

PROCEDURE



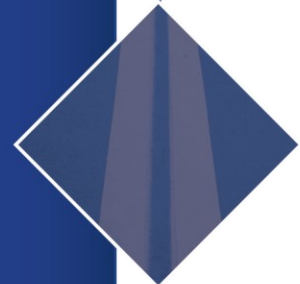
SIGNS



SIGNALS



MARKINGS



SPECIAL  
OPERATIONAL  
TOPICS



## SECTION 5.1

# GOLF CART CROSSING AND OPERATION ON THE STATE HIGHWAY SYSTEM

### 5.1.1 PURPOSE

The purpose of this section is to establish criteria and guidelines for safe operation of golf carts on authorized portions of the State Highway System.

### 5.1.2 GENERAL

The Department has developed this section in response to a growing public interest in using golf carts. Golf carts are increasingly used to make short trips for shopping, social and recreational purposes from nearby residential neighborhoods. These passenger-carrying vehicles offer a variety of advantages, including comparatively low-cost and energy-efficient mobility at lower speeds.

Golf cart use and operation on public roads is authorized only under certain circumstances as provided in [Section 316.212, F.S.](#) and in the [Guide to Safe and Legal Golf Cart Operation in Florida](#). The intent of this section is to provide criteria and guidelines for authorizing golf cart crossings at designated locations along State Highway System and promote uniformity within the State. This section also provides safety recommendations to counties and municipalities wishing to enact ordinances authorizing the use of golf carts on sidewalks adjacent to or on the State Highway System within their corresponding jurisdictions.

### 5.1.3 DEFINITIONS

**Golf Cart:** A motor vehicle that is designed and manufactured for operation on a golf course for sporting or recreational purposes and that is not capable of exceeding speeds of 20 miles per hour.

**Grade-Separated Crossing:** A crossing of two roadways, or a roadway with a railroad or pedestrian pathway, at different levels.

**Local Government:** The governing body of a unit of local general-purpose government which may include a county agency, municipality, tourist development council, county tourism promotion agency, or special district as defined in [Section 189.012, F.S.](#) and in [Section 11.45 \(e\), F.S.](#)

**State Roadway:** These are the roads on the State Highway System (i.e., roads owned and maintained by the State of Florida. Includes roads signed as interstate highways, U.S. routes, and state roads).

#### 5.1.4 PROCEDURE

Acquire [District Traffic Operations Engineer \(DTOE\)](#) approval prior to installation of any golf cart crossing proposed for a location on the State Highway System. The Department prefers grade-separated facilities for golf cart crossings on state roads.

Local governments are to submit requests to the corresponding [DTOE](#). Non-governmental entities seeking authorization for a golf cart crossing may do so through the local government with jurisdictional authority.

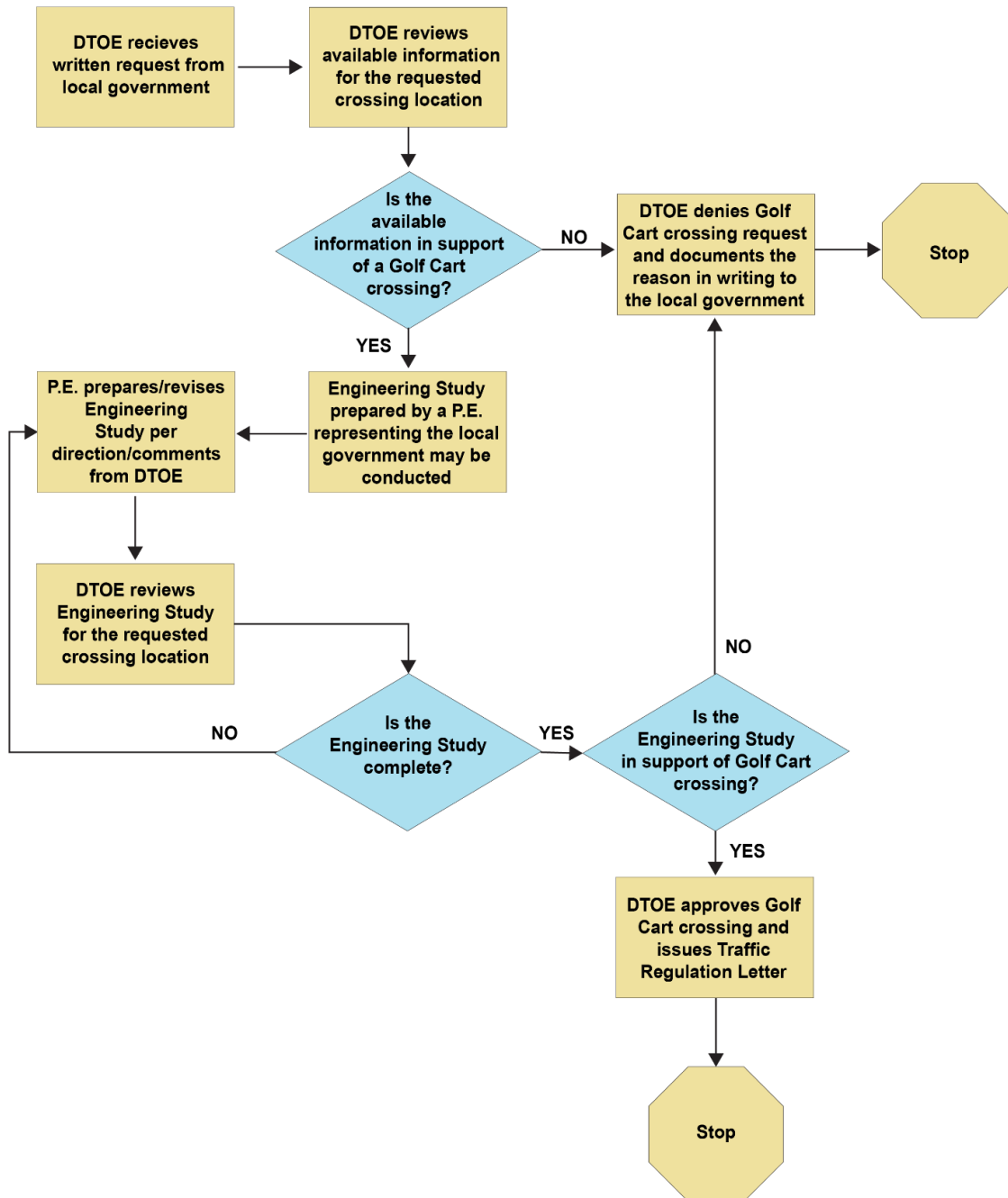
If the [DTOE's](#) review supports the installation of a golf cart crossing based upon the criteria outlined in **TEM 5.1.5**, a professional engineer licensed in the State of Florida must conduct a full engineering study representing the requester. Meet the criteria referenced in **TEM 5.1.5**, as documented in an engineering study, as a condition for approval of a golf cart crossing. Include the following information in the engineering study:

- Document the need for a golf cart crossing based on conditions set forth in [Section 316.212, F.S.](#), and verify the following:
  - The intersecting county or municipal road has been designated for use by golf carts.
  - A golf course or single mobile home park is constructed on both sides of a state road.
- Document all safety considerations with respect to intersecting sight distances, proximity to intersection and driveway conflict areas, number and configuration of approach lanes to signalized intersections, and roadway speed and volume thresholds as described in **TEM 5.1.5** that can be satisfied at the proposed location.
- Document the proposed golf cart crossing, roadway segment location (Roadway ID and Mile Post), and corresponding signing, marking, and signal treatments as applicable. Provide a schematic layout over aerial photography or survey to show locations of signs, markings, and other treatments in proximity to existing traffic control devices.
- Document all crash history within the vicinity of the proposed golf cart crossing based upon a minimum three years of data.

If the evaluation results in a decision not to authorize the installation of a golf cart crossing, the [DTOE](#) shall document the reasons and advise the local government of the findings. Meeting the minimum criteria outlined in this section does not guarantee approval of a request for a golf cart crossing.

Prior to the approval of a golf cart crossing, coordination is necessary between the appropriate [District Traffic Operations Office](#), District Maintenance Office and local governments to determine any permitting requirements or responsibilities for maintenance.

**Figure 5.1-1. Procedure Flowchart**

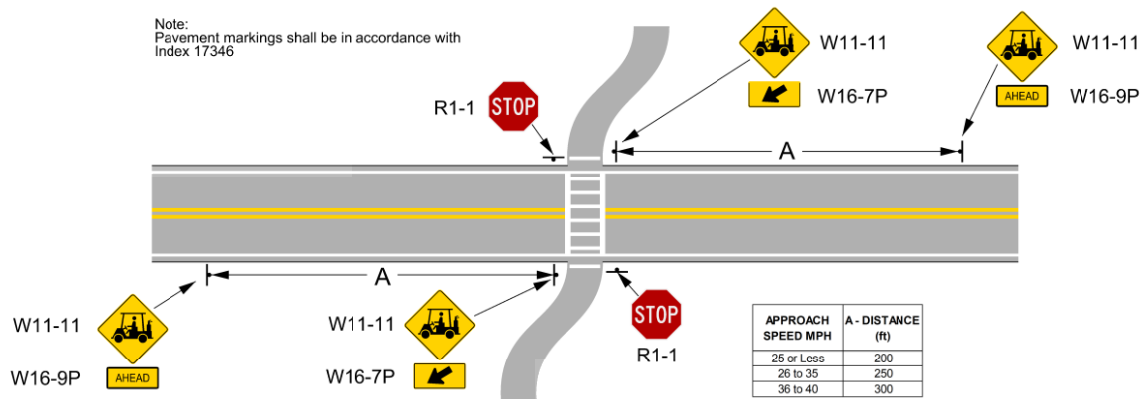


### 5.1.5 CRITERIA FOR APPROVAL OF CROSSING

**Mid-Block Crossing:** Golf carts may cross a state road at a mid-block location where there is a golf course or a single mobile home park on both sides of the road if the following criteria are met:

- Maximum vehicular volume of 15,000 Average Daily Traffic (ADT) or less along the roadway segment.
- Maximum Posted Speed Limit of 40 miles per hour or less.
- Maximum number of lanes is three (3) with or without bike lanes.
- Maximum allowable median width is 15 feet.
- Minimum distance to the nearest driveway, access point or pedestrian crosswalk is 350 feet in each direction.
- The crossing must be on a straight road segment, with the nearest point of curvature at least 350 feet away in each direction.
- A clear and unobstructed view of the roadside on the approach to the crossing.
- Signing and pavement markings are installed as shown in **Figure 5.1-2**.
- Golf carts are the only vehicle permitted to use the designated crossing or to traverse State right-of-way. Other vehicles such as Low Speed Vehicles are strictly prohibited. See [320.01\(42\) F.S.](#)

