition A	Candidate site for marked crosswalk alone (standard if speed limit is 30 MPH or less, high-visibility if speed limit is 35 MPH or greater). Evaluate need for advance signing
Condition B	Potential candidate site for marked crosswalk. Location should be monitored & consideration given to providing a high-visibility crosswalk and/or warning signs (see Section 7.2)
Condition C	Marked crosswalks alone are insufficient. The crosswalk shall use a high-visibility pattern and other improvements (warning signs and/or geometric/ traffic calming improvements) (see Section 7.2) <u>will likely be necessary.</u>
Condition D	Marked crosswalks <u>shall not</u> be installed

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Unsignalized Marked Crosswalk Standards

* The pedestrian walkway through a refuge island shall be at least 5 feet wide (6 feet width or greater is preferred) and at least 6 feet long to be considered a safe refuge area (see detail on the bottom right from VDOT Standard Drawing CG-12). A raised median generally provides greater pedestrian-vehicle crash reduction benefit than a flush (painted) median, however the presence of a painted median can also provide advantages to the crossing pedestrian over an undivided road.



Pedestrian Refuge Detail

6.0 CROSSWALK DESIGN

6.1 – Crosswalk Width and Location

In general, crosswalks should be the same width as the pedestrian facility on either side of the roadway, subject to the following requirements:

- Crosswalks shall be at least six feet wide as per the MUTCD, and
- Crosswalks should be at least seven feet wide in order to allow two wheelchairs, parents with strollers, etc. to pass each other.

Wider crosswalks than described above should be provided at locations with heavy pedestrian volumes during peak periods, to avoid creating situations where pedestrians are “crowded out” of the crosswalk. The width should not exceed 10 feet except when necessary to accommodate peak pedestrian periods at locations with exceptionally high pedestrian activity. Crosswalks that are part of a shared use path should be at least as wide as the path (ten feet recommended) to accommodate bicyclists passing in both directions.

Unnecessarily wide crosswalks can result in the stop lines having to be placed further back from the intersection which in turn can have an adverse impact on driver's sight distance.

Crosswalks shall start and end at curb ramps where curb is present. Crosswalks shall be straight and not kinked, except that crosswalks may change direction from within a refuge island. If existing curb ramps are present on a project involving alterations, then it might be necessary to reconstruct/relocate existing curb ramps and/or modify existing raised medians in order to provide crosswalks at a logical location.

6.2 – Crosswalk Marking Patterns

Marked crosswalk patterns can be divided into two basic categories: standard and high-visibility. Standard crosswalks use the transverse lines (two parallel lines) pattern. High-visibility crosswalks have bar-pairs, ladder, longitudinal lines, or zebra patterns. Permissible crosswalk marking patterns that may be used on VDOT-maintained roadways are shown in **Table 3**.

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Unsignalized Marked Crosswalk Standards

According to [an FHWA study](#)³, high-visibility crosswalks can have up to double the detection distance (for drivers approaching the crosswalk) compared to standard crosswalks - an 8 second increase in detection distance for a 30 mph approach. However, high-visibility crosswalks are also more expensive (as much as five times the cost) - both for initial installation and future maintenance. Some high-visibility crosswalk marking materials can also become slick when wet, potentially resulting in a loss of traction for vehicles (particularly motorcyclists and bicyclists) in the travel lanes as well as for pedestrians crossing the crosswalk. High-visibility crosswalks can lose some of their enhanced effectiveness if they are used too often.

Standard crosswalks should be used for all marked crosswalks except at locations meeting the below criteria.

A high-visibility crosswalk pattern shall be utilized where any of the following conditions exist:

- The crossing is at an uncontrolled roadway approach and meets Condition C (orange area) of the selection chart in **Table 2**,
- The crossing is located across a multilane roundabout approach or exit from a multi-lane roundabout,
- The crossing is part of a shared use path and crosses an uncontrolled roadway approach with a speed limit > 25 mph, or
- The crosswalk is part of a Pedestrian Hybrid Beacon (PHB) crossing.

High-visibility marked crosswalks should be installed at locations where all of the following conditions exist:

- The speed limit is > 25 mph,
- The crossing is across an uncontrolled roadway approach, and
- One or more of the following special conditions apply:
 - The crossing meets Condition B (yellow area) of the selection chart in **Table 2**,
 - The crossing is not illuminated by nearby roadway lighting,
 - Engineering judgment determines that the pedestrian crossing volume is expected to be very high⁴,
 - The crossing is part of a walking route approximately ¼ mile or less between a residential development of moderate or heavy density and a school or recreational area,
 - The crossing is connected by pedestrian facilities to a rail transit stop or major bus transfer station within walking distance of approximately ¼ mile or less,
 - The crosswalk is within a downtown Central Business District area, or
 - The crosswalk is in a location where the surrounding land use is indicative of walking as a transportation mode.

³ Fitzpatrick, K., et al. *Crosswalk Marking Field Visibility Study (FHWA: 2010)*, <http://www.fhwa.dot.gov/publications/research/safety/pedbike/10067/10067.pdf>

⁴ The designer should use local knowledge and site context to determine if current or anticipated pedestrian crossing volume could be considered “very high.” A crossing with very high pedestrian volume usually is expected to have pedestrian activity during most 15-minute daytime periods when weather conditions are conducive to walking. [EXPLANATION FOR MY EDIT: even in areas with tons of pedestrian movements like, say, right in front of the Metro stop, you probably have fairly light pedestrian volumes at certain hours. For example, 7:15 on a Sunday morning]

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Unsignalized Marked Crosswalk Standards

In addition, marked crosswalks across single-lane roundabout approaches and exits should use a high-visibility marking pattern.

High-visibility crosswalks may also be installed where engineering judgment determines that they are necessary to increase driver recognition distance to help compensate for other factors such as roadway geometry, visual clutter in the surrounding environment, crash history, and/or traffic and pedestrian volume patterns.

Table 3 –Permissible Crosswalk Types on VDOT-maintained Roadways

Type	Class	Design details	Sketch
Transverse Lines (two parallel lines)	Standard	<ul style="list-style-type: none"> The transverse lines shall be between 6" and 12" in width. Typically, VDOT uses 6" width, however 8", 10", or 12" widths can be used to increase the visibility of the lines as they become worn over time. 	
Longitudinal Lines ("continental")	High-Visibility	<ul style="list-style-type: none"> Refer to PM-3 standards for details of longitudinal line widths and placement. Longitudinal lines should be spaced to avoid the wheel paths of through vehicles. 	
Bar Pairs	High-Visibility	<ul style="list-style-type: none"> Identical to Longitudinal Lines crosswalk, but uses pairs of 8" lines with 8" gap (8/8/8 pattern) in lieu of a 24" longitudinal line. Spacing between the 8/8/8 bar pairs shall be the same as the requirements of PM-3 for spacing between Longitudinal Lines. The bar pairs should be spaced to avoid the wheel paths of through vehicles. 	

Source: 2008 VDOT Road and Bridge Standards, Section 1330.33

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Unsignalized Marked Crosswalk Standards

Other high-visibility marking patterns, such as “ladder” or “zebra” markings, should not be used except when necessary to match the pattern of other adjacent marked crosswalks.

Bar Pairs crosswalks have several advantages over Longitudinal Lines crosswalks:

- [An FHWA study](#) of the Bar Pairs pattern concluded that it behaves comparably with the Longitudinal Lines pattern in terms of driver recognition and behavior,
- Similar cost as Longitudinal Lines crosswalks (although installation is slightly more complicated, the Bar Pairs crosswalk uses less marking material),
- Easier for motorcyclist/bicyclist traffic to avoid traveling over the pavement marking material, which may be slick when wet, and
- Easier for pedestrians to avoid stepping directly on the pavement marking material, which may be slick.



If an existing standard crosswalk is upgraded to a high-visibility crosswalk independent of a roadway resurfacing project, the transverse lines may be retained to eliminate the need for pavement marking eradication. The transverse lines should not be restored when the roadway is resurfaced.

6.3 – Aesthetic Treatments Between Crosswalk Lines

Localities may request the use of aesthetic treatments, such as stamped concrete, brick pavers, or thermoplastic patterned inlays, between the crosswalk lines. Such requests will be evaluated as per the latest edition of L&D Instructional & Informational Memorandum [IIM-LD-218](#). Such aesthetic treatments by themselves do not constitute a marked crosswalk; they must be edged by transverse white lines to legally establish the marked crosswalk and also to provide visual contrast between the pavement and the aesthetic treatment.

As per Section 3G.01 of the 2009 MUTCD, aesthetic or colored pavement between crosswalk lines should not use colors or patterns that degrade the contrast of the white transverse crosswalk lines or that might be mistaken by road users as a traffic control application.

7.0 OTHER PEDESTRIAN CROSSING SAFETY TREATMENTS

7.1 Pedestrian or School Regulatory and Warning Signs

Pedestrian/school regulatory and warning signs, when used, shall be located and installed in accordance with the MUTCD and the Virginia Supplement to the MUTCD.

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Unsignalized Marked Crosswalk Standards

7.2 Geometric/Traffic Calming Improvements

There are many options available to designers to modify or construct new roadway geometry to improve the safety of crossing pedestrians by achieving one or more of the following goals:

- Reducing the crossing distance length (which reduces the pedestrian's exposure to traffic),
- Increasing the visibility of pedestrians who are crossing or waiting to cross, or
- Encouraging drivers to drive at slower speeds.

These options include:

- Installing corner or midblock bulb-outs,
- Installing median refuge islands and "choker" islands,
- Reducing corner radii,
- Increasing the intersecting angle of channelized turn lanes,
- Installing raised crosswalks, and/or
- Installing mini-roundabouts.

These design elements should be designed in accordance with Appendix B(2) of the latest effective version of VDOT's [Road Design Manual](#) and DRPT's [Multimodal System Design Guidelines](#).

Traffic calming improvements on residential streets, such as raised crosswalks or choker islands, should be planned and designed in accordance with the latest effective version of VDOT's [Traffic Calming Guide for Local Residential Streets](#).