**Figure 5.1-2. Mid-Block Crossing**

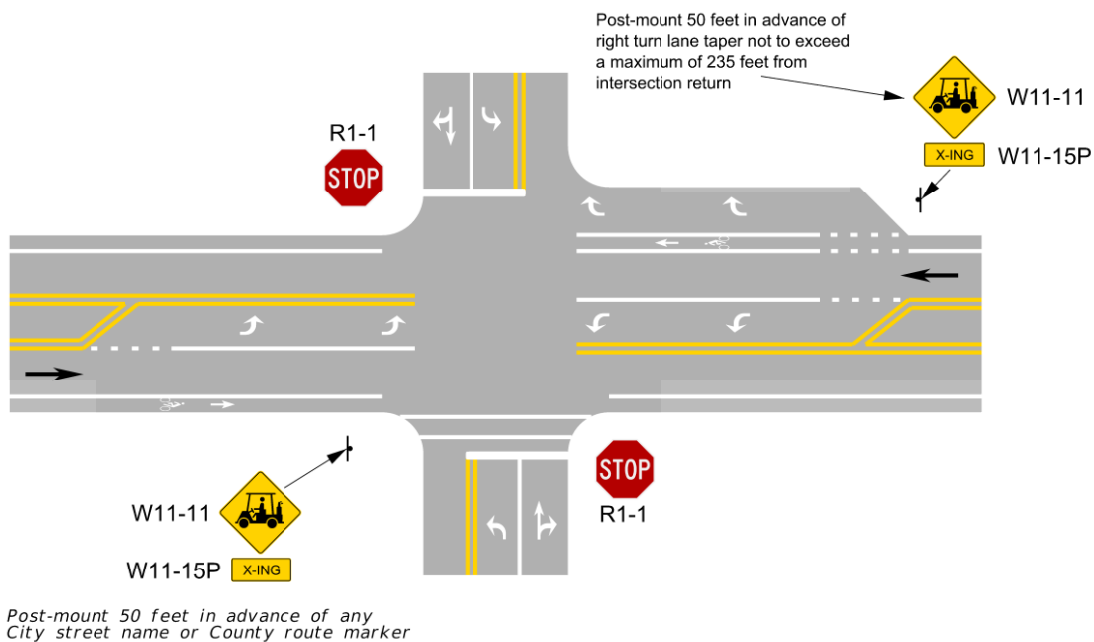


**Side Street Stop Controlled Intersections:** To be considered for a golf cart crossing at a roadway intersection with side street stop control, the location along any state road shall meet the following criteria:

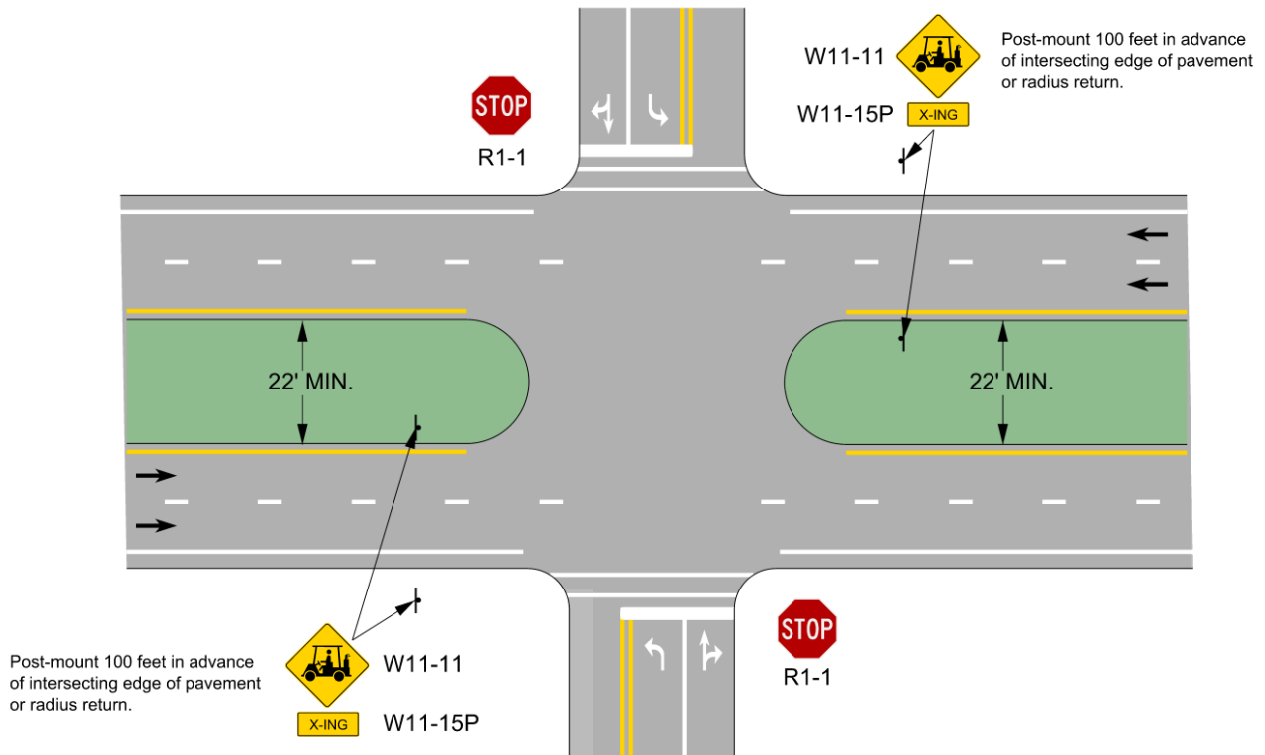
- Side street maximum vehicular volume 1,200 ADT and AM/PM Peak Hour not to exceed 110 vehicles per hour single direction.
- Main street posted speed limit is 35 miles per hour or less.

- Maximum crossing distance for undivided roadways is three (3) lanes (excluding any right turn lanes, bike lanes, or crosswalks). For divided roadways of four (4) lanes or less, a minimum of twenty-two (22) feet median width is required (**Figure 5.1-4**).
- Side street approaches should have an exclusive left turn lane and a shared through-right turn lane. Other lane approach configurations will be considered on case-by-case basis.
- Side street intersection alignment shall be a 90 degrees (not more than 105 degrees) angle to the mainline tangent. Skewed or offset intersections are not considered for golf cart crossings.
- Follow [MUTCD](#) and [Standard Plans, Index 711-001](#) for approach stop signs and pavement markings.
- Place Golf Cart signs (W11-11) on the mainline approach as shown in **Figure 5.1-3** and **Figure 5.1-4**.

**Figure 5.1-3. Stop-Controlled Crossing**



**Figure 5.1-4. Four-Lane Stop-Controlled Crossing**

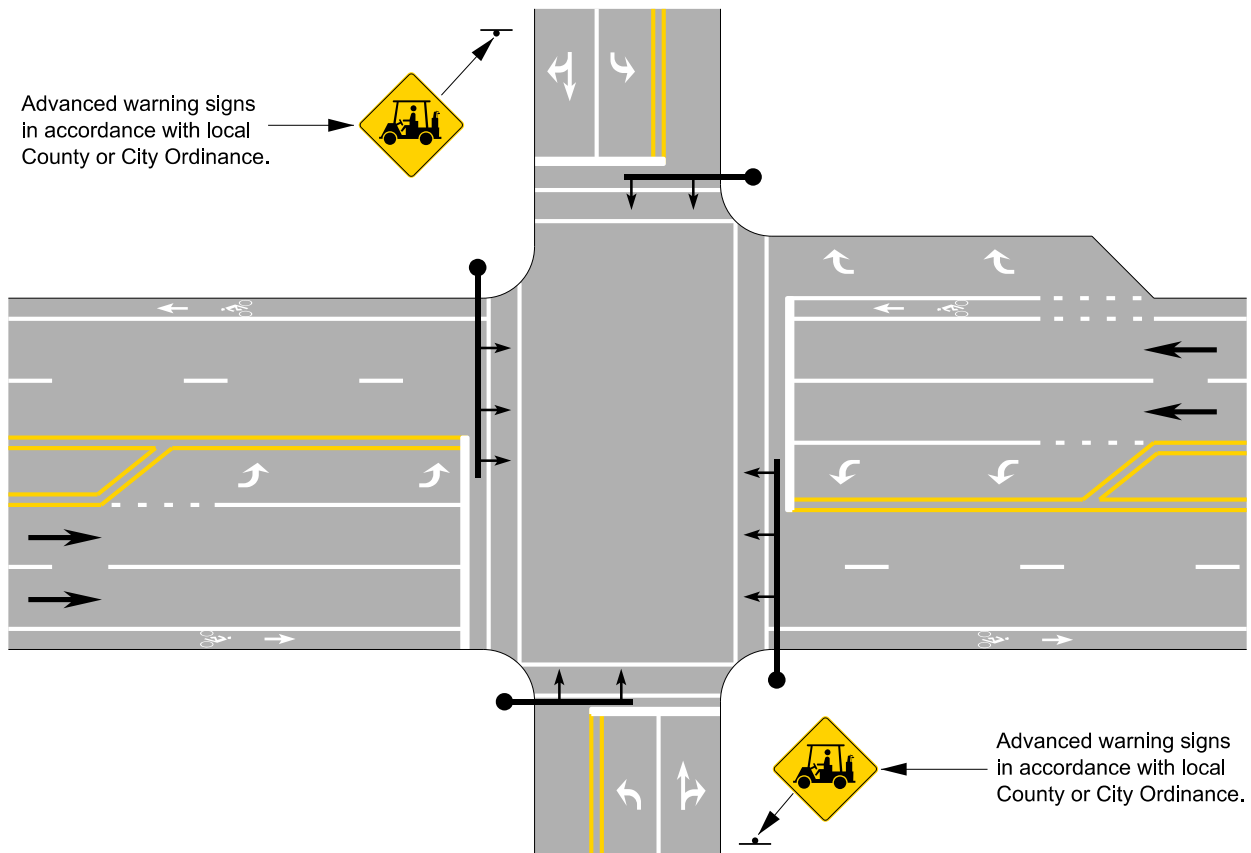


**Full Signalized Intersections:** To be considered for a golf cart crossing at a roadway intersection with full signal control, the location along any state road shall meet the following criteria:

- Side street maximum vehicular volume 1,500 ADT and AM/PM peak hour not to exceed 200 vehicles per hour in single direction.
- Maximum side street posted speed limit is 35 mph.
- Maximum crossing distance is five (5) lanes (excluding any right-turn lanes, bike lanes, or crosswalks).
- Side street approaches should have at least one (1) exclusive left-turn lane and at least one (1) exclusive through or shared through-right-turn lane. Other lane approach configurations will be considered on a case-by-case basis.
- Side street intersection alignment shall be a 90 degrees (not more than 105 degrees) angle to the mainline tangent. Skewed or offset intersections are not considered for golf cart crossings.
- Golf carts are not allowed to use pedestrian crosswalks or sidewalk ramps to cross the mainline state road.
- Golf cart crossings are not permitted at "T" intersections.

- For existing signalized “T” intersections, a proposed fourth leg approach and receiving lane for the exclusive use of golf cart crossing shall not be permitted.
- Follow [MUTCD](#) and [Standard Plans, Index 711-001](#) for approach stop signs and pavement markings.
- Place the Golf Cart signs (**W11-11**) on the side street approach as shown in the **Figure 5.1-5**.

**Figure 5.1-5. Traffic Signal Controlled Crossing**



### 5.1.6 OPERATION OF GOLF CARTS ON SIDEWALKS

[Title 23 of United States Code, Section 217](#), prohibits the use of motorized vehicles, such as golf carts, on existing and proposed non-motorized trails and pedestrian walkways that use Federal transportation funds. However, exceptions can be authorized through a framework developed by the Federal Highway Administration (FHWA).

**Safety and Operational Recommendations:** Consider the following recommendations for the operation of golf carts on sidewalks adjacent to a state road when authorizing such use by local government ordinance:

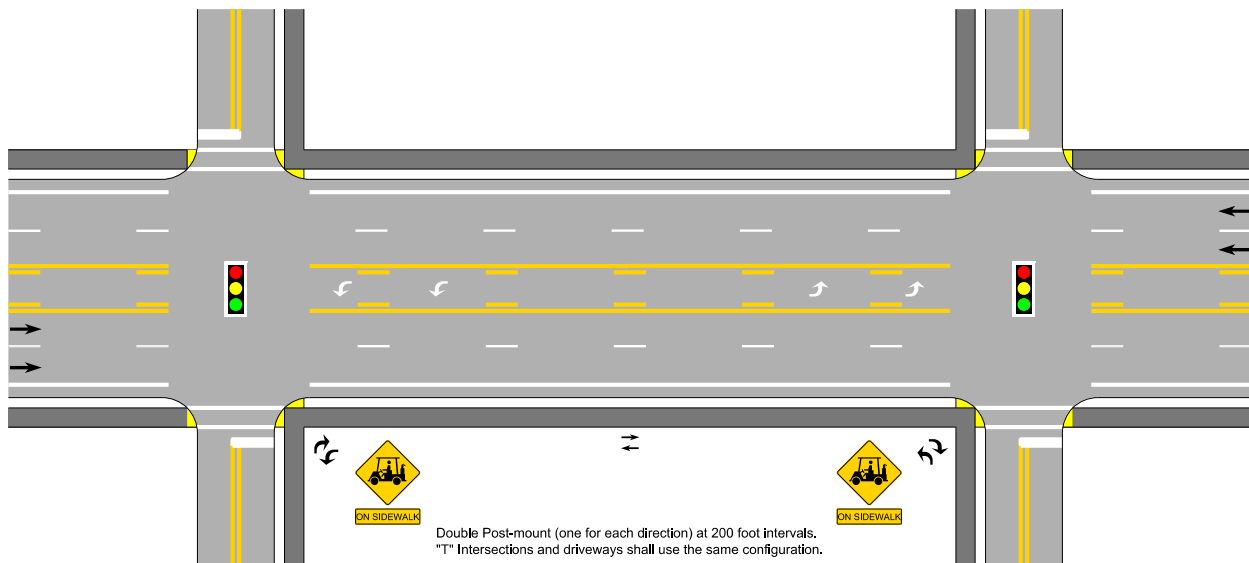
- Access to state-maintained sidewalks should be from county- or city-maintained



sidewalks adjacent to side streets intersecting with a state road. In-street golf cart operation onto state-operated sidewalks via ADA curb ramps is not permitted.

- Crossing a state road from county- or city-maintained streets or sidewalks to access state-operated adjacent sidewalks is not recommended. If a local government submits a request for a golf cart crossing and seeks consultation for golf cart operation on a state-operated sidewalk at the same location, the golf cart crossing will not be allowed.
- A minimum unobstructed sidewalk width of 8 feet is required, and separation from the back of the curb or edge of the shoulder by at least 5 feet is recommended.
- A minimum width of 4 feet of grassed or stabilized, relatively flat area should be provided beyond the outside edge of sidewalks for recovery or stalled golf carts. Do not consider drainage feature or fencing adjacent to a sidewalk.
- Terminate golf cart operation on state-operated sidewalks at a connecting county or city-maintained sidewalk.
- Install state-approved, “Golf Cart On Sidewalk” signs along state-operated sidewalks as shown in **Figure 5.1-6**.

**Figure 5.1-6. Golf Cart Operation on Sidewalks**



## Section 5.2

# TREATMENTS FOR PEDESTRIAN CROSSWALKS AT MIDBLOCK AND UNSIGNALIZED INTERSECTIONS

### 5.2.1 PURPOSE

This section establishes criteria and guidelines for the consistent installation and operation of pedestrian treatments at midblock and unsignalized intersections on the State Highway System. These treatments include marked pedestrian crosswalks, signs, traffic control devices, and other measures. Information on pedestrian crosswalks at roundabouts can be found in [FDOT Design Manual \(FDM\) 213](#).

### 5.2.2 GENERAL

A crosswalk is a safe and predictable location that facilitates pedestrian access and concentrates crossing activity. Pedestrian treatments at midblock and unsignalized intersections aim to enhance pedestrian connectivity and reduce instances of unpredictable crossings. This can be achieved by reducing confusion and removing measurable risks to pedestrians and other road users.

To determine whether to apply pedestrian crosswalks at midblock and unsignalized intersections, consider documented pedestrian demand. When the distance to the nearest controlled intersection crossing would result in significant out-of-direction travel for pedestrians, it increases the risk for unexpected crossings and crashes. Pedestrian crosswalks applied at these locations may be a suitable treatment.

Supplemental signage can improve safety and compliance in locations with or without traffic control devices where a marked pedestrian crosswalk has been installed. Other crosswalk design treatments, including refuge islands, curb extensions, lighting, and raised crosswalks, could also be considered to support pedestrian visibility and safety. **Figure 5.2-13** illustrates the combined use of many of these treatments.

Well-located and thoughtfully designed marked crosswalks and pedestrian treatments can improve pedestrian connections, community walkability, and pedestrian safety. However, they are not suitable for all locations. Careful evaluation is necessary to determine suitability based on expected levels of pedestrian crossing demand, safety characteristics of the crossing location, and design considerations for the crossing control type.

### 5.2.3 DEFINITIONS

**Alternative Pedestrian Crossing Location.** Any controlled location with a STOP sign, traffic signal, or a grade-separated pedestrian bridge or tunnel that accommodates pedestrian movement across the subject roadway.

**Average Day.** A day representing traffic volumes normally and repeatedly found at a specific location. Weekdays having volumes influenced by employment or weekend days having volumes influenced by entertainment or recreation represent two types of an Average Day.

**Context Classification.** Description of the land use and transportation context where a roadway is found. Roadways are designed to match the characteristics and demands defined by the appropriate Context Classification. See [FDM 200](#) for additional information.

**Controlled Approach.** All lanes of traffic moving toward an intersection or a midblock location from one direction (including any adjacent parking lane) that are controlled by a sign, signal, marking, or other devices.

**In-Roadway Lights.** Special types of highway traffic control devices installed in the roadway surface to warn road users that they are approaching a condition on or adjacent to the roadway that might not be readily apparent and might require the road users to slow down and/or come to a stop.

**Marked Crosswalk.** Any portion of a roadway segment, including an intersection or midblock distinctly indicated as a pedestrian crossing by pavement marking lines on the surface which might be supplemented by contrasting pavement structure, style, or color. Marked crosswalks serve to provide guidance, define and delineate crossing paths, define intersections, and designate a stopping location when motorists are required to stop in the absence of a stop line.

**Midblock Crossing.** Any location where a marked crosswalk (signalized or unsignalized) is proposed or already exists between intersections.

**Midblock Pedestrian Signal (MPS).** An MPS is a hybrid between a Midblock Traffic Control Signal and a Pedestrian Hybrid Beacon and it is currently an **MUTCD Request to Experiment (RTE)**. It is a highway traffic signal in which traffic is alternately directed to stop, then a flashing RED indication during the pedestrian clearing interval is activated to assist pedestrians crossing a street or highway at a marked crosswalk.

**Midblock Traffic Control Signal.** Any highway traffic signal by which traffic is alternately directed to stop and permitted to proceed at a midblock crosswalk.

**Passive Pedestrian Detection.** Automated pedestrian detection systems that can detect the presence and direction of pedestrians and activate the traffic control device without any required action by the pedestrian.

**Pedestrian Attractor.** A residential, commercial, office, recreational, or other land use that is expected to be an end destination for pedestrian trips.

**Pedestrian Generator.** A residential, commercial, office, transit, recreational or other land use that serves as the starting point for a pedestrian trip.

**Pedestrian Hybrid Beacon (PHB).** A special type of hybrid beacon used to warn and control traffic at an unsignalized location to assist pedestrians in crossing a street or

highway at a marked crosswalk. It is also known as high-intensity activated crosswalk (HAWK).

**Rectangular Rapid Flashing Beacon (RRFB).** A traffic control device consisting of two rapidly and alternately flashing rectangular yellow indications having LED array-based pulsing light sources that function as a warning beacon.

**Shared Use Path.** A multi-user path outside the traveled way and physically separated from motorized vehicular traffic by an open space or barrier and either within the highway right-of-way or within an independent alignment. Shared use paths are used by pedestrians (including skaters, users of manual and motorized wheelchairs, and joggers), bicyclists and other authorized motorized and non-motorized users.

**Two-Stage Pedestrian Crossing.** A marked crosswalk controlled by RRFB, PHB or midblock traffic signal that is designed to allow pedestrians to cross each half of the roadway independently, using a median refuge island for pedestrians to wait before completing the crossing. A two-stage pedestrian crossing may have a lesser impact on vehicle delay (compared to a single crossing) since the signal serves each direction independently while the median serves as a refuge area for pedestrians to wait prior to completing their crossing.

**Uncontrolled Approach.** All lanes of traffic moving toward an unsignalized intersection or a midblock location from one direction (including any adjacent parking lane) that are not controlled by any sign, signal, marking, or other control devices.

**Unsignalized intersection.** Any at-grade junction of two or more public roads at which a highway traffic signal does not control the right-of-way for motorists, bicyclists, and pedestrians.

**Unmarked Crosswalk.** The legal crossing area at an intersection connecting opposite sides of the roadway that does not have painted lines, words, or images.

## 5.2.4 PROCEDURE

These procedures apply to all marked crosswalks at midblock and unsignalized intersections:

- Contact the appropriate [District Traffic Operations Office](#) to request an evaluation of a marked crosswalk or other treatments.
- Install special markings and signs for all midblock crosswalks and uncontrolled approaches with crosswalks. Meet the criteria in **TEM 5.2.5** for additional treatments.
- For existing marked crosswalks at midblock or unsignalized intersections, a study or warrant analysis is required before installing midblock traffic control signals or PHBs. Refer to **TEM 5.2.5** for guidance.
- See **TEM 5.2.6** for new marked crosswalks.

- When evaluating new marked crosswalks, consider the following safety factors:
  - Stopping sight distance
  - Adequate lighting for the crosswalk
  - A refuge island or raised median for roads with five or more lanes, to facilitate two-stage crossing.
  - A suitable bus stop location to minimize conflicts with transit vehicles.
- For further safety improvements, see **TEM 5.2.7**.
- Before approving a new marked crosswalk or treatment for an existing one, the [District Traffic Operations Office](#) must coordinate with the local agency responsible for maintenance and compensation.
- Have the [DTOE](#) review and approve any proposed marked crosswalk or treatment at a midblock or unsignalized intersection on the State Highway System before installation.

## 5.2.5 SELECTION CRITERIA

### 5.2.5.1 Criteria for Marked Crosswalk

Follow the strategic plan and validate the need for placement of marked crosswalks at midblock and uncontrolled approaches with an engineering study. Listed below are the criteria for placement of marked crosswalks:

- Proximity to significant generators and attractors
  - Any midblock or unsignalized intersection under consideration for a marked crosswalk should have either of the following characteristics:
    - A well-defined spatial pattern of pedestrian generators, attractors, and flow (across a roadway) between them; or
    - A well-defined pattern of existing pedestrian crossings.
  - Identification of pedestrian generators and attractors shall be documented in an engineering study to illustrate potential pedestrian routes in relation to any proposed marked crosswalk locations, as described in **TEM 5.2.6**.
- Recommended Levels of Pedestrian Demand
  - The pedestrian volume threshold for a new marked crosswalk is 20 or more pedestrians during a single hour (any four consecutive 15-minute periods) of an average day. Average day pedestrian volume data should be collected with the methods outlined in **TEM 5.2.6**.