7.3 Midblock Pedestrian Signals and Pedestrian Hybrid Beacons

Vehicular traffic signals may be used to control a midblock pedestrian crossing if the traffic signal is warranted based on the Pedestrian Volume Warrant in Section 4C.05 of the 2009 MUTCD.

Pedestrian Hybrid Beacons (PHBs) may be used to control a midblock pedestrian crossing if warranted, designed, and operated as per Chapter 4F of the 2009 MUTCD. As per [Official Interpretation 4\(09\)-14\(I\)](#), a red clearance interval is permissible and should be considered between the start of the steady red phase and the start of the pedestrian walk interval, and then again between the end of the pedestrian walk interval and the end of the alternating flashing red interval. The duration of the flashing yellow interval should be as per [Official Interpretation 4\(09\)-32\(I\)](#).

PHBs shall not be installed where the crossing volume is less than 20 pedestrians per hour.



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Unsignalized Marked Crosswalk Standards

7.4 Rectangular Rapid Flashing Beacons (RRFBs)

If Condition B (yellow area) or C (orange area) is met in Table 2, RRFBs may be considered as an appropriate additional crossing treatment to supplement marked crosswalks.

RRFBs, similar to In-Roadway Warning Lights (IRWLs), rely on lights that flash upon pedestrian activation to alert drivers to the likely presence of pedestrians within or waiting to cross the crosswalk. However, RRFBs are mounted on the sign posts (or, less often, overhead) and therefore have lesser long-term maintenance costs than the in-pavement IRWLs which are subjected to vehicular wear, snowplows, and pavement resurfacing.

RRFBs are not currently included in the 2009 MUTCD and may only be used per the requirements of FHWA's Interim Approval. In 2011 VDOT received Interim Approval from FHWA to operate RRFBs on VDOT maintained roads. Localities that maintain their own roads must separately apply for and receive Interim Approval from FHWA prior to installing RRFBs.

FHWA's MUTCD [Interim Approval website](#) lists several Official Interpretations that clarify and/or amend the initial RRFB approval. These interpretations shall be followed when planning, designing, and operating RRFB installations. This website should be monitored periodically for updated Interpretations. Note that existing installations do require retrofits should new requirements come out after initial activation. As of the date of this revised IIM, the following interpretation subjects include:

- Overhead Mounting, 2009
- Flash Pattern, 2010, 2012, 2014
- Use with W11-15 Sign, 2010
- Light Intensity, 2012
- Dimming during Daytime Hours, 2012
- Flashing Extensions and Delays, 2013
- Placement of Units above Sign, 2016

RRFBs should not be used indiscriminately. Overuse of RRFBs in the roadway environment could decrease not only the effectiveness of the RRFBs but those crossings without RRFBs.

7.4.1 Visibility

The sign and light components of the RRFBs should be prominently visible to approaching vehicles, and the RRFBs should have side indication lights informing pedestrians when the flashers are activated.



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Unsignalized Marked Crosswalk Standards

An RRFB assembly should be placed on the median or on an overhead mast arm at crossings with obstructed visibility for side-mounted traffic control devices (e.g. near side transit stops, trees, visual clutter, roadway geometry, large volume of heavy vehicles, and etc.).

If a median is present and the RRFBs are post-mounted, both right hand and median mounted RRFBs should be installed.

Advance RRFBs should be considered for any crossings that have excessive surrounding visual clutter, steep vertical and/or sharp horizontal roadway curvature.

7.4.2 Speed

There may be conditions that necessitate the installation of pedestrian crossings where speeds are higher and special consideration is warranted (B and C Conditions in **Table 2** where speed limit is > 35 mph). Consideration should also be given to installing advance RRFBs on higher speed (> 35 mph) roadways even if there is adequate SSD on both approaches. See **Figures 1 and 2** for additional guidance on low speed (≤ 35 mph) and high speed (> 35 mph) roadways.

Vehicle and Pedestrian/Bicycle Volume

RRFBs should not be installed unless there are a minimum of 20 pedestrians/bicyclists using the crosswalk in an hour. That threshold may be reduced to 10 pedestrians per hour if the crossing is expected to be used by a high number of vulnerable pedestrians (pedestrians who are disabled, aged 65 and over, or aged 15 and under), or if the reduced volume is met for three consecutive hours.

RRFBs shall not be installed if pedestrian and vehicular volumes fall outside the limit lines shown in **Figures 1 and 2**, unless approved by the Regional Traffic Engineer (RTE). RRFBs may not be appropriate in locations where there is a combination of both high traffic volumes and high pedestrian volumes (above the RRFB upper thresholds in the below figures). At such locations there may be an increase in crashes and/or traffic delay that make the use of RRFBs inappropriate. At such locations, PHBs, pedestrian traffic signals, or grade separated crossings should be considered. The colored lines in Figures 1 and 2 depict the warrant requirements for PHBs as per Section 4F.01 of the MUTCD.

Engineering judgement should take into account the proximity of adjacent signals.

If PHBs are considered, Section 4F of the 2009 MUTCD contains warranting guidelines that utilize traffic, automobile speeds, and pedestrian crossing distance.

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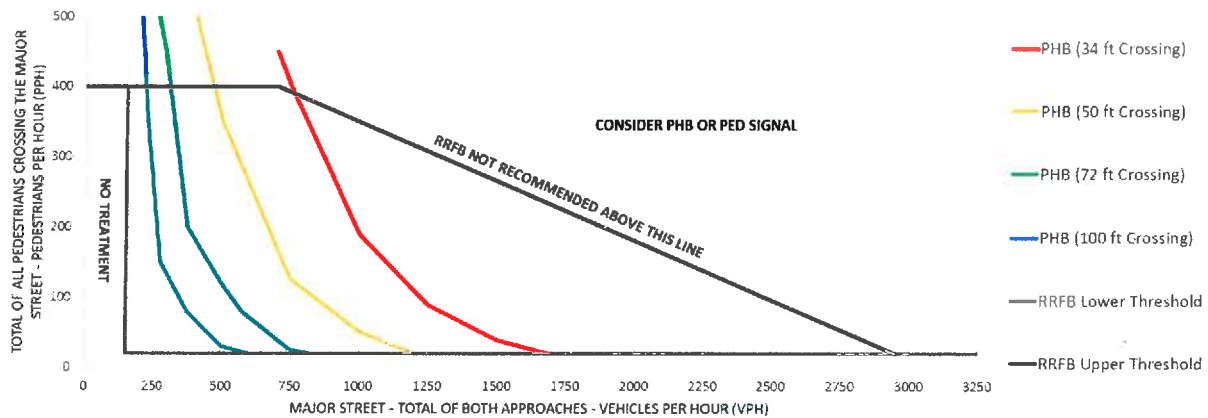


FIGURE 1 – Installation of RRFBs and PHBs on Low Speed Roadways (speed limit ≤ 35 mph)

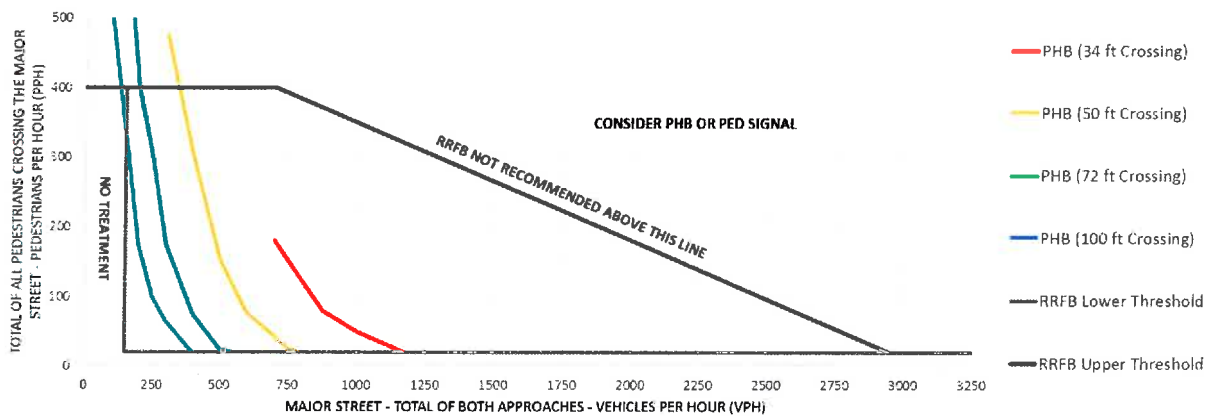


FIGURE 2 – Installation of RRFBs and PHBs on High Speed Roadways (> 35 mph)

Source: 2009 MUTCD, Section 4F and Pedestrian Crossing Treatment Installation Guidelines, City of Boulder

7.5 In-Roadway Warning Lights (IRWLs)

IRWLs rely on lights embedded in the pavement that flash upon pedestrian activation or detection to alert drivers to the likely presence of pedestrians within or waiting to cross the crosswalk.

It is recommended that RRFBs or other treatments be considered in lieu of IRWLs due to their long-term maintenance costs.

8.0 UNCONVENTIONAL LOCATIONS

8.1 T and Offset Intersections

At closely spaced T and offset intersections, it might not be prudent or necessary to mark all legal crosswalks. At T intersections, it may be appropriate to only mark one of the two crossings

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Unsignalized Marked Crosswalk Standards

across the through road. This decision should be based on pedestrian demand volumes and the volume of left- and right-turning traffic from the stem of the T.

8.2 Roundabouts

Pedestrian crossings at roundabouts should be located and designed as per the latest effective version of VDOT's [Road Design Manual](#), Chapter 2D, [Roundabouts: An Informational Guide, 2nd Edition](#) (NCHRP Report 672), and the 2009 MUTCD, Section 3C.05.

The Code of Virginia's definition of where unmarked crosswalks exist at intersections does not necessarily apply to roundabout intersections. In order to establish that a crosswalk exists, and also for safety reasons, marked crosswalks shall be provided across all legs of a roundabout (both entrances and exits) where there are adjacent pedestrian facilities on both sides of the leg, unless the Regional Traffic Engineer or designee concurs that a significant operational or safety concern prevents their use.