- Pedestrian volume demand data is not needed for the following conditions:
  - Pedestrian crosswalks within a school zone
  - Pedestrian crosswalks under the following Context Classifications:
    - C2T Rural Town
    - C3C Suburban Commercial
    - C4 Urban General
    - C5 Urban Center
    - C6 Urban Core
- Crosswalks threshold at midblock or unsignalized intersection connecting a **SHARED USE PATH**
  - To promote the use of shared use paths and reduce the occurrence of multiple roadway crossings, crossing locations connecting to a shared use path may use a 50 percent reduction to the recommended pedestrian threshold in **TEM 5.2.5.1-(2)b**.
  - Check with Consult local strategic plan when determining the location for installing these types of marked crosswalks.
- Nature-based trail crossings
  - Before a new nature-based trail crossing is approved by the [D<sub>TOE</sub>](#), the [D<sub>TOE</sub>](#) should evaluate whether it's appropriate to install the trail crossing on the State Highway System (SHS).
  - See **TEM 2.33** for additional information on nature-based trail crossings.
- Minimum Location Characteristics
  - A minimum vehicular volume of 2,000 Average Daily Traffic (ADT) along the roadway segment.
  - Minimum distance to nearest alternative intersection or crossing location
    - The minimum distance to nearest alternative intersection or crossing location is 300 feet per the [FDM 222](#).
    - A proposed crossing location that falls between 100 and 300 feet from an alternative existing crossing may be considered if it is more practical for pedestrian use; this justification must be documented in the engineering study.
  - Adjacent signalized intersection
    - The proposed location must be outside the influence area of adjacent signalized intersections, including the limits of the auxiliary turn lanes.

## 5.2.5.2 Criteria for Beacons and Signals

### Yellow Flashing Beacon

Use Yellow Flashing Beacons to enhance conspicuity for standard signs in accordance with [Section 2A.15 of the MUTCD](#).

### Rectangular Rapid Flashing Beacon (RRFB)

Limit the use to the roadways with the following conditions:

- Posted speed limit of 35 mph or slower
- A marked special emphasis crosswalk
- Maximum of four (4) through lanes (both directions) irrespective of median presence, or five (5) lanes with a median refuge island (Note: For locations with five (5) lanes with a Two-Way Left-Turn Lane, a refuge island or raised median needs to be present for RRFB application).

For locations that do not meet the criteria above, submit a variation to the [State Traffic Engineering and Operations Office](#) for review and approval. Include the following information in the variation submittal:

- AADT
- Sight distance
- Speed data
- Crash data
- Supplemental information including location description and observations.

### Pedestrian Hybrid Beacon (PHB)

When installing a pedestrian hybrid beacon (PHB), make sure to place it at least 100 feet away from side streets or driveways controlled by stop or yield signs, and avoid installing it at an intersection or driveway. If the location is less than 100 feet from the side streets or driveways controlled by a stop sign, additional treatments should be implemented to reduce the risk of conflicts between pedestrians and vehicles. These treatments may include blank-out signs, static signs, in-roadway lights, R1-6a sign, R10-6 (STOP HERE ON RED) sign, or other treatments to inform drivers of the PHB.

Consider the following conditions for the installation of a PHB:

- Where a midblock traffic control signal is not justified under [Chapter 4C of the MUTCD](#) signal warrants and when gaps in traffic are not adequate to permit pedestrians to cross.
- Where the speed of vehicles approaching the location on the major street is too high to permit pedestrians to cross.

- Where pedestrian delay is excessive, follow the engineering study requirement mentioned in [Section 4F.01 of the MUTCD](#).

See [Chapter 4F of the MUTCD](#) for PHB volume guidance. This guidance is summarized in [Figure 5.2-1](#) and [Figure 5.2-2](#). In an urban corridor under context classification C4, C5, and C6 with a site location that warrants a PHB in accordance with the above criteria, the PHB may be substituted with a midblock traffic control signal using [Warrant 8 of the MUTCD, Roadway Network](#).

Follow [Section 4F.02 of the MUTCD](#) for a sequence for a PHB and adjust according to this manual. The guidance is shown in [Figure 4F-3](#).

- Keep the signal dark outside of the activation window.
- Follow [TEM 3.6.2.1](#) for the duration of the flashing yellow.
- The steady yellow change interval is determined using engineering practices with a minimum duration of 3 seconds and a maximum duration of 6 seconds (see [Section 4D.26 of the MUTCD](#)). The longer intervals are reserved for use on approaches with higher speeds or multiple travel lanes.
- Make the duration of steady red equal to the pedestrian walk interval. The guidance is shown in [Section 4F.03 of the MUTCD](#).
- Make the duration of the alternating flashing red equal to the pedestrian clearance interval. The guidance is shown in [Section 4F.03 of the MUTCD](#).
- When implementing a PHB, follow [Section 4F.02 of the MUTCD](#) for a sequence and adjust according to the manual. Keep the signal dark outside of the activation window and follow [TEM 3.6.2.1](#) for the duration of the flashing yellow. Determine the steady yellow change interval using engineering practices, with a minimum duration of 3 seconds and a maximum duration of 6 seconds (see [Section 4D.26 of the MUTCD](#)). Longer intervals are reserved for approaches with higher speeds or multiple travel lanes. Make the duration of steady red equal to the pedestrian walk interval and the duration of the alternating flashing red equal to the pedestrian clearance interval. Guidance for these intervals is provided in [Section 4F.03 of the MUTCD](#).

### Midblock Traffic Control Signal

To ensure safe pedestrian crossing, traffic control signals at midblock crosswalks must be positioned at a minimum distance of 300 feet from side streets or driveways with stop or yield signs. For midblock crosswalks located over 300 feet away from the nearest signalized intersection, the signal's distance to adjacent signals and the availability of adequate gaps for pedestrian crossing must also be considered to determine whether a signal is required.



Traffic Control Signals at midblock crosswalks shall meet [Warrant 4 of the MUTCD, Pedestrian Volume](#). **Figure 5.2-1** and **Figure 5.2-2** summarize this warrant. The minimum pedestrian volume threshold under Warrant 4 may be reduced for the following conditions:

- When the 15th percentile crossing speed is less than 3.5 feet per second, the pedestrian volume that crosses the major street can be reduced as much as 50 percent.
- When the 85th percentile speed on the major street exceeds 35 mph or when the area of the midblock crossing is within the built-up area of an isolated community having a population of less than 10,000, the pedestrian volume that crosses the major street can be reduced by 30 percent.

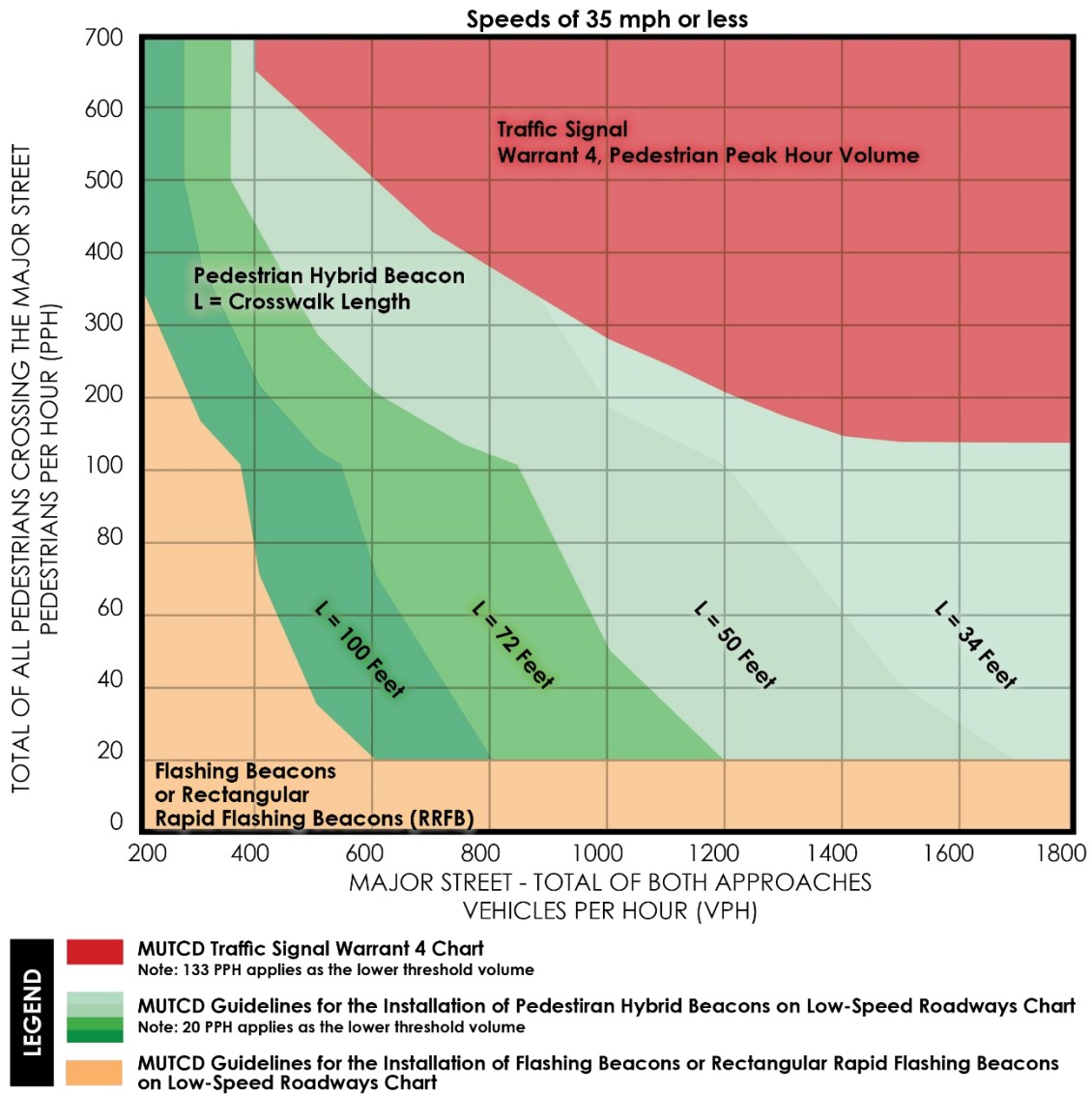
Combining both pedestrian volume reductions of 30 and 50 percent is allowed when it meets the criteria listed above.

Information on requirements for traffic control signal at intersections can be found in **TEM 3.3**.