Marked crosswalks at single-lane roundabouts should use a high-visibility marking pattern. Marked crosswalks across multilane roundabout approaches or exits shall use a high-visibility marking pattern.

Note that neighborhood traffic circles that do not meet the design criteria for a modern roundabout (e.g. lack of splitter islands) need not have marked crosswalks. Unmarked crosswalks are typically sufficient for neighborhood traffic circles and other subdivision streets.

8.3 Interchanges

Due to high-speed merging and diverging traffic that may be present on the cross road at interchanges, it may be desirable to limit the pedestrian pathway through the interchange to just one side of the cross street. Pedestrian pathways through interchanges need to be carefully planned to take into account conflicts from merging and diverging traffic. At free-flowing or YIELD controlled ramps, the crosswalk should be installed perpendicular to the ramp at a location where sight distance is optimal, even if this location is further away from the parallel roadway.

For interchanges with multiple merging and diverging ramps, such as cloverleaf interchanges and Diverging Diamond Interchanges (DDIs), it may be desirable to provide a pedestrian pathway through the median of the cross road to minimize pedestrian-vehicle conflict if space for a pedestrian facility in the median exists.

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Unsignalized Marked Crosswalk Standards

9.0 REFERENCE

- [VDOT Policy for Integrating Bicycle and Pedestrian Accommodations](#)
- [2009 MUTCD with Revisions](#)
- [2011 Virginia Supplement to the MUTCD With Revisions](#)
- [VDOT Road Design Manual \(latest effective version\)](#)
- [2008 VDOT Road and Bridge Standards](#)
- [DRPT Multimodal System Design Guidelines](#)
- [Instructional & Informational Memorandum IIM-LD-218, Latest Revision](#)
- [Roundabouts: An Informational Guide, 2nd Edition](#)
- [City of Boulder Pedestrian Crossing Treatment Installation Guidelines](#)
- [MDOT Guidance for Installation of Pedestrian Crosswalks on Michigan State Trunkline Highways](#)
- [FHWA Crosswalk Marking Field Visibility Study](#)

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ATTACHMENT B

Complete Section

Virginia Code 46.2-924 Signing and Marking Criteria

IIM-TE Memo 384 – Attachment B
Code 46.2-924 Signing and Marking Criteria

BACKGROUND:

- Virginia Code [Section §46.2-924](#) Part 3C states that certain localities in Northern Virginia District may impose a fine for drivers who fail to yield the right-of-way to pedestrians crossing or attempting to cross the highway, provided the following:
 - The fine is enacted by ordinance and the crosswalk is marked
 - There are standard highway signs informing drivers of their duty to yield to pedestrians at each and every crossing location covered by the higher fines ordinance
- This document provides VDOT's "criteria for the design, location and installation of such signs" as required by [§46.2-924](#).
- These criteria are based primarily on the FHWA Manual on Uniform Traffic Control Devices ([MUTCD](#)), the [Virginia Supplement](#) to the MUTCD and traffic engineering best practices.
- Localities that maintain their own roads shall still abide by these criteria and by the MUTCD. They may also choose to adopt the [Virginia Supplement](#) to the MUTCD.
- The current edition of the [MUTCD](#) and [Virginia Supplement](#) became effective January 1, 2012 and should be followed as outlined in both manuals.

CRITERIA:

- The crosswalk marking pattern and dimensions shall be as per this IIM, preferably with high-visibility marking patterns.
 - An R1-5 or R1-5A "Yield Here to Pedestrians" sign shall be placed approximately 20-50 feet upstream of the near crosswalk edge in both directions, as per [Section 2B.11](#) of the MUTCD.
 - Signs that read "Stop for Pedestrians" shall not be used, as the Code requires drivers to "yield" to pedestrians.
 - A R2-6P "Fines Higher" or R2-6bP "\$XXX Fine" sign shall be placed below the R1-5/R1-5a signs, as required by [Section 2B.17](#) of the MUTCD.
 - On multilane approaches, the R1-5/R1-5a sign should be coupled with yield line markings ("shark's teeth") [MUTCD Markings Requirements](#) Section 3B.16, Figures 3B-16 and 3B-17, or other approved markings.
 - Alternatively, the locality may modify the R1-6 "State Law Yield to Pedestrians Within Crosswalk" or overhead R1-9 "State Law Yield to Pedestrians" sign to add a "Fines Higher" or "\$XXX fine" message, using black all-caps text on white background.
 - As per [Section 2B.12](#) of the MUTCD, modified R1-6 signs shall not be post-mounted on the left or right side of the highway.
- Standard signs shall be erected and maintained by localities. On VDOT-maintained roads, the VDOT Regional Traffic Engineer or designee shall approve these sign locations.



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ATTACHMENT C

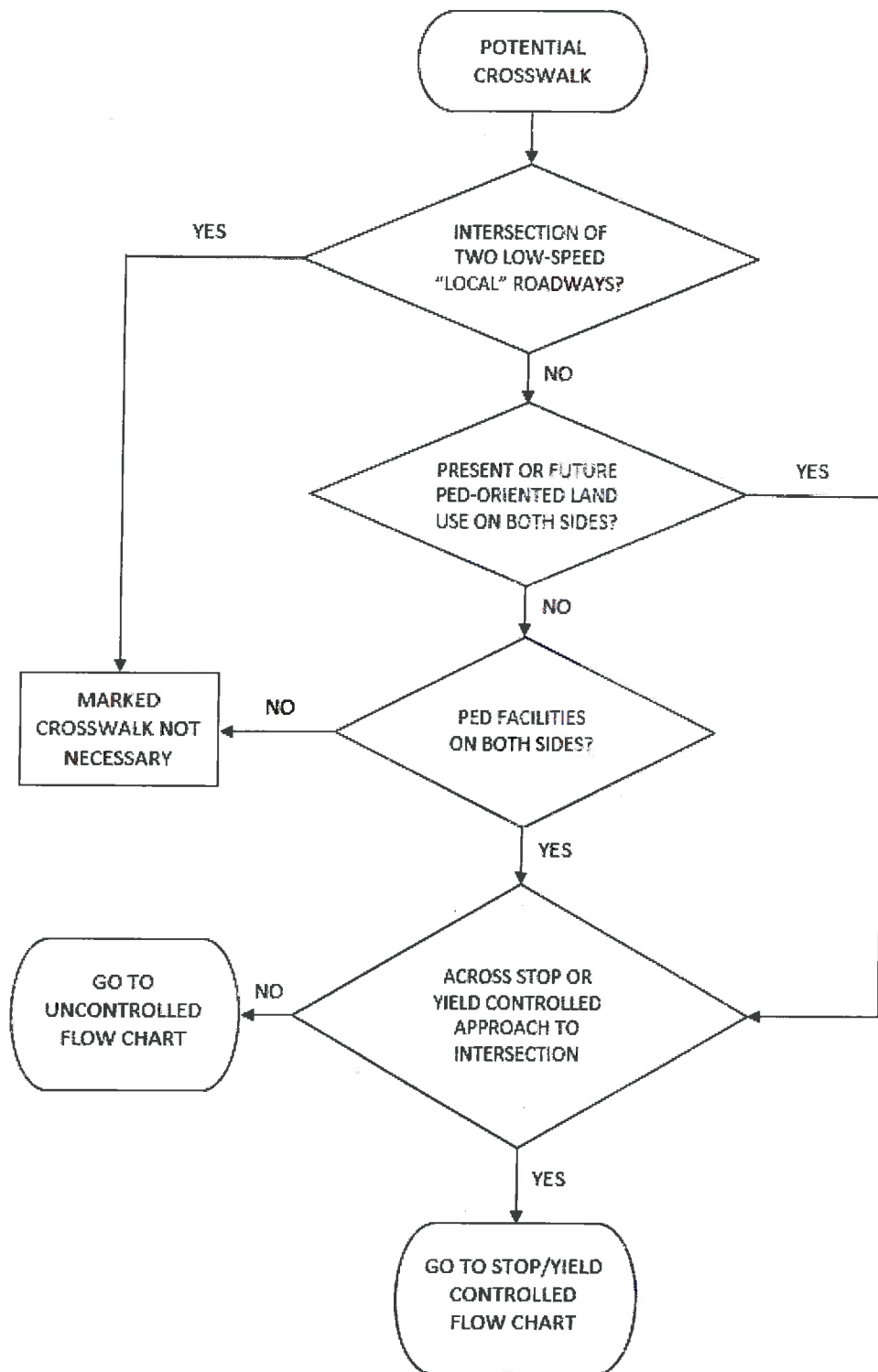
Process Flow Charts for Determining Appropriate Pedestrian Crossing Accommodations at Unsignalized Locations

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Figure C1. Potential Crosswalk Flow Chart	C1
Figure C2. Stop or Yield Controlled Flow Chart	C2
Figure C3. Uncontrolled Approach Flow Chart	C3
Figure C4. Table 2 Flow Chart	C4

IIM-TE-384 – Attachment C
Reference Flow Charts for Pedestrian Crossing Accommodations at
Unsignalized Locations

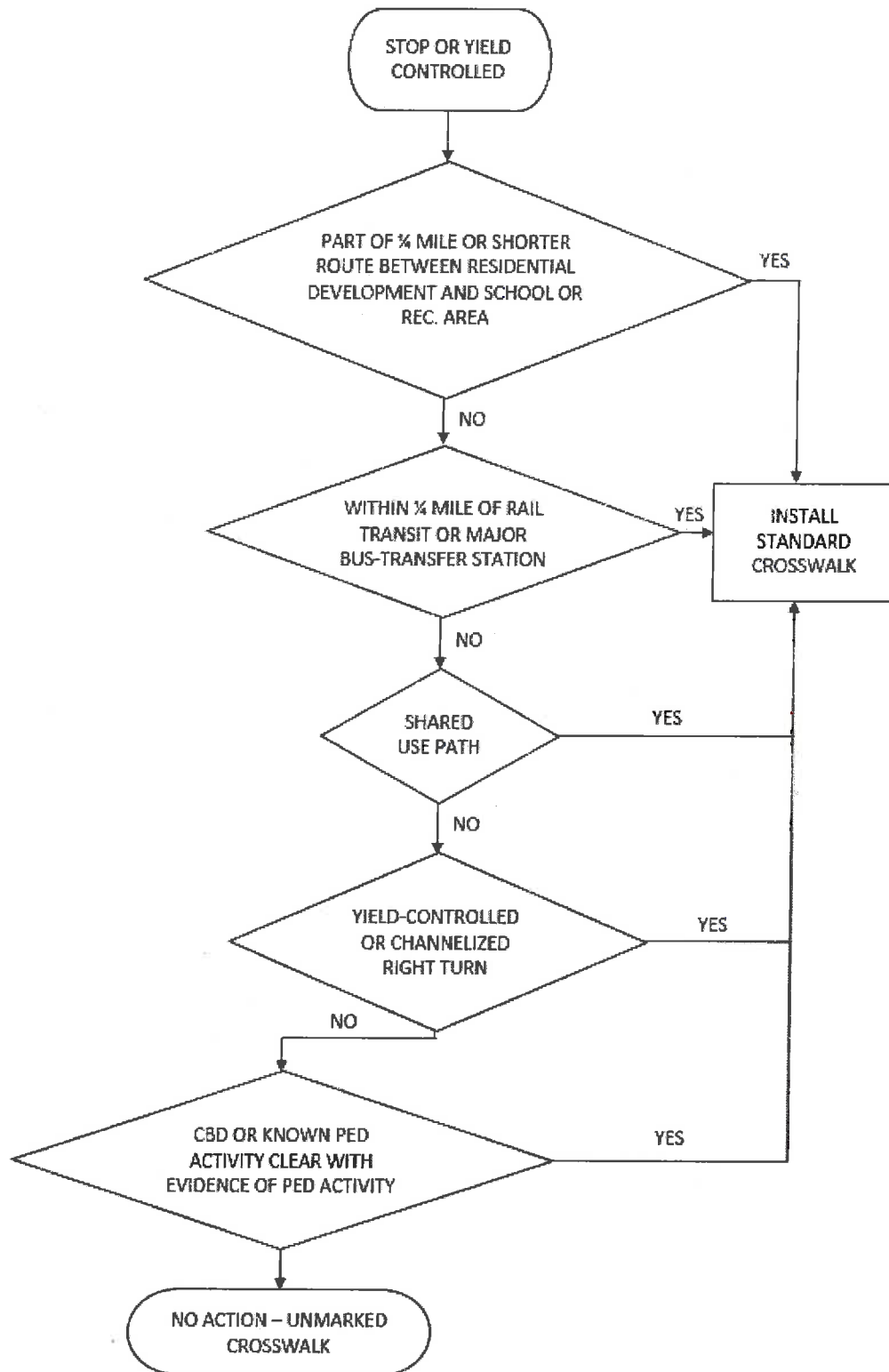
889 **Figure C1. Potential Crosswalk Flow Chart**



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IIM-TE-384 – Attachment C
Reference Flow Charts for Pedestrian Crossing Accommodations at
Unsignalized Locations

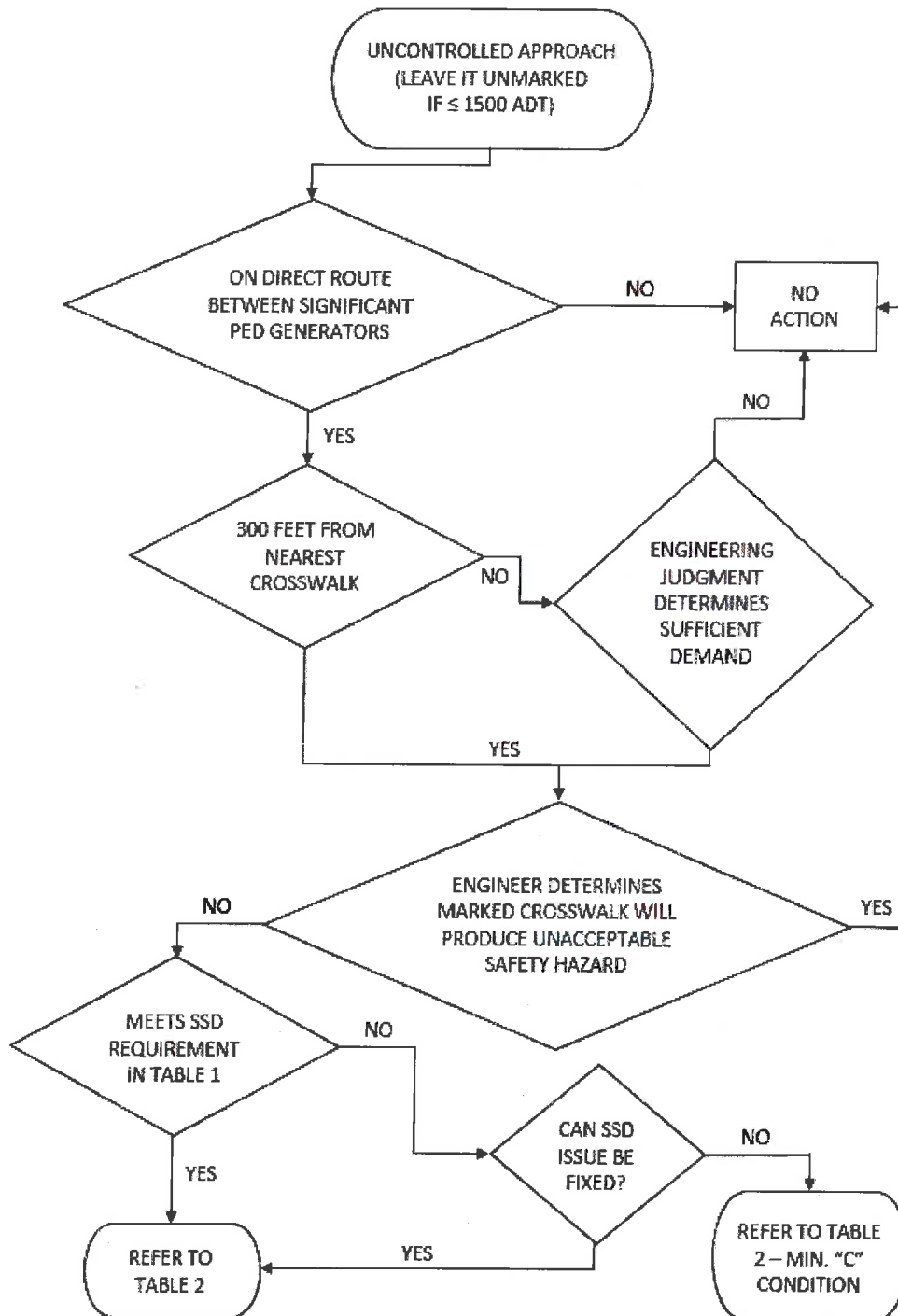
892 **Figure C2. Stop or Yield Controlled Flow Chart**



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IIM-TE-384 – Attachment C Reference Flow Charts for Pedestrian Crossing Accommodations at Unsignalized Locations

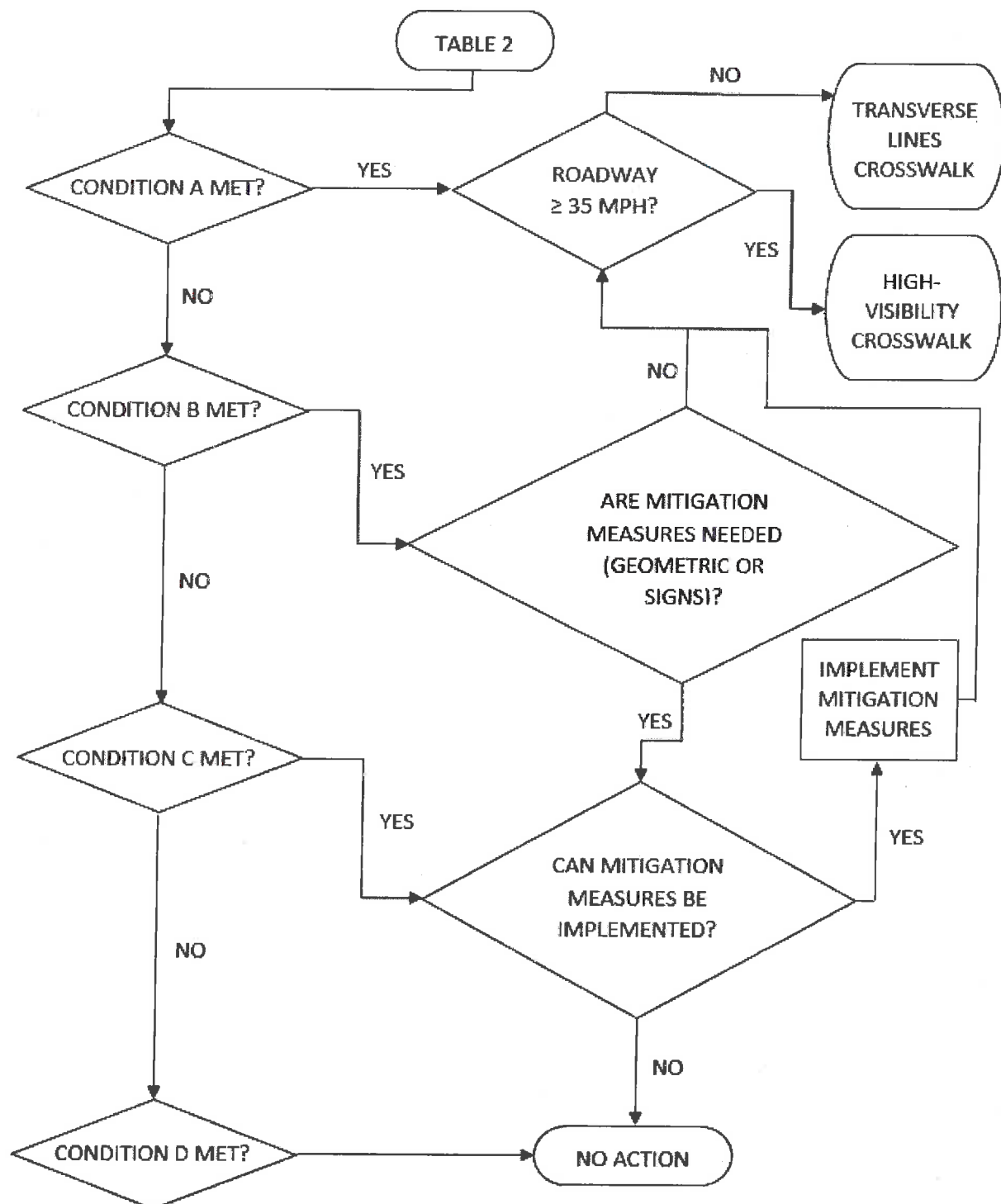
894 Figure C3. Uncontrolled Approach Flow Chart