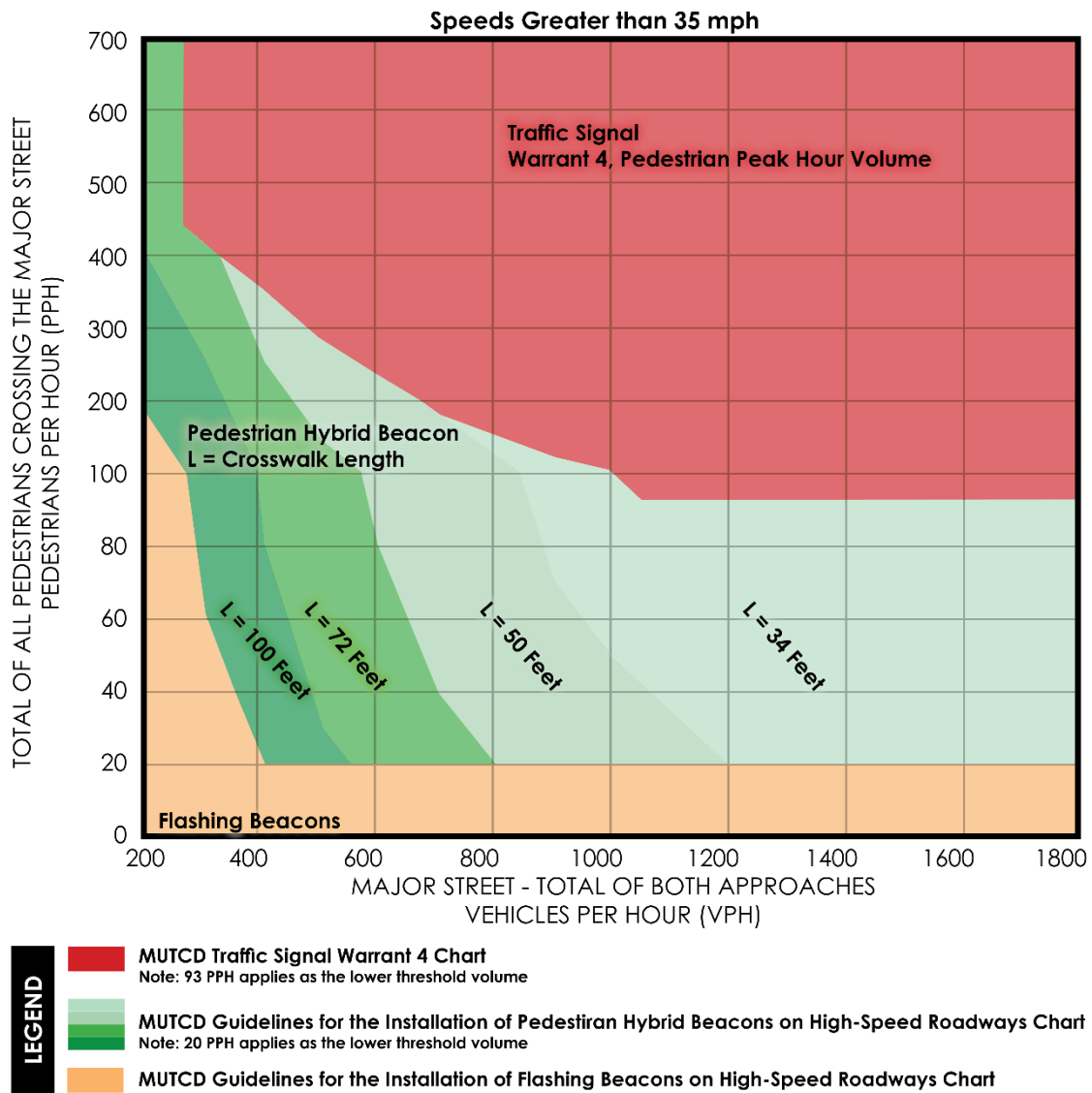
To meet the criteria for safe pedestrian crossing, traffic control signals at midblock crosswalks must comply with [Warrant 4 of the MUTCD, Pedestrian Volume](#), which assesses pedestrian volume. **Figure 5.2-1** and **Figure 5.2-2** summarize this warrant. The minimum pedestrian volume threshold under Warrant 4 may be lowered for certain conditions. For instance, when the 15th percentile crossing speed is below 3.5 feet per second, the pedestrian volume crossing the major street can be reduced by up to 50 percent. When the 85th percentile speed on the major street is over 35 mph or when the midblock crossing is in the built-up area of an isolated community with fewer than 10,000 inhabitants, the pedestrian volume crossing the major street can be reduced by up to 30 percent. Both reductions in pedestrian volume can be combined if they meet the above criteria.

For details on requirements for traffic control signals at intersections, refer to **TEM 3.3**.

**Figure 5.2-1. Guidelines for the Installation of Pedestrian Treatments on Low-Speed Roadways**



**Figure 5.2-2. Guidelines for the Installation of Pedestrian Treatments on High-Speed Roadways**



### 5.2.6 ENGINEERING STUDY

Conduct an engineering study before the installation of a marked pedestrian crosswalk or treatments at a midblock crosswalk location or unsignalized intersection.

The study should select treatments based on factors such as pedestrian and vehicular volumes, roadway characteristics, and environmental factors documented in the study.

The engineering study should include the following information:

- Field data to demonstrate the need for a marked crosswalk based upon minimum

pedestrian volumes (except as described in **TEM 5.2.5.1** and availability of any alternative crossing locations that satisfy the criteria described in **TEM 5.2.5**).

- Data collection should be based upon pedestrian volumes observed crossing the roadway outside a crosswalk at or in the vicinity of the proposed location or at an adjacent (nearby) intersection. If applicable, a cyclist can be counted as a pedestrian.
- The [Department's Manual on Uniform Traffic Studies \(MUTS\)](#) provides additional information on obtaining pedestrian group size and vehicle gap size field data for use in making assessments of opportunities for safe crossings at midblock and unsignalized intersections.
- Field data to estimate individual pedestrian walking speeds, pedestrian speed cumulative curve, and the 15<sup>th</sup> percentile pedestrian crossing speed. The [Chapter 9 of the Department's Manual on Uniform Traffic Studies \(MUTS\)](#) provides additional information on the procedure and method for calculating the parameters of pedestrian walking speed.
- Potential links between pedestrian generators and attractors. Generators and attractors should be identified from an aerial photograph to illustrate potential pedestrian routes in relation to any proposed marked crosswalk location. This information is required for establishing the proposed crossing location or to confirm existing pedestrian crossing patterns.
- All safety considerations as described in **TEM 5.2.4** with respect to stopping sight distances, illumination levels, and proximity to intersection conflict areas.
- Proposed crossing location and corresponding signing, marking, and signal treatments as follows:
  - A schematic layout should be provided over aerial photography or survey to show locations of signs, markings, and other treatments in proximity to existing traffic control devices.
  - Treatments are dependent upon the site context, vehicle operating speeds, roadway cross-section, pedestrian volumes, and other variables. Treatments may include consideration of traffic signals or other warning devices to enhance driver yielding behavior. Other treatments such as median refuge areas, curb extensions, raised crosswalks, and supplemental signing and markings may also be applicable at some locations to support reduced crossing distance and enhanced pedestrian visibility. See **TEM 5.2.7** for discussion of treatment options and guidance on treatment selection.
- Documentation of the latest three years of pedestrian-vehicle crash history within the vicinity of the proposed crosswalk, including the number and nature of conflicts based on field observations.
- Transit route data and the location of transit stops within the vicinity of the proposed crosswalk.

Consider an alternative control strategy, found in the [Department's Manual on Intersection Control Evaluation](#), to resolve a need for an intersection or midblock crosswalk. Alternative analysis can be conducted at adjacent intersections and midblock locations through the procedure described in the [Department's Manual on Intersection Control Evaluation](#).

## 5.2.7 TREATMENT OPTIONS

### 5.2.7.1 Pavement Markings

#### Requirements for Marked Pedestrian Crosswalk

Special Emphasis Crosswalk - Marked crosswalks at unsignalized intersections (uncontrolled approach) and midblock crossings require a special emphasis crosswalk. Follow the procedures identified in **TEM 5.2.4** prior to installation.

Standard Crosswalk - At an unsignalized intersection-controlled approach, the crosswalk marking must comply with [FDM 230](#) design criteria. An engineering study is not required for the installation of standard crosswalks.

#### PEDESTRIAN CROSSING WARNING Sign (*W11-2*) Pavement Markings

The *W11-2* pavement markings may be used to supplement existing signage at marked pedestrian crossings when high vehicular volumes and speeds are documented in an engineering study. Receive [D<sub>TOE</sub>](#) approval of *W11-2* pavement markings the prior to installation. The use of *W11-2* pavement markings as a safety countermeasure is recommended and should be installed if any of the following conditions apply:

When there is a high volume of fast-moving vehicles at a marked pedestrian crossing, the *W11-2* pavement markings can be used alongside existing signs. To install these markings, approval must first be obtained from the [District Transportation Operations Engineer](#). Using *W11-2* pavement markings is recommended as a safety measure in the following circumstances:

- Multi-lane roadway (45 mph or greater)
- Rural two-lane roadway (50 mph or greater)
- Crosswalks have restricted sight distance due to obstructions such as trees or parked vehicles.
- There is a documented history of non-compliant driver yielding to pedestrian behavior.

When installing at midblock or unsignalized intersections, apply the *W11-2* pavement markings as follows (see **Figure 5.2-3** and **Figure 5.2-4** for additional information):

- Centered in the travel lane(s) on the approach to the crosswalk and in alignment with adjacent lanes when used on multi-lane approaches.

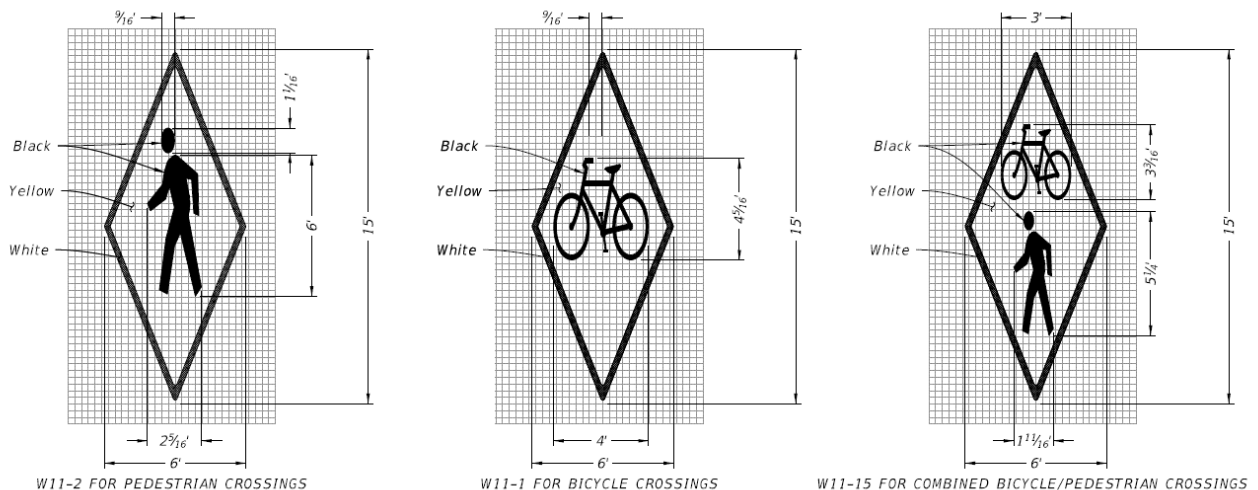
- The **W11-2** pavement marking shall not be intermixed with other pavement markings.
- Place the markings in the travel lane(s) approaching the crosswalk, centered and aligned with adjacent lanes for multi-lane approaches (refer to **Figure 5.2-3** and **Figure 5.2-4** for further guidance)
- Do not mix **W11-2** markings with other pavement markings.