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IIM-TE-384 – Attachment C
Reference Flow Charts for Pedestrian Crossing Accommodations at
Unsignalized Locations

897 **Figure C4. Table 2 Flow Chart**



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ATTACHMENT D

Data Collection Sheets for Pedestrian Crossing Accommodation Studies at Unsignalized Locations

ATTACHMENT CONTENTS

Data Collection Sheet: Location Description Part 1	D1
Data Collection Sheet: Location Description Part 2	D2
Data Collection Sheet: Traffic Data	D3

IIM-TE-384 – Attachment D
Sample Data Collection Sheet for Pedestrian Crossing
Accommodations at Unsignalized Locations

LOCATION DESCRIPTION – PART 1	
Name of Data Collector: _____	
Date of Data Collection: _____	
Locality/District of Study Location: _____	
1) Crossing Location: <input type="checkbox"/> Unsignalized Intersection <input type="checkbox"/> Mid-block	
If crossing is (or will be) at unsignalized intersection location, define intersecting streets:	
Major Street	
Name: _____	Posted Speed Limit: _____ MPH
Functionality: <input type="checkbox"/> Arterial <input type="checkbox"/> Collector <input type="checkbox"/> Local	
Minor Street	
Name: _____	Posted Speed Limit: _____ MPH
Functionality: <input type="checkbox"/> Arterial <input type="checkbox"/> Collector <input type="checkbox"/> Local	
If crossing is (or will be) at mid-block location, define location on major street:	
Major Street	
Name: _____	Posted Speed Limit: _____ MPH
Functionality: <input type="checkbox"/> Arterial <input type="checkbox"/> Collector <input type="checkbox"/> Local	
Location Description (e.g. 500 ft East of Main St.): _____	
2) Is this a shared-use path (e.g. bicycles) crossing? <input type="checkbox"/> Yes <input type="checkbox"/> No	
3) Existing Nearby Pedestrian Generators and Attractors (e.g. moderate density residential developments, schools, parks, commercial establishments, transit stops):	
North/East of crossing: _____	
South/West of crossing: _____	
4) Existing Traffic Control: <input type="checkbox"/> Stop/Yield Sign <input type="checkbox"/> Uncontrolled	
5) Is there Another Marked Crosswalk across the same roadway within 300 feet of the Crossing Location? <input type="checkbox"/> Yes <input type="checkbox"/> No	
6) Existing Crossing Treatments (if any) (e.g. standard crosswalk, curb ramps, and etc.):	

7) (for stop/yield controlled locations only) Is the Crossing Location Across a Yield-controlled Approach at an Off-ramp Junction or Channelized Right Turn Lane? <input type="checkbox"/> Yes <input type="checkbox"/> No	

IIM-TE-384 – Attachment D
Sample Data Collection Sheet for Pedestrian Crossing
Accommodations at Unsignalized Locations

LOCATION DESCRIPTION - PART 2	

8) Roadway Configuration:

- ☐ 2-Lanes (one-way street)
- ☐ 2-Lanes (two-way street with no median)
- ☐ 2-Lanes with raised median
- ☐ 3-Lanes with refuge island
- ☐ 3-Lanes (center turn lane)
- ☐ 4-Lanes (two-way street with no median)
- ☐ 4-Lanes with raised median
- ☐ 5-Lanes with refuge island
- ☐ 5-Lanes (center turn lane)
- ☐ 6-Lanes (two-way street with or without median)
- ☐ Other:

9) Crossing Distance by Direction:

Total: ft

(if applicable) From one end to the median: _____ ft, Direction: _____

(if applicable) From other end to the median: _____ ft, Direction: _____

10) Nearest Marked or Protected Pedestrian Crossing: _____ Distance to: _____ ft

11) Could the Crossing Contain a Crosswalk of at Least 6 ft in Width? ☐ Yes ☐ No

12) (for uncontrolled locations only) Stopping Sight Distance (SSD):

_____ ft, Direction: _____

ft, Direction:

Can SSD be improved? ☐ Yes ☐ No ☐ Other: _____

13) Potential Safety Hazard within Crossing Location (if any):

14) Sketch/Photo of the Crossing Location:

IIM-TE-384 – Attachment D
Sample Data Collection Sheet for Pedestrian Crossing
Accommodations at Unsignalized Locations

918

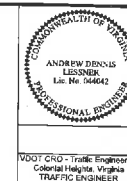
STEP 3 – TRAFFIC DATA																																		
<p>What are the peak period(s) for pedestrian activity?</p> <p><input type="checkbox"/> AM <input type="checkbox"/> PM <input type="checkbox"/> Midday <input type="checkbox"/> Other: _____</p>																																		
<p>Major Street Vehicular Volume (ADT): _____ vehicles/day</p> <p>(if applicable) Minor Street Vehicular Volume (ADT): _____ vehicles/day</p>																																		
<p>(Complete where appropriate) Pedestrian Crossing Volumes / Bicycle Crossing Volumes:</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 30%;"></th> <th style="width: 15%;">AM</th> <th style="width: 15%;">Mid-day</th> <th style="width: 15%;">PM</th> <th style="width: 15%;">Other</th> </tr> <tr> <td style="text-align: center;">Time:</td> <td style="text-align: center;">to</td> <td style="text-align: center;">to</td> <td style="text-align: center;">to</td> <td style="text-align: center;">to</td> </tr> <tr> <td style="text-align: center;">Date / Day of Week:</td> <td style="text-align: center;">/</td> <td style="text-align: center;">/</td> <td style="text-align: center;">/</td> <td style="text-align: center;">/</td> </tr> <tr> <td style="text-align: center;">Major Street Vehicular Volume (Hourly):</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td style="text-align: center;"># of Bicyclists (if known)</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td style="text-align: center;"># of Pedestrians (if known)</td> <td></td> <td></td> <td></td> <td></td> </tr> </thead></table>						AM	Mid-day	PM	Other	Time:	to	to	to	to	Date / Day of Week:	/	/	/	/	Major Street Vehicular Volume (Hourly):					# of Bicyclists (if known)					# of Pedestrians (if known)				
	AM	Mid-day	PM	Other																														
Time:	to	to	to	to																														
Date / Day of Week:	/	/	/	/																														
Major Street Vehicular Volume (Hourly):																																		
# of Bicyclists (if known)																																		
# of Pedestrians (if known)																																		
<p>Is a significant proportion of the pedestrians at this location expected to be young (middle school students or below), elderly, or disabled?</p> <p><input type="checkbox"/> Yes <input type="checkbox"/> No Describe: _____</p>																																		

919

2/18/2015
10:58 PM

PROJECT MANAGER/CA:
SURVEYED BY: DATE: N/A
DESIGN BY: Wm. David (S401) 899-4544 / F. Travis (S401) 899-4544
SUBSURFACE UTILITY BY: DATE: N/A

FOOLIGN
Plotted By: andrew.jessner

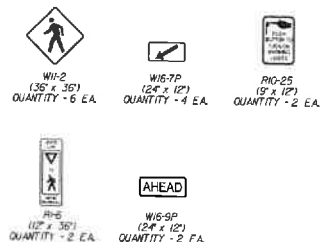


REVISION	STATE	ROUTE	STATE	PROJECT	SHEET NO.
	VA.	654			FBI

DESIGN FEATURES RELATING TO CONSTRUCTION OR TO PROTECTION AND CONTROL OF TRAFFIC MAY BE SUBJECT TO CHANGE AS DEEMED NECESSARY BY THE DEPARTMENT

VDOT CRD - Traffic Engineering
Colonial Heights, Virginia
TRAFFIC ENGINEER

Proposed Signs



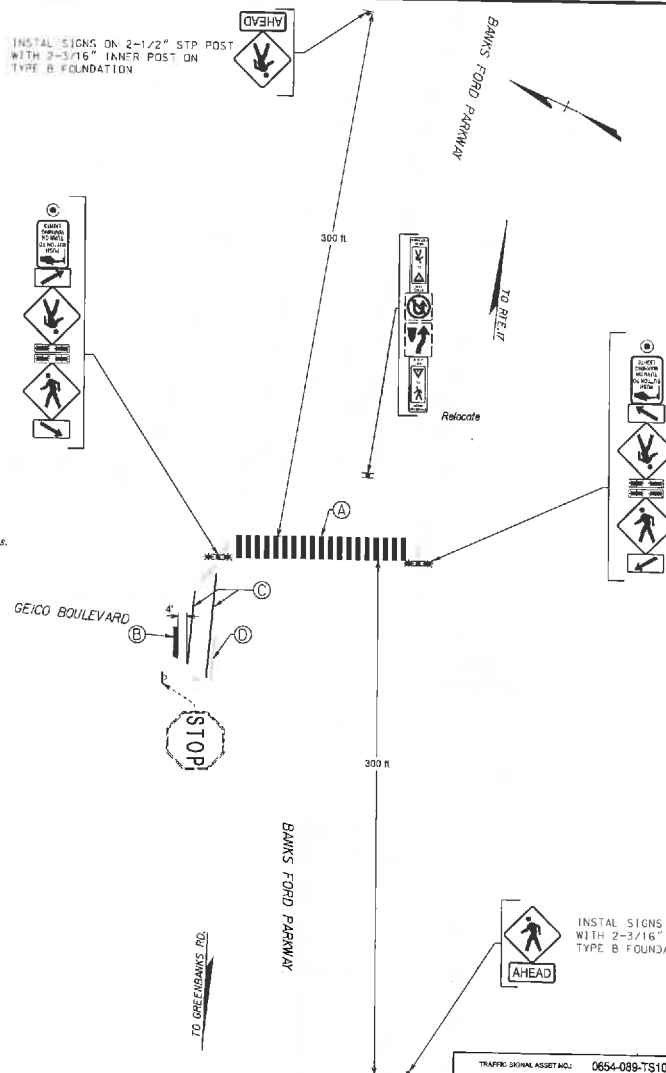
- NOTES:
1. The pedestrian push button shall be placed as shown on the plans.
 2. All sign locations shall be approved by the Traffic Engineering staff prior to installation.
 3. All Rapid Flashing Beacons shall be activated by the push button.
 4. Contact Ken Thornehill, (540) 899-4544, 48 hours prior to installation to verify pavement marking locations.

PAVEMENT MARKING LEGEND

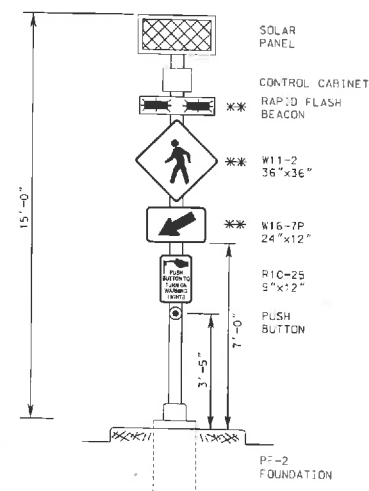
- (A) 24\"/>

STANDARD SIGN LEGEND

PLAN ITEM	PLAN SYMBOL	
	PROPOSED	EXISTING
Single Post Sign Support		
Double Post Sign Support		
Triple Post Sign Support		
Flashing Beacon		
SIGN CALL-OUTS		
Existing Sign to Remain or to be Relocated		
Existing Sign to be Removed		
Proposed Sign Panel		



Flasher Beacon Detail



*** ONE SIGN PER DIRECTION
INSTALLED BACK TO BACK

SCALE
0 25' 50'

TRAFFIC CONTROL ASSET NO. 0654-089-TS102		
REVISIONS		
LETTER	DATE	DESCRIPTION
A	03-18-2015	Final Color Proposed Post Sign Activated Rapid Flashing Beacons and Pedestrian Signage

VDOT
CENTRAL REGION OPERATIONS
TRAFFIC ENGINEERING
2430 PINE FOREST DRIVE
COLONIAL HEIGHTS, VA 23834

TRAFFIC CONTROL DEVICE PLANS
PEDESTRIAN FLASHER BEACON PLAN
BANKS FORD PARKWAY &
GECO BOULEVARD
STAFFORD COUNTY

PROJECT SHEET NO. FBI

Scala, Mary Joy

From: Stewart, Lance
Sent: Wednesday, September 07, 2016 10:47 AM
To: Scala, Mary Joy; Poncy, Amanda
Cc: Hanbali, Rashad; Ikefuna, Alexander; O'Donnell, Gisela; Mueller, Judy
Subject: RE: CIP meeting follow up information

MJ, Amanda:

I'm following up to recap our meeting yesterday morning.

No decisions were made, but options were discussed. Those would be:

- Actively pursue B.A.R. approval of the proposed rapid flasher system.
- Explore other technologies that may be less obtrusive. MJ is considering calling other cities with historic districts to find out what they do. Rashad, we'd appreciate it if you'd share info on any products you're aware of that we might consider.
- Sticking with the current make/model of in-ground lights is not in our opinion a viable option, for reasons cited below. However, Gigi and I will be researching alternatives (no luck so far, but we're not done yet) to see whether we can find something more durable, and following up with people who've used those products to ask how they've held up over time.
- Consider removing the in-ground lights and not replacing them. The crossing in front of the Library has bulb outs and warning posts on either side of the street. There's a good chance of some push back from the community if we were to do that, so our thought was to consider how we would approach a request to install some kind of system if there were no current system, accounting for road width, speed limit, and volume of vehicular and pedestrian traffic. This is not my area of expertise, so I would look to Amanda and Rashad to consider this possibility. The crossing in front of the garage is a different story in some ways, but the same in others.

Regardless of our approach, there is certainly a political element to this decision. We should all be in agreement on the plan forward, and then on how that plan is executed.

Lance Stewart
Charlottesville Public Works
(434) 970-3665

From: Stewart, Lance
Sent: Thursday, September 01, 2016 9:56 AM
To: Scala, Mary Joy; Poncy, Amanda; Hanbali, Rashad
Subject: FW: CIP meeting follow up information

MJ, seems like we've been invited to meet with each other, which I think would be helpful.

Rashad, Amanda, it would be great if one or both of you could join us. With limited research, I find other options but none which seem to be lower in the visibility scale except versions of the in-ground lights that have plagued us. A question that hasn't been posed at this point is whether any kind of lit pedestrian warning system are necessary. If they didn't exist here, what would our thought process be?



Rapid Flashing Beacons in Historic Districts

Background

Rectangular Rapid Flashing Beacons (RRFBs) in historic districts first came to staff's attention when they were installed in 2015 at the Corner. UVA took out all of their in-ground pedestrian lights, because of high maintenance costs and replaced them with lower-maintenance rapid flash beacons over that summer. Representatives of UVA's Office of the Architect, UVA Facilities, and UVA Parking and Transportation were involved with the planning and implementation of the new lights and signage.

Last year Public Works decided to replace all in-road warning lights at pedestrian crossings with the RRFBs, due to maintenance costs. Staff met with Lance Stewart, Facilities Maintenance Manager from Public Works, and Amanda Poncy, Bicycle and Pedestrian Coordinator, to review options for pedestrian crossing safety. Staff queried other localities with historic districts (attached) to see what their experiences had been.

Application

Paul Oberdorfer, the new Director of Public Works, has submitted information prepared by the Timmons Group regarding Rectangular Rapid Flashing Beacons RRFBs, including comparisons with other types of pedestrian lighting equipment currently in use within the City.

Public Works plans to install RRFBs at two locations on East Market Street: near the library at 2nd Street NE, and near the parking garage at 6th Street NE. The applicant will submit additional information about those two specific locations, and a map that shows additional potential locations in historic districts.

Criteria, Standards, and Guidelines

Review Criteria Generally

Sec. 34-284(b) of the City Code states that,

In considering a particular application the BAR shall approve the application unless it finds:

- (1) That the proposal does not meet specific standards set forth within this division or applicable provisions of the Design Guidelines established by the board pursuant to Sec.34-288(6); and*
- (2) The proposal is incompatible with the historic, cultural or architectural character of the district in which the property is located or the protected property that is the subject of the application.*

Pertinent Standards for Review of Construction and Alterations include:

- (1) Whether the material, texture, color, height, scale, mass and placement of the proposed addition, modification or construction are visually and architecturally compatible with the site and the applicable design control district;*
- (2) The harmony of the proposed change in terms of overall proportion and the size and placement of entrances, windows, awnings, exterior stairs and signs;*
- (3) The Secretary of the Interior Standards for Rehabilitation set forth within the Code of Federal Regulations (36 C.F.R. §67.7(b)), as may be relevant;*

- (4) *The effect of the proposed change on the historic district neighborhood;*
- (5) *The impact of the proposed change on other protected features on the property, such as gardens, landscaping, fences, walls and walks;*
- (6) *Whether the proposed method of construction, renovation or restoration could have an adverse impact on the structure or site, or adjacent buildings or structures;*
- (8) *Any applicable provisions of the City's Design Guidelines.*

Pertinent Design Review Guidelines for Public Design and Improvements

A. Introduction

Public spaces define the spatial organization of the City, forming the basis for social, cultural, and economic interaction. The Downtown Pedestrian Mall is the centerpiece of the community. Charlottesville's historic parks, trails, boulevards, cemeteries, playgrounds, and other open spaces help balance the desired urban density and promote healthy living and quality of life. Public spaces accommodate multiple functions and provide social venues. The historic uses and organization of public spaces represent a timeline of cultural practices and values of the community. Significant features should be identified and respected when changes are proposed. New public spaces and improvements should reflect contemporary design principles and values.

*Charlottesville has a rich history of public improvements, which include public buildings, bridges, streetscape landscaping and lighting, street furniture, monuments, public art, fountains, and signage. Many of these improvements have been made within the historic districts, and there will be the opportunity to create additional such amenities in future years. All changes or improvements require BAR review and approval, and **should be compatible with the general architectural features and character of an area or district.** Repairs and maintenance should match original materials and design, and should be accomplished in a historically appropriate manner.*

All public improvements should reflect the quality and attention to detail and craftsmanship of the overall historic districts' character.