For guidance on the placement of **W11-2** pavement markings similar to the warning signs and their alignment with the posted speed limit, follow **Chapter 2C of the MUTCD**. Additionally, coordinate this installation with the District Maintenance Office.

**Figure 5.2-3. PEDESTRIAN CROSSING WARNING Sign (W11-2) Pavement Marking**



**Figure 5.2-4. PEDESTRIAN and BICYCLE CROSSING WARNING Signs Pavement Marking Details**



## Pavement Word Markings

See **TEM 4.2** for information on the use of Pavement Word Markings.

### 5.2.7.2 Signs

#### General

The signs covered in this subsection may be installed at midblock crosswalks and unsignalized intersections to improve non-compliant driver yielding and stopping behavior to pedestrians. See [FDM 230](#) for sign placement details.

To enhance sign conspicuity, highlighted signs and flashing beacons may be installed in accordance with [Section 2A.15 of the MUTCD](#).

#### **STOP HERE FOR PEDESTRIANS Sign (R1-5b and R1-5c)**

For additional emphasis, a stop line may be installed with the STOP HERE FOR PEDESTRIANS (**R1-5b** and **R1-5c**) sign in accordance with [Section 2B.11 of the MUTCD](#). If used, place the stop lines 40 feet in advance of the marked crosswalk.

To make sure drivers stop for pedestrians, a stop line can be added with the STOP HERE FOR PEDESTRIANS sign in accordance with [Section 2B.11 of the MUTCD](#). If this is done, the stop line should be 40 feet before the marked crosswalk.

When the STOP HERE FOR PEDESTRIANS sign is installed, parking is prohibited in the area between the stop line and the marked crosswalk. Use a solid lane line between the stop line and crosswalk.

Use the **R1-5b** and **R1-5c** signs with the advanced warning **W11-2** and **W16-7P** signs.

Do NOT use the **R1-5b** and **R1-5c** signs in combination with the traffic signal or PHB.

The **R1-5b** and **R1-5c** sign may be used at locations where there is non-compliant stopping for pedestrians at an existing mid-block crosswalk, as follows:

- One sign in each direction
- Within 100 feet in advance of the crosswalk
- Does not interfere with required signs

**Figure 5.2-5. Pedestrian Crossing Signs  
(R1-5b and W11-2 with an RRFB)**



### **TURNING VEHICLES STOP FOR PEDESTRIANS Sign (R10-15a)**

See **TEM 2.44** for guidance on the use of the TURNING VEHICLES STOP FOR PEDESTRIANS sign (**R10-15a**) at locations other than midblock crosswalks.

### **PEDESTRIAN CROSSING Signs**

Use a PEDESTRIAN CROSSING (**W11-2**) warning sign with supplemental AHEAD plaque (**W16-9P**) in combination with the **R1-5b** or **R1-5c** sign.

A school sign (**S1-1**) with supplemental diagonal downward pointing arrow (**W16-7P**) may be used to advise road users that they are approaching a crosswalk in close proximity to a school.

The combined bicycle/pedestrian sign (**W11-15**) may be used where both bicyclists and pedestrians might be crossing the roadway. A TRAIL X-ING (**W11-15P**) supplemental plaque may be mounted below the **W11-15** sign.

### **In-Street Sign (R1-6a)**

In-street signs (**R1-6a**) are useful on low-speed roadways to remind road users of laws regarding right-of-way at a midblock or unsignalized pedestrian crosswalk. Implement in-street signs (**R1-6a**) in roadways with four (4) or fewer through lanes (both directions) and with a posted speed limit of 35 mph or less.

Coordinate with the District Maintenance Office prior to **DTOE** approval for the use of the in-street sign (**R1-6a**).



If used, place the in-street signs (**R1-6a**) at one of the following locations:

- In the roadway at the marked crosswalk location on the center line,
- In the case of a one-way roadway application, on a lane line, or
- On a median island as allowed by [Section 2B.12 of the MUTCD](#).

See [Standard Plans, Index 700-102-1](#) for design details on the fabrication of in-street signs (**R1-6a**). Do NOT post mount the in-street sign (**R1-6a**) on either side of the roadway.

The use of in-street signs (**R1-6a**) on lane lines may be substituted with tubular markers to reduce the maintenance and replacement cost due to periodic impacts from vehicular traffic. When the tubular markers are used to supplement an **R1-6** series sign that is either on the center line, lane line, or median island, they should not be used on the same pavement marking line where the **R1-6** Series sign is installed. If used, match the tubular marker color to the pavement marking that they supplement, in accordance with [Section 3H.01 of the MUTCD](#).

For further guidance on tubular marker substitution, see **TEM 5.2.7.2**.

To reduce maintenance and replacement costs from vehicular traffic, use tubular markers instead of in-street signs on lane lines. If used, match the color of the tubular markers to the pavement marking they supplement, following [Section 3H.01 of the MUTCD](#). Do not install tubular markers on the same pavement marking line as the R1-6 series sign. For more guidance on using tubular markers, see **TEM 5.2.7.2**.

**Figure 5.2-6. Pedestrian Crossing Signs (R1-6a and W11-2)**



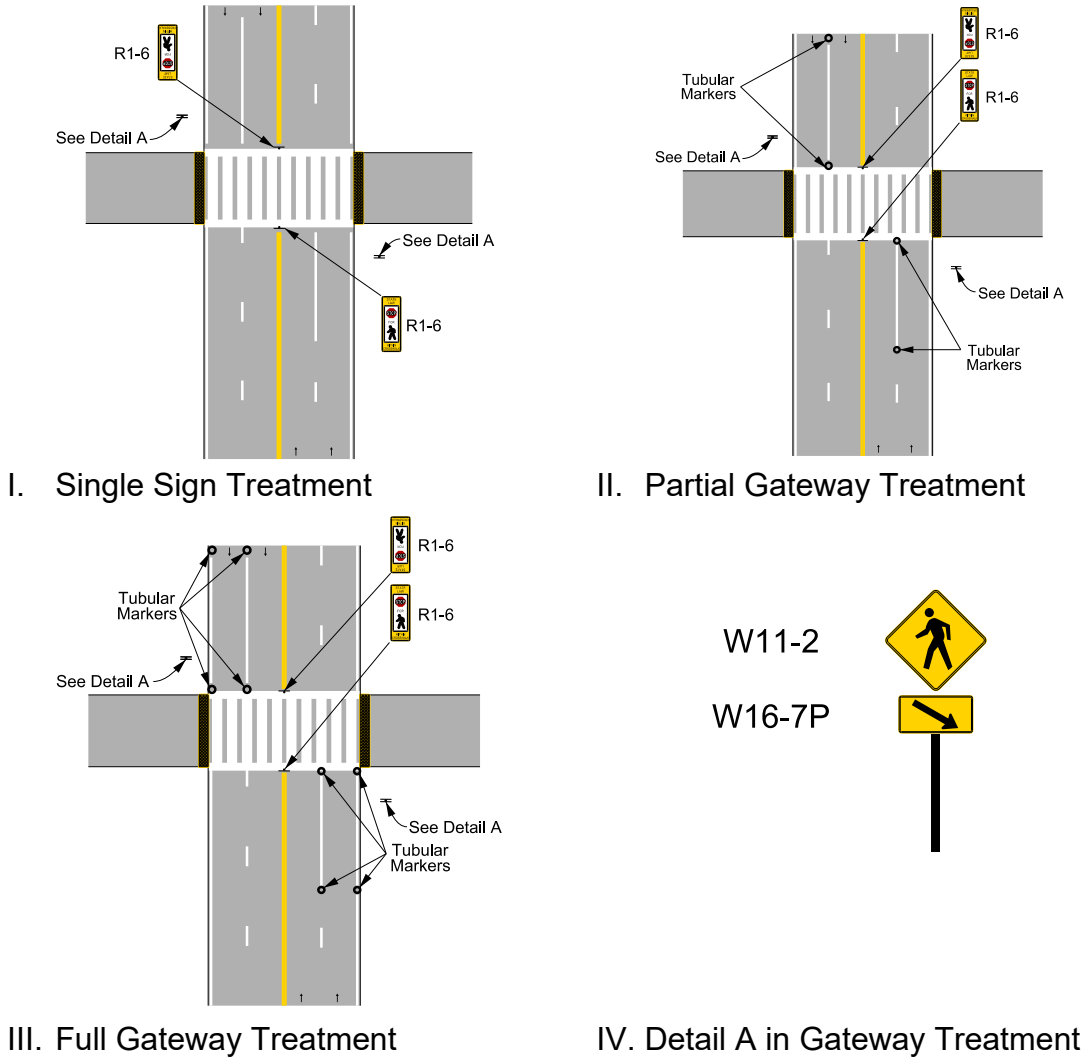
## Tubular Marker Gateway Treatment

To provide additional emphasis for the pedestrian crossing and to provide a channelizing and potentially calming effect on vehicle traffic, the in-street signs (**R1-6a**) may be used with one or more supplemental tubular markers on the lane lines or edge lines at a mid-block pedestrian crossing.

The use of supplemental tubular marker for gateway treatment is compliant with the [MUTCD](#). See FHWA Official Ruling [3\(09\)-61 \(I\) – Channelizing Devices at Mid-Block Pedestrian Crossings in Conjunction with In-Street Pedestrian Crossing \(R1-6 Series\) Signs](#) issued on August 3, 2020, with guidance and illustrations.

To make sure drivers pay attention to pedestrians crossing the road and to help control traffic, use in-street signs (**R1-6a**) with one or more tubular markers on lane or edge lines at a mid-block pedestrian crossing. This use of tubular markers is allowed by the MUTCD and complies with FHWA Official Ruling [3\(09\)-61 \(I\) – Channelizing Devices at Mid-Block Pedestrian Crossings in Conjunction with In-Street Pedestrian Crossing \(R1-6 Series\) Signs](#). The ruling includes helpful guidance and illustrations and was issued on August 3, 2020.

**Figure 5.2-7. Gateway Treatment with R1-6a and Tubular Marker**



**Portable Changeable Message Sign (PCMS)**

To inform the traveling public of a new traffic control pattern, a PCMS is required for all new RRFB, PHB, flashing yellow beacon, and midblock traffic control signals in accordance with the following criteria.

- Display the following safety message the PCMS:
  - NEW SIGNAL XX/XX
  - PREPARE TO STOP
- Coordinate with Local Law Enforcement, Local Agency, District Public Information Office, District’s Law Enforcement Liaison, and District CTST Coordinator two weeks before the new traffic control device is installed.
- Install the PCMS two weeks prior and remain in place for a minimum of one week after the installation of traffic control devices mentioned above.

### 5.2.7.3 Beacons (Signal Warrant Analysis Not Required)

#### General

If a location doesn't meet the requirements for traffic control signals or PHBs, you can use other devices that pedestrians activate to warn drivers and draw attention to the marked crosswalk and pedestrians. **TEM 5.2.4** provides guidance on these devices that are exempt from requirements. Depending on the site's specific features, other treatments not listed here may also be appropriate. Engineering judgment should guide decisions about which additional treatment options to include, if any.

#### Rectangular Rapid Flashing Beacons (RRFB)

The FHWA issued [Interim Approval 21, Rectangular Rapid Flashing Beacons at Crosswalks \(IA-21\)](#) on March 20, 2018, which specifies the intended use and design requirements for RRFB devices.

FDOT has received FHWA approval to install RRFBs on the State Highway System. Local agencies must receive FHWA approval prior to installing RRFBs on their local roads.