D. Streets, Walks, & Curbs

- 1) *Retain historic paving or curbing.*
- 2) *If any historic paving or curbing is uncovered in future public projects, consider reusing it or parts of it in the new project.*
- 3) *Make street paving consistent throughout districts.*
- 4) *When widening existing streets provide sidewalks, street trees, and other elements that maintain the street wall and emphasize the human scale.*
- 5) *Limit paved areas to streets, driveways and pedestrian areas.*
- 6) *Consider using some type of distinctive crosswalks at key intersections or crossings.*
- 7) *Avoid faux techniques or appearances in materials, such as stamped asphalt or concrete.*
- 8) *When sidewalks must be repaired, match adjacent materials in design, color, texture, and tooling.*
- 9) *Avoid variation in sidewalk and curb materials.*
- 10) *When sidewalks need replacement, use a paving unit, such as brick or concrete with a tooled or saw cut joint that relates to the scale of the districts.*
- 11) *Avoid excessive curb cuts for vehicular access across pedestrian ways.*
- 12) *Where curb cuts are necessary, they should be consistent with other curb cuts in the area.*
- 13) *Do not block sidewalks with street furniture elements.*
- 14) *Remove obsolete signs and poles.*

H. Traffic Signals & Utilities

- 1) *Consider installing signals on poles that are placed beside the street and are compatible with the pedestrian-scaled light fixtures.*
- 2) *Place utilities underground, or behind buildings, if possible.*
- 3) *Screen surface equipment.*
- 4) *Place necessary utilities, such as transformers and overhead wires, so that they are as visually unobtrusive as possible.*

Discussion and Recommendations

The Fredericksburg planner made good points, that the whole intent of pedestrian safety lights is to be intrusive, and that we all want our historic districts to be busy, walkable places, so contemporary safety devices are a necessary by-product.

The BAR should confirm that the pedestrian signage/lights intended for public safety are consistent, as much as possible, with the Guidelines.

If the BAR wants to issue a COA for these two and future RFFBs, staff can do that administratively.

I'd like to meet as soon as can be arranged. The next BAR meeting is the 20th, I think? I was hoping for a quick decision. The in-street lit crossing at the Library is currently non-functional. We are out of spare heads, and there's a lead time on replacements. We won't know how many of the 10 heads are broken until we start replacing them, so we'll have to order a minimum of 10, at roughly \$750/each; an investment I'd rather not make when there's a preferred alternative.

I'll send out a meeting invitation shortly.

Lance Stewart
Charlottesville Public Works
(434) 970-3665

From: Ikefuna, Alexander
Sent: Wednesday, August 31, 2016 10:24 AM
To: Scala, Mary Joy
Cc: Miller, Melanie; Stewart, Lance; Creasy, Missy; Davidson, Ryan; Silman, Martin; Murphy, Mike; Edwards, Tony
Subject: RE: CIP meeting follow up information

Mary Joy:

Thanks for the clarification. It is a good idea to invite Lance to the BAR meeting for discussion regarding the lighting issue. Please keep us posted of the outcome of Lance's discussion with the BAR.

Thanks!

Alex

From: Scala, Mary Joy
Sent: Wednesday, August 31, 2016 8:45 AM
To: Creasy, Missy; Davidson, Ryan; Silman, Martin; Ikefuna, Alexander; Murphy, Mike; Edwards, Tony
Cc: Miller, Melanie; Stewart, Lance
Subject: RE: CIP meeting follow up information

The BAR has jurisdiction over any exterior changes in their districts. Obviously, the City departments do a lot of work in historic districts, and much of that work consists of routine maintenance items. However, new signage, lighting, street furniture, removal of trees, new above-ground utility vaults, and painting unpainted masonry, for example, can have large impacts on the character of districts so the BAR is very interested in reviewing those changes.

I told the BAR last night that I would invite Lance Stewart to talk with them about the pedestrian lighting/signage. The problem is, that type of signage may be effective on wider streets, but on narrow urban streets the signs are out of scale, and get blocked by trees and other signage. They signs are so wide they have to be installed at a height so pedestrians won't walk into them. Perhaps there are other alternatives for downtown.

Mary Joy Scala, AICP
Preservation and Design Planner
City of Charlottesville
Department of Neighborhood Development Services
City Hall - 610 East Market Street
P.O. Box 911
Charlottesville, VA 22902
Ph 434.970.3130 FAX 434.970.3359
scala@charlottesville.org

From: Creasy, Missy

Sent: Tuesday, August 30, 2016 5:49 PM

To: Davidson, Ryan; Silman, Martin; Ikefuna, Alexander; Murphy, Mike; Edwards, Tony

Subject: CIP meeting follow up information

Here are items I had listed for followup and next steps

1. Does BAR have purview over the pedestrian lights within historic districts? Mary Joy is planning to meet with Lance to talk through concerns first. That will be the ideal for resolution. If further discussion is needed, we can add in the attorney's office.
2. Belmont funding break down (attached)
3. Pedestrian Lighting – 15 sites to implement study – How will maintenance be handled? These would become part of the City system and as part of the CIP final application, a number for maintenance will be outlined for this project.
4. Lighting Study – Judy asked for a copy of the study including the list of priority locations. Tony will be forwarding that information.
5. Wayfinding - It is clear that the mall kiosks can be addressed in a different way. It is less clear about the larger wayfinding signs. We are hopeful that Rashad and Ali will be able to sort through this project to determine the funding needs further. The information Ryan was planning to find will be helpful as we work through those next steps

At this point NDS will eliminate Friendship Court Infrastructure and Green Infrastructure Opportunities from final submission. We anticipate adding an Adaptive Signal Project request to complete the funding for that commitment.

We look forward to additional input as it is available.

Missy

Scala, Mary Joy

From: McBride, Susan <Susan.McBride@norfolk.gov>
Sent: Thursday, September 08, 2016 7:23 AM
To: Von Lindern, Aubrey (DHR); Sharon Angle; Allison Whitworth; Alison Teetor; Al Cox; Blank, Linda C.; Burton, Renee; bgoumas@suffolkva.us; Cynthia Liccese-Torres; Carolyn Murphy; Chen, Kimberly M. - PDR; Catherine Miliaras; dquesenberry@pulaskitown.org; enelson@fredericksburgva.gov; Siebentritt, Heidi; Sutphin, Jason; jwhite@pulaskitown.org; Kali Casper; Kate S. Schwartz; Kathy C. Baker; kmorgan@petersburg-va.org; Murphy, Lauren; larry.dire@capecharles.org; Martin, Tom; Matthew Johnson; Ocel, Raymond; Parviz Moosavi; Rebecca Ballo; Mark Reed; Scala, Mary Joy; Sean Taylor; SBush@culpeperva.gov; Will Moore; Timothy Youmans; Josh Crump; Tom Scofield; wparrish@spotsylvania.va.us; William Saunders
Subject: RE: Question from a fellow CLG staffer

We have not had any of these installed in our local historic districts.

Susan M. McBride
Principal City Planner, Historic


Department of City Planning
810 Union Street, Suite 508
Norfolk, VA 23510
757-823-1451 | 757-441-1569 fax

Connect with us:

www.norfolk.gov



From: Von Lindern, Aubrey (DHR) [mailto:Aubrey.VonLindern@dhr.virginia.gov]
Sent: Wednesday, September 07, 2016 4:13 PM
To: Sharon Angle <AngleSE@ci.staunton.va.us>; Allison Whitworth <awhitworth@ci.manassas.va.us>; Alison Teetor <ateetor@clarkecounty.gov>; Al Cox <Al.Cox@alexandriava.gov>; Blank, Linda C. <Linda.Blank@fairfaxcounty.gov>; Burton, Renee <burtotr@danvilleva.gov>; bgoumas@suffolkva.us; Cynthia Liccese-Torres <Liccese@arlingtonva.us>; Carolyn Murphy <CMurphy@williamsburgva.gov>; Chen, Kimberly M. - PDR <Kimberly.Chen@richmondgov.com>; Catherine Miliaras <Catherine.Miliaras@alexandriava.gov>; dquesenberry@pulaskitown.org; enelson@fredericksburgva.gov; Siebentritt, Heidi <Heidi.Siebentritt@loudoun.gov>; Sutphin, Jason <Jason.Sutphin@fairfaxva.gov>; jwhite@pulaskitown.org; Kali Casper <KCasper@blacksburg.gov>; Kate S. Schwartz <ksschwartz@fredericksburgva.gov>; Kathy C. Baker <KBaker@staffordcountyva.gov>; kmorgan@petersburg-va.org; Murphy, Lauren <Lauren.Murphy@loudoun.gov>; larry.dire@capecharles.org; Martin, Tom <tom.martin@lynchburgva.gov>; Matthew Johnson <mjohnson@abingdon-va.gov>; Ocel, Raymond <Raymond.Ocel@herndon-va.gov>; Parviz Moosavi <Parviz.Moosavi@roanokeva.gov>; Rebecca Ballo <Rballo@arlingtonva.us>; Mark Reed <MReed@vbgov.com>; Scala, Mary Joy <scala@charlottesville.org>; Sean Taylor <staylor@abingdon-va.gov>; SBush@culpeperva.gov; McBride, Susan <Susan.McBride@norfolk.gov>; Will Moore <townplanner@middleburgva.gov>; Timothy Youmans <Timothy.Youmans@winchesterva.gov>; Josh Crump <Josh.Crump@winchesterva.gov>; Tom Scofield <TScofield@LEESBURGVA.GOV>; wparrish@spotsylvania.va.us; William

Saunders <wsaunders@smithfieldva.gov>

Subject: Question from a fellow CLG staffer

Hi All,

Below is a question from a fellow CLG staffer. Please reply all with your answers/advice. Please see the photo attached and don't forget to REPLY ALL.

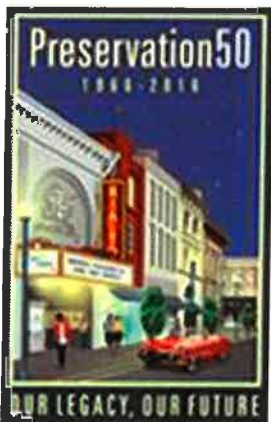
Have any of you addressed the issue of rapid flasher signage (attached photo) for pedestrian crosswalks in historic districts?

Do you know of any alternative methods that are more in scale with HDs and less obtrusive?

Thank you for your responses!

Aubrey

Aubrey Von Lindern, Architectural Historian
Certified Local Government Coordinator
Northern Region Preservation Office
Virginia Department of Historic Resources
P.O. Box 519
Stephens City, VA 22655
Phone: (540) 868-7029
FAX: (540) 868-7029



Join us.