The rectangular beacons are provided in pairs below the PEDESTRIAN CROSSING warning sign (**W11-2**) (and above the diagonal downward arrow (**W16-7P**) plaque for post-mounted RRFB) and operate in a flash pattern upon activation by the pedestrian. For school zone or trail crossings, school sign (**S1-1**) or combined bicycle/pedestrian sign (**W11-15**) may be placed alternatively above the rectangular beacons instead of the pedestrian crossing sign (**W11-2**). Detailed conditions of use, including sign/beacon assembly, dimensions, placement, and flashing rates are provided in [IA-21](#). Refer to the following FDOT policy for more guidance on RRFB implementation:

- [Standard Plans, Index 654-001](#)
- [FDM 941](#)
- [Standard Specifications, Section 654](#)

[Standard Plans, Index 654-001](#) requires that RRFBs to include an instruction sign (**FTP-68C-21**), mounted adjacent to or integral with the pedestrian push button device, with a 3-line legend that reads: PUSH BUTTON FOR WARNING LIGHTS / WAIT FOR TRAFFIC TO STOP / CROSS WITH CAUTION.

As of January 1, 2021, include, on all RRFB installations, an audible warning message that states "WAIT FOR TRAFFIC TO STOP THEN CROSS WITH CAUTION" when activated. An example of the RRFB treatment is shown in **Figure 5.2-8**.

**Figure 5.2-8. Rectangular Rapid Flashing Beacons**



### Flashing Yellow Beacons

For locations where traffic signals are not warranted, additional emphasis on the crossing location can be provided when using flashing yellow beacons to supplement the appropriately marked crossing warning or regulatory signs. These devices are still allowable in the [MUTCD](#), although newer devices such as RRFBs have increased in popularity. See [Chapter 4L of the MUTCD](#) for a complete list of requirements.

See [Standard Plans, Index 700-120](#) for design and installation details.

Configuration of beacons is either overhead or side-mounted; however, the preferred configuration is a side post-mounting to avoid drivers confusing the beacons for a flashing traffic signal.

- When post-mounted, the recommendation is to have a configuration of two vertically aligned beacons. Operate these beacons in an alternating flash pattern.
- When overhead mounted, flashing yellow beacons should feature an internally-illuminated Overhead Pedestrian Crossing sign (**R1-9a**) in conjunction with the beacons, which is continuously lit at night.

## In-Roadway Warning Lights (IRWL)

[Chapter 4N of the MUTCD](#) provides detailed guidance on the installation of in-roadway lights. Coordinate with the District Maintenance Office prior to seeking [DTOE](#) approval on the use of the in-roadway lights.

In-roadway warning lights are installed in the roadway surface to warn road users that they are approaching a condition on or adjacent to the roadway that might not be readily apparent and might require the road users to slow down or come to a stop. This includes marked midblock crosswalks and marked crosswalks on uncontrolled approaches. In addition, when deploying IRWLs in conjunction with midblock pedestrian signals or pedestrian hybrid beacons, it is essential to obtain Request to Experiment (RTE) approval.

In-roadway warning lights may be installed at certain marked crosswalks, based on an engineering study or engineering judgment, to provide additional warning to road users. Operate in-roadway lights in a flashing pattern.

The installation of in-roadway warning lights in conjunction with overhead or LED roadside highlighted signs or flashing yellow beacons is allowed as long as the flashing rates are identical and flash in unison. Exercising engineering judgment is of great importance.

In locations where overhead lighting has been omitted by the EOR, consider in-roadway lights. Use following criteria for in-roadway lights:

- Install only at marked crosswalks with applicable warning signs.
- Install along both sides of the crosswalk and span its entire length.
- Do NOT use IRWLs at crosswalks controlled by YIELD signs, STOP signs, or traffic control signals.

If a pedestrian push button actuates the in-roadway lights, mount a PUSH BUTTON TO TURN ON WARNING LIGHTS (with push-button symbol) (**R10-25** or **FTP-68C-21**) sign adjacent to or integral with each pedestrian push button.

### 5.2.7.4 Beacons and Signals (Warrant Analysis Required)

#### Pedestrian Hybrid Beacon (PHB)

A possible alternative to the traffic signal is a PHB. Use PHBs in conjunction with signs and pavement markings to warn and control traffic at locations where pedestrians enter or cross a street or highway. See **Figure 5.2-9** for an example of the PHB treatment.

Only install PHBs at midblock crosswalks. See [Chapter 4F of the MUTCD](#) for guidance and criteria on PHB installations.

For six-lane roadways or crossing distances exceeding 80 feet, consider a two-stage pedestrian crossing with a median refuge island where a warranted PHB will control the proposed marked crossing.

Include the CROSSWALK, STOP ON RED, PROCEED ON FLASHING RED WHEN CLEAR (**R10-23a**) sign in PHB treatments. The **R10-23a** replaces the existing **MUTCD R10-23** sign per the [FHWA Interpretation Letter 4\(09\)-61\(I\)](#).

**Figure 5.2-9. Pedestrian Hybrid Beacons**



### **Midblock Traffic Control Signal**

Where pedestrian volumes meet the [Signal Warrant 4 of the MUTCD](#), a midblock traffic control signal may be installed to serve this demand in accordance with [Section 4C.05 of the MUTCD](#). Ensure that the new pedestrian signal is compatible with the signal system along the arterial corridor.

Where signalized control is selected for the pedestrian crossing, additional coordination is recommended with the District Access Management Review Committee and the [DTOE](#).

For six-lane divided roadways or crossing distances exceeding 80 feet, also consider a two-stage pedestrian crossing with a median refuge island where a warranted traffic control signal will control the proposed marked midblock crossing.

At locations where pedestrian compliance is of concern, feedback devices may be installed with the traffic control signal button to provide pedestrians with confirmation of the call.

For locations where signal warrants are met, consideration may be given to providing a pedestrian bridge or tunnel to address safety and compliance issues that cannot be addressed by a traffic signal.

In some cases, a traffic control signal may not be needed at the study midblock location if adjacent coordinated traffic control signals consistently provide gaps of adequate length for pedestrians to cross the roadway.

See the [Department's Manual on Uniform Traffic Studies \(MUTS\)](#) for guidance on conducting Pedestrian Group Size and Vehicle Gap Size studies.

See **TEM 3.7** for information on the use of accessible pedestrian signals.

See [Standard Plans, Index 653-001](#) for details on installing midblock traffic control signals. An example of the midblock traffic control signal treatment is shown in **Figure 5.2-10**.

**Figure 5.2-10. Midblock Traffic Control Signal**



### 5.2.7.5 Other Treatments

Consider incorporating pedestrian refuge islands, raised median, curb extensions, raised crosswalks (See **Figure 5.2-11**) or the following treatments to improve visibility, support pedestrian travel, and increase awareness for pedestrians at crossings. For other **speed reduction treatments** see [FDM 202](#).

See [FDM 222](#) for design criteria of pedestrian treatments.



**Figure 5.2-11. Raised Pedestrian Crosswalk**



### **Crosswalk Illumination**

There are locations such as environmentally sensitive areas or crosswalks serving facilities that are open only during daylight hours, where lighting may be omitted. [DTOE's](#) approval is required for this omission. Consider in-roadway lighting at locations that omit illuminating the crosswalk.

Provide crosswalk illumination in accordance with [FDM 222 and 231](#).

### **Passive Pedestrian Detection**

In addition to traditional active pedestrian detection (push button), passive pedestrian detection may be used to supplement and improve pedestrian detection for signals, RRFBs, PHBs, and warning beacons.

Consider passive pedestrian detection in locations with documented observations of low usage of the active pedestrian detection (push button). This could be acquired by field review, demographics, or per request. Children/teenagers, school zone, aging roadway users, and other demographics should be considered when implementing passive pedestrian detection.

When passive pedestrian detection is installed, adequate passing space around the waiting detection area on the sidewalk should be present. Provide overhead lighting to increase

pedestrian visibility and detector accuracy. Adjust detection zones after installation to cover the exact specified pedestrian waiting area.

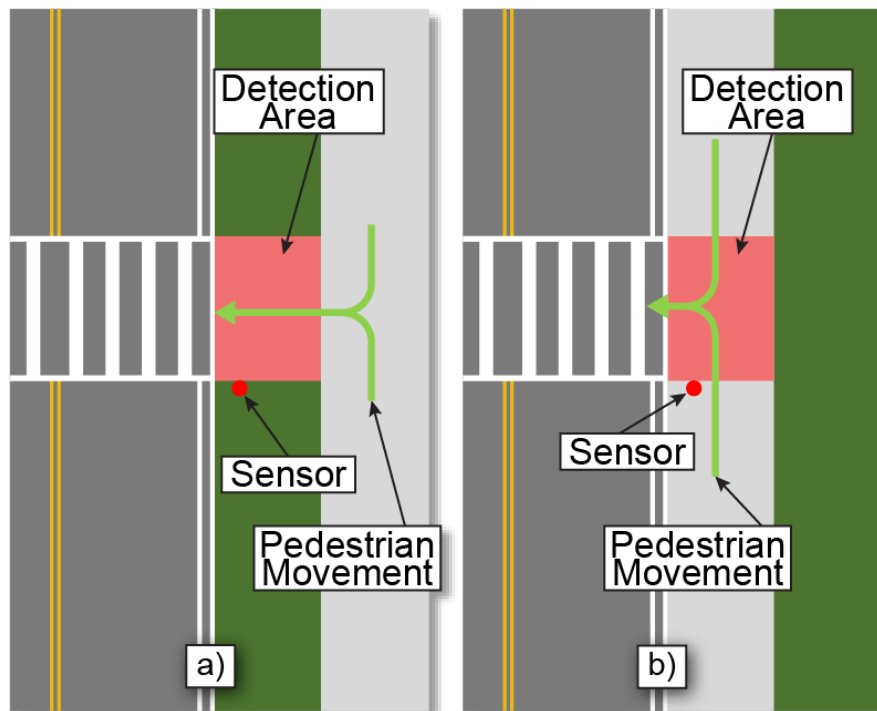
When using passive pedestrian detection, ensure adequate installation height, detection distance, and position and angle of the detector to recognize pedestrian features and detect the presence of pedestrians. If there are no existing poles or infrastructure at the implementation site, consider a supplemental pole or an extended arm from an existing pole.

When deploying a passive pedestrian detection system, two options will be encountered for the sidewalk locations as illustrated in **Figure 5.2-12**.

For the option in **Figure 5.2-12 a)**, a grassy shoulder/buffer is constructed between the sidewalk and the road. The area leading towards the crosswalk can be used as the detection zone for the system, providing a well-established and clear area for detection. This option is preferable for deploying passive pedestrian detection.

For the option in **Figure 5.2-12 b)**, a sidewalk is constructed next to a curb without any buffer between them, which is common in urban environments with limited right-of-way. The area that can be used for detection is smaller, and a pedestrian walking on the sidewalk turning into the crosswalk may not be detected in some cases. There may also be false detections with this design. The pedestrian “WALK” signal can be activated by pedestrians walking along the sidewalk but not turning to the crosswalk. Consider this limitation when implementing passive pedestrian detection.