Celebrate the 50th Anniversary of the National Historic Preservation Act.

And the 50th of the Department of Historic Resources, Virginia's State Historic Preservation Office.

<http://www.dhr.virginia.gov/50NHPA/50thindex.htm>

Scala, Mary Joy

From: Erik Nelson <enelson@fredericksburgva.gov>
Sent: Thursday, September 08, 2016 9:18 AM
To: Von Lindern, Aubrey (DHR); Sharon Angle; Allison Whitworth; Alison Teetor; Al Cox; Blank, Linda C.; Burton, Renee; bgoumas@suffolkva.us; Cynthia Liccese-Torres; Carolyn Murphy; Chen, Kimberly M. - PDR; Catherine Miliaras; dquesenberry@pulaskitown.org; Siebentritt, Heidi; Sutphin, Jason; jwhite@pulaskitown.org; Kali Casper; Kate S. Schwartz; Kathy C. Baker; kmorgan@petersburg-va.org; Murphy, Lauren; larry.dire@capecharles.org; Martin, Tom; Matthew Johnson; Ocel, Raymond; Parviz Moosavi; Rebecca Ballo; Mark Reed; Scala, Mary Joy; Sean Taylor; SBush@culpeperva.gov; McBride, Susan; Will Moore; Timothy Youmans; Josh Crump; Tom Scofield; wparrish@spotsylvania.va.us; William Saunders
Subject: RE: Question from a fellow CLG staffer

The whole intent of pedestrian safety devices is to be intrusive. Having said that, our experience with VDOT today (as opposed to yesteryear) is that they are often very receptive to working through issues such as this. It would be worthwhile to reach out to your VDOT district office. It sounds like this would be a good topic for preservation conference. I was on a panel that talked about such things at the recent NAPC conference in Mobile and it would probably be worthwhile to have a similar discussion among Virginia jurisdictions. We all want our historic districts to be busy, walkable places and contemporary safety devices are going to be a necessary by-product. I am confident VDOT would work with us.

Erik F. Nelson

Senior Planner
City of Fredericksburg
540 372-1179

From: Von Lindern, Aubrey (DHR) [mailto:Aubrey.VonLindern@dhr.virginia.gov]
Sent: Wednesday, September 07, 2016 4:13 PM
To: Sharon Angle; Allison Whitworth; Alison Teetor; Al Cox; Blank, Linda C.; Burton, Renee; bgoumas@suffolkva.us; Cynthia Liccese-Torres; Carolyn Murphy; Chen, Kimberly M. - PDR; Catherine Miliaras; dquesenberry@pulaskitown.org; Erik Nelson; Siebentritt, Heidi; Sutphin, Jason; jwhite@pulaskitown.org; Kali Casper; Kate S. Schwartz; Kathy C. Baker; kmorgan@petersburg-va.org; Murphy, Lauren; larry.dire@capecharles.org; Martin, Tom; Matthew Johnson; Ocel, Raymond; Parviz Moosavi; Rebecca Ballo; Mark Reed; Scala, Mary Joy; Sean Taylor; SBush@culpeperva.gov; McBride, Susan; Will Moore; Timothy Youmans; Josh Crump; Tom Scofield; wparrish@spotsylvania.va.us; William Saunders
Subject: Question from a fellow CLG staffer

Hi All,

Below is a question from a fellow CLG staffer. Please reply all with your answers/advice. Please see the photo attached and don't forget to REPLY ALL.

Have any of you addressed the issue of rapid flasher signage (attached photo) for pedestrian crosswalks in historic districts?

Do you know of any alternative methods that are more in scale with HDs and less obtrusive?

Thank you for your responses!

Aubrey

Scala, Mary Joy

From: Al Cox <Al.Cox@alexandriava.gov>
Sent: Wednesday, September 14, 2016 4:05 PM
To: Erik Nelson; Von Lindern, Aubrey (DHR); Sharon Angle; Allison Whitworth; Alison Teetor; Blank, Linda C.; Burton, Renee; bgoumas@suffolkva.us; Cynthia Liccese-Torres; Carolyn Murphy; Chen, Kimberly M. - PDR; Catherine Miliaras; dquesenberry@pulaskitown.org; Siebentritt, Heidi; Sutphin, Jason; jwhite@pulaskitown.org; Kali Casper; Kate S. Schwartz; Kathy C. Baker; kmorgan@petersburg-va.org; Murphy, Lauren; larry.dire@capecharles.org; Martin, Tom; Matthew Johnson; Ocel, Raymond; Parviz Moosavi; Rebecca Ballo; Mark Reed; Scala, Mary Joy; Sean Taylor; SBush@culpeperva.gov; McBride, Susan; Will Moore; Timothy Youmans; Josh Crump; Tom Scofield; wparrish@spotsylvania.va.us; William Saunders
Subject: RE: Question from a fellow CLG staffer

I agree with Eric that this would be a useful conference topic, particularly if we had some traffic engineers there. While we don't have rapid flasher signage within the district, we do have pedestrian countdown signals on all signalized intersections. The signals themselves have been fine but required two - four new poles at each of the intersections, so it is very cluttered. In addition we are in on-going discussions with our transportation planners about their desire to paint bike lanes green throughout the historic district and crossing the GW Parkway. As Eric said, these bike/ped safety features are designed to attract your attention and so, by definition, visually compete with the historic buildings.

We have recently received support from the City Attorney's office and the current Transportation Director to require a Certificate of Appropriateness for all infrastructure in the right-of-way. Our BAR just approved new but much more historically authentic street light designs but our neighbor notification requirements were overwhelming and very expensive because virtually every property in the district abuts the public right-of-way. How do others approve bus shelters, benches, bike racks and trash cans, etc.?

Al Cox, FAIA
Historic Preservation Manager
Department of Planning & Zoning
703 746-3830 direct
<http://alexandriava.gov/Preservation>

From: Erik Nelson [mailto:enelson@fredericksburgva.gov]
Sent: Thursday, September 08, 2016 9:18 AM
To: Von Lindern, Aubrey (DHR); Sharon Angle; Allison Whitworth; Alison Teetor; Al Cox; Blank, Linda C.; Burton, Renee; bgoumas@suffolkva.us; Cynthia Liccese-Torres; Carolyn Murphy; Chen, Kimberly M. - PDR; Catherine Miliaras; dquesenberry@pulaskitown.org; Siebentritt, Heidi; Sutphin, Jason; jwhite@pulaskitown.org; Kali Casper; Kate S. Schwartz; Kathy C. Baker; kmorgan@petersburg-va.org; Murphy, Lauren; larry.dire@capecharles.org; Martin, Tom; Matthew Johnson; Ocel, Raymond; Parviz Moosavi; Rebecca Ballo; Mark Reed; Scala, Mary Joy; Sean Taylor; SBush@culpeperva.gov; McBride, Susan; Will Moore; Timothy Youmans; Josh Crump; Tom Scofield; wparrish@spotsylvania.va.us; William Saunders
Subject: RE: Question from a fellow CLG staffer

The whole intent of pedestrian safety devices is to be intrusive. Having said that, our experience with VDOT today (as opposed to yesteryear) is that they are often very receptive to working through issues such as this. It would be worthwhile to reach out to your VDOT district office. It sounds like this would be a good topic for preservation conference. I was on a panel that talked about such things at the recent NAPC conference in Mobile and it would probably be worthwhile to have a similar discussion among Virginia jurisdictions. We all want our historic districts to be

Scala, Mary Joy

From: Oberdorfer, Paul
Sent: Tuesday, July 25, 2017 1:35 PM
To: Scala, Mary Joy
Cc: Stewart, Lance; Danny Lamie; Scott Dunn; Duncan, Brennen; Poncy, Amanda; Ikefuna, Alexander; Silman, Martin; Creasy, Missy
Subject: RE: Rectangular Rapid Flashing Beacon (RRFB) - White Paper for BAR Presentation

MJ,

I will prepare a site plan with photos as part of the presentation. The two locations on East Market Street are replacing the two existing crosswalks. I will see if we can generate a map of locations that could be potential installation sites in the future.

Paul

From: Scala, Mary Joy
Sent: Tuesday, July 25, 2017 1:30 PM
To: Oberdorfer, Paul
Cc: Stewart, Lance; Danny Lamie; Scott Dunn; Duncan, Brennen; Poncy, Amanda; Ikefuna, Alexander; Silman, Martin; Creasy, Missy
Subject: RE: Rectangular Rapid Flashing Beacon (RRFB) - White Paper for BAR Presentation

Thank you Paul.

In addition, what is your specific request at this time - only the two locations on East Market Street?
Can you provide a color photo of the actual proposed sign, and photos of the proposed street locations?

How many more installations in historic districts might the BAR expect – do you have a map that shows all the locations that potentially meet the stated criteria?

Thank you.

Mary Joy Scala, AICP

Preservation and Design Planner
City of Charlottesville
Department of Neighborhood Development Services
City Hall – 610 East Market Street
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Ph 434.970.3130 FAX 434.970.3359
scala@charlottesville.org

From: Oberdorfer, Paul
Sent: Tuesday, July 25, 2017 12:52 PM
To: Scala, Mary Joy
Cc: Stewart, Lance; Danny Lamie; Scott Dunn; Duncan, Brennen; Poncy, Amanda; Ikefuna, Alexander; Silman, Martin; Creasy, Missy
Subject: Rectangular Rapid Flashing Beacon (RRFB) - White Paper for BAR Presentation

Good afternoon Mary Joy,

Attached is the white paper that I will be discussing with the BAR on the installation of RRFB on Market Street. The Market Street installations will be representative of what to expect in road right-of-ways within historic districts. My intention is to provide a brief presentation of facts to the BAR so they understand the methodology used in identifying the appropriate selection of enhanced pedestrian crosswalks. Should I prepare a memo for the BAR or is the white paper sufficient?

Please let me know if you will need anything else for the next BAR on August 15.

Very truly yours,

Paul Oberdorfer
Public Works Director



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"Service to others is the rent you pay for your room here on earth."

~ Muhammad Ali