**Figure 5.2-12. Sidewalk Location Options for Passive Pedestrian Detection**



For a shared-use path that crosses a state roadway, passive bicyclist detection may be added in addition to an active bicyclist detection (push button) to improve driver yielding behavior and cyclist safety. Consider the following guidance when installing passive bicyclist detection at midblock or unsignalized intersections:

- At unsignalized intersections and midblock that require bicyclist detection, consider passive bicyclist detection.
- Place the passive bicyclist detection devices in the expected path of the bicyclists.
- Locate bicycle detection devices in the most conspicuous location and supplemented by appropriate signing and pavement markings to inform bicyclists of where to wait.
- Install advanced bicycle detection on the approach to the intersection to extend the phase or to prompt the phase and allow for continuous bicycle through movements.
- Consider the amount of metal in typical bicycles in the design of loop detectors. Certain loop configurations are better at detecting bicyclists than others. Adjust settings for loop detectors to detect bicycles properly.

### Transverse Rumble Strips

Transverse rumble strips in advance of rural stop-controlled intersections have been shown to improve driver awareness and overall safety performance. Therefore, this type of rumble strips may be used in advance of midblock and unsignalized intersections where driver yielding behavior has not been successful with other advance warning treatments identified in this section. Install transverse rumble strips in accordance with [Standard Plans, Index 546-001](#), [Standard Specifications, Section 546](#), and [FDM 210](#). Consider the following factors when installing transverse rumble strips near midblock or unsignalized intersections:

- Evaluate the noise impact of installing transverse rumble strips near residential areas before installation.
- Coordinate with the District Maintenance Office prior to [DTOE](#) approval for the use of the transverse rumble strips.
- There are two basic layouts for transverse rumble strips, extending across the entire traffic lane or placement only in the wheel tracks. The wheel track layout is preferred because it allows drivers that do not need any additional warning to avoid the rumbles without driving into the opposing lane.
- Use the transverse rumble strips in combination with Pedestrian Crossing (**W11-2**) signs.

## 5.2.8 TREATMENT OPTIONS SELECTION MATRIX

Select pedestrian treatments at midblock crosswalks and unsignalized intersections based on pedestrian volume, roadway context classification, number of lanes, posted speed limit, and other related factors as identified in **TEM 5.2.4**, **TEM 5.2.5**, and **TEM 5.2.7**. As a reference **Figure 5.2-13** has been designed to aid in the treatment option selections process. This matrix summarizes the procedures, selection criteria and treatment requirements identified in **TEM 5.2**.

**Figure 5.2-13. Midblock Crosswalk and Unsignalized Intersection Selection Guidance Matrix**

<b>TEM 5.2</b> Midblock Crosswalks and Unsignalized Intersection Selection Guidance Matrix			Midblock and Unsignalized Intersections					Midblock			TEM SECTION
			Pavement Marking			RRFB		PHB	Traffic Signal		
			Special Emphasis Crosswalk								
			20 PPH for 1 Hr			2-4 lanes	3-5 lanes With TWTL	Florida warrants must be met			
			or SHARE USE PATH 50% PPH reduction								
			or school zones								
or C2T, C3C, C4, C5, and C6			40-45 mph	>45 mph	≤35 mph		All Speeds				
Pavement Markings	Special emphasis crosswalk	Midblock	M	M	M	M	M	M	M	5.2.7.1	
		Intersection	M	M	M	M	M	N	N		
Signs	Stop Here for Peds Sign (R1-5b) / Stop Here for Pedestrians Sign (R1-5c)	Enhance option: highlighted or beacon	O	O	O	M	M	N	N	5.2.7.2	
	Pedestrian Sign (W11-2) / Ahead Plaque (W16-9P)		M	M	M	M	M	M	M		
	PushButton For Warning Lights, Wait For Traffic To Stop, Cross With Caution Sign (FTP-68C-21)		O	O	O	M	M	O	O		
	Overhead Ped Crossing Sign (R1-9a)		O	O	O	O	O	O	O		
	Crosswalk, Stop on Red Sign (R10-23a)		N/A	N/A	N/A	N	N	M	N		
	In-street Ped Crossing Sign (R1-6a)		R (≤35 mph)	N	N	R	N	N	N		
Emphasis / Enhancements	Audible message		N/A	N/A	N/A	M	M	N	N	5.2.7.3	
	In-roadway warning light		N/A	N/A	N/A	O	O	O	N		
	Passive pedestrian and bike detection	SHARED USE PATH	N/A	N/A	N/A	R	R	R	R	5.2.7.5	
		All others locations	N/A	N/A	N/A	O	O	O	O		
TEM SECTION			5.2.5.1			5.2.5.2					

**Legend**

- M Mandatory if applied
- R Recommended Option
- O Optional
- N Not to be Applied
- N/A Not Available Option<sup>(1)</sup>

Note  
(1) Identifies where the treatment cannot be applied because the infrastructure is not there. Ex: Audible Message on a Marked Crosswalk

## Section 5.3

# TREATMENTS FOR PEDESTRIANS AND BICYCLISTS ON MOVABLE BRIDGES

### 5.3.1 PURPOSE

The intent of this section is to establish criteria and guidelines for the consistent installation and operation of pedestrian treatments on movable bridges. These treatments include swing-style pedestrian gate, signs, and advanced detection systems such as LiDAR and Thermal Imaging cameras. See [Structures Design Guidelines \(SDG\) 8.1.9](#) for more design information.

### 5.3.2 GENERAL

Pedestrian and bicyclist safety can significantly improve by thoughtfully placed signs and swing-style pedestrian gates on movable bridges. Advanced Detection Systems help the bridge tenders detect pedestrians or bicyclists and prevent the bridge from opening when there are any pedestrians or bicyclists in the vulnerable zones of the movable span.

### 5.3.3 DEFINITIONS

**Advanced Detection System.** A passive detection system that can identify, target, track, and alert if a moving or still human characteristic is spatially referenced in a predetermined geographical space during all weather conditions.

**Bascule Bridge.** A movable bridge (also referred to as a drawbridge or a lifting bridge) with a counterweight that continuously balances a span, or leaf, throughout its upward swing to provide clearance for maritime traffic. It may be single- or double-leafed.

**Bridge Tender.** Operator of the movable bridge according to the regulations of the United States Coast Guard (Chapter 33 of the Code of Federal Regulations Section 117.1101, which is included in Volume I: Appendix G) and with the State of Florida Statutes.

**Lift Bridge.** A vertical-lift bridge or just lift bridge is a type of movable bridge in which a span rises vertically while remaining parallel with the deck.

**Movable Bridge.** A bridge that moves to accommodate the passage of maritime vessels. There are several types of movable bridges mentioned in this section.

**Swing Bridge.** A swing bridge (or swing span bridge) is a movable bridge that has, as its primary structural support, a vertical locating pin and support ring which is usually at or near its center of gravity about which the swing span (turning span) can then pivot horizontally.

**Swing-Style Pedestrian Gate.** A gate that opens and closes automatically with the assistance of electronic, hydraulic, or mechanical means. Swing-style pedestrian gates open on their vertical axes so that they swing towards or away from pedestrians.

**Vulnerable Zones.** Areas of high risk for pedestrians, bicycles, and vehicles that may cause harm during bridge openings.

### 5.3.4 TREATMENT OPTIONS

#### Swing-Style Pedestrian Gate

Install swing-style pedestrian gate on movable bridges in accordance with [SDG 8.1.9](#).

#### Signage

Install a **NO PEDESTRIANS OR BICYCLES BEYOND GATE** sign on movable bridge swing-style pedestrian gate as shown in **TEM 2.6.6**.

#### Advanced Detection Systems

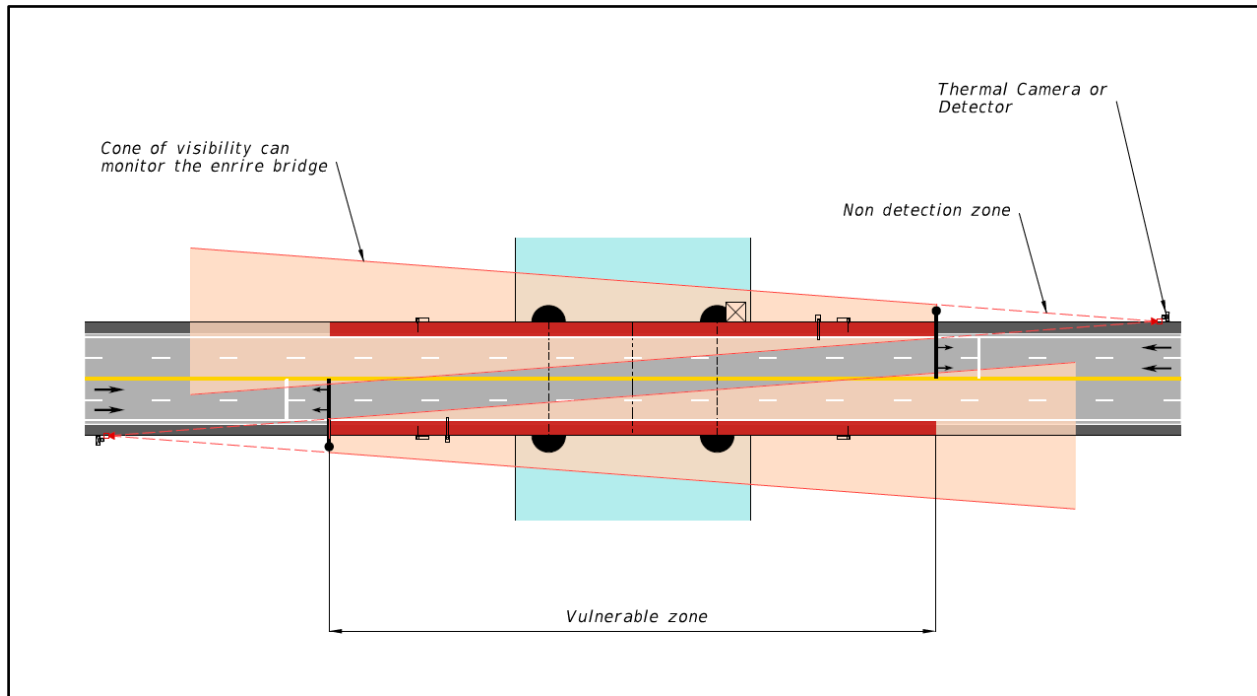
These passive thermal or laser-based systems identify, target, track, and alert the bridge tender station if any pedestrians or bicyclists are detected in vulnerable zones of the movable bridge.

- The thermal camera system is an advanced detection system that uses infrared radiation to detect and locate heat signature objects.
- LiDAR camera system is an advanced detection system that uses **Light Detection and Ranging** technology. Pulsed laser beams are emitted in a predetermined geographic space that measures the time taken for each pulse of laser light to be reflected back from the environment and objects of interest creating a 3D image of the target. Typically, these lasers can be visible light, infrared or ultraviolet lasers.

Bridge tender house receives the sensor data from the advanced detection system into a computer, with an uninterruptible power supply, that displays the feed through a monitor. These systems, including all integrated components, are currently on the [Department's Approved Products List \(APL\)](#). Systems may include but are not limited to:

- Thermal camera, or LiDAR camera
- Controller or server cabinet
- Communication system (wired or wireless or cellular service)
- Network switch
- Conduit and pull box
- Power supply (hook up to existing power or solar power systems)
- Wire, cable, and related fittings

**Figure 5.3-1. Typical Detection Zones**



The advanced detection system technology selection is at the discretion of the [DTOE](#). [State Traffic Operations Engineer \(STOE\)](#) approval is required to select technology not covered in this section.