CHAPTER

5

Special Operational Topics

SECTION 5.1

GOLF CART CROSSING AND OPERATION ON THE STATE HIGHWAY SYSTEM

5.1.1 PURPOSE

This section establishes criteria and guidelines for safe golf cart operation on authorized portions of the State Highway System and for uniform crossings at designated locations.

Safety recommendations for counties and municipalities that wish to enact ordinances authorizing golf cart use on the State Highway System or adjacent sidewalks within their jurisdictions are also provided here.

5.1.2 GENERAL

Golf carts can be used for short trips from residential neighborhoods to shopping, social, and recreational destinations. These small passenger vehicles offer a variety of advantages, including comparatively low cost and energy-efficient mobility at lower speeds.

Florida authorizes golf cart use and operation on public roads only under certain circumstances, as described in ***Section 316.212, F.S.*** and the ***Guide to Safe and Legal Golf Cart Operation in Florida***.

5.1.3 DEFINITIONS

Golf Cart: A motor vehicle that cannot exceed 20 mph and is designed and manufactured to operate on a golf course for sporting or recreational purposes.

Grade-Separated Crossing: A crossing of two facilities (roadways, railroad, or pedestrian pathways) at different levels.

Local Government: The governing body of a unit of local general-purpose government, such as a county agency, municipality, tourist development council, county tourism promotion agency, or special district, as defined in ***Section 189.012, F.S.*** and ***Section 11.45 (g), F.S.***

State Roadway: Road within the State Highway System (owned and maintained by the State of Florida). This includes roads signed as interstate highways, U.S. routes, and state roads.

5.1.4 PROCEDURE

Local governments are required to obtain ***District Traffic Operations Engineer (DTOE)*** approval before installing a golf cart crossing on the State Highway System. FDOT prefers that golf cart crossings on state roads be grade-separated facilities.

Non-governmental entities seeking authorization for a golf cart crossing may do so through the local government with jurisdictional authority.

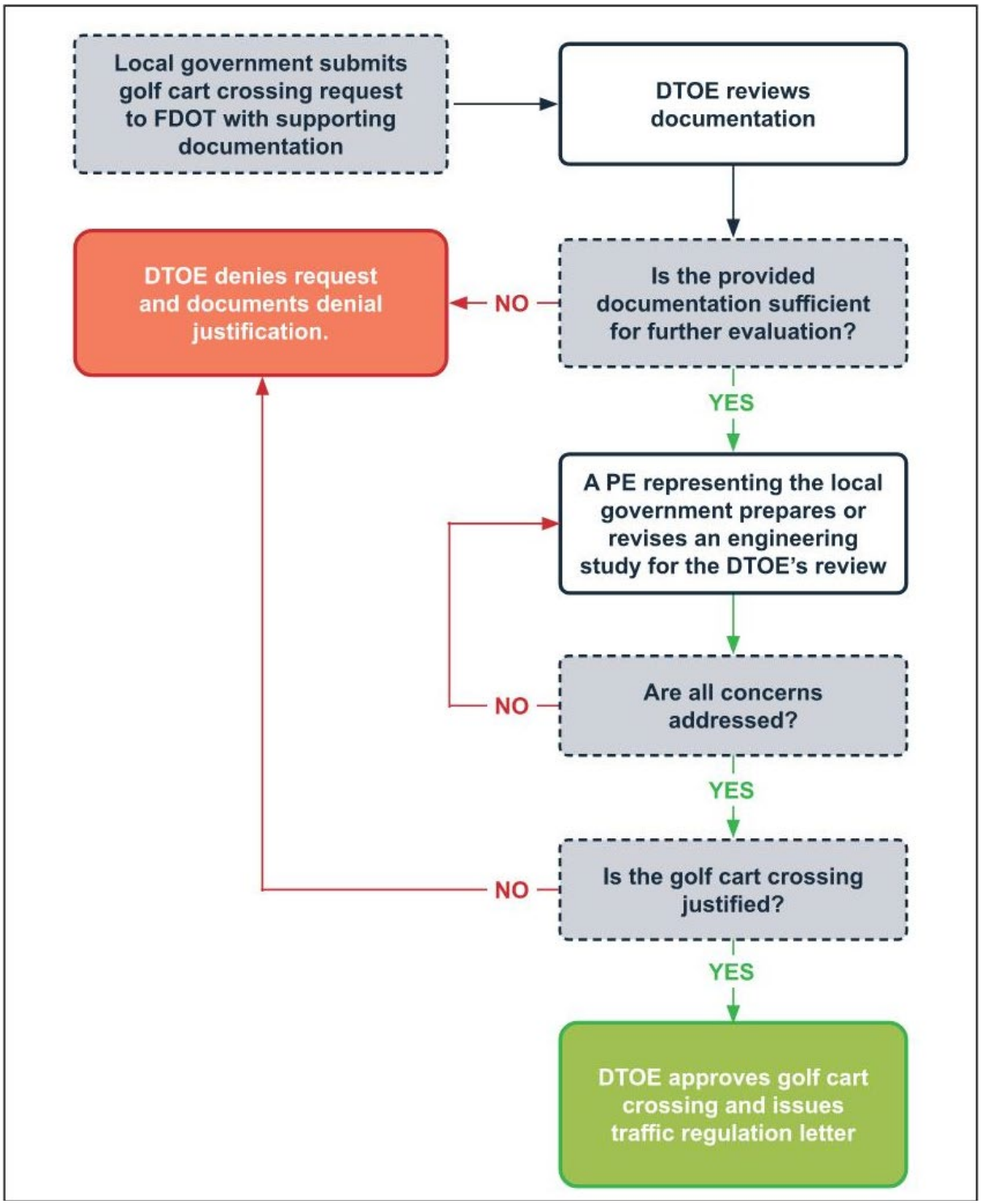
If the ***DTOE*** supports installing a golf cart crossing based on ***TEM 5.1.5*** criteria, the requester must have a Professional Engineer licensed in the State of Florida conduct an engineering study that documents:

- The need for a golf cart crossing based on conditions outlined in ***Section 316.212, F.S.*** and verifies that:
  - 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 the state road.
- All safety considerations at the proposed location, including 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***.
- The proposed golf cart crossing; roadway segment location (roadway ID and milepoint); and corresponding signing, marking, and signal treatments, as applicable. Provide a schematic layout over aerial imagery or survey to show the proposed signs, markings, and other treatments and existing traffic control devices nearby.
- A minimum of five years of crash data within the influence area of the proposed crossing.

If the ***DTOE*** decides not to authorize the golf cart crossing, they will document the reasons and advise the local government of their findings. Meeting the minimum criteria outlined in this section does not guarantee approval for a golf cart crossing.

Before a golf cart crossing can be approved, the local government must coordinate with the appropriate ***District Traffic Operations Office*** and ***District Maintenance Office*** to determine permitting requirements and review existing maintenance agreements to determine if adjustments are needed.

Figure 5.1-1. Procedure Flowchart



5.1.5 CRITERIA FOR CROSSINGS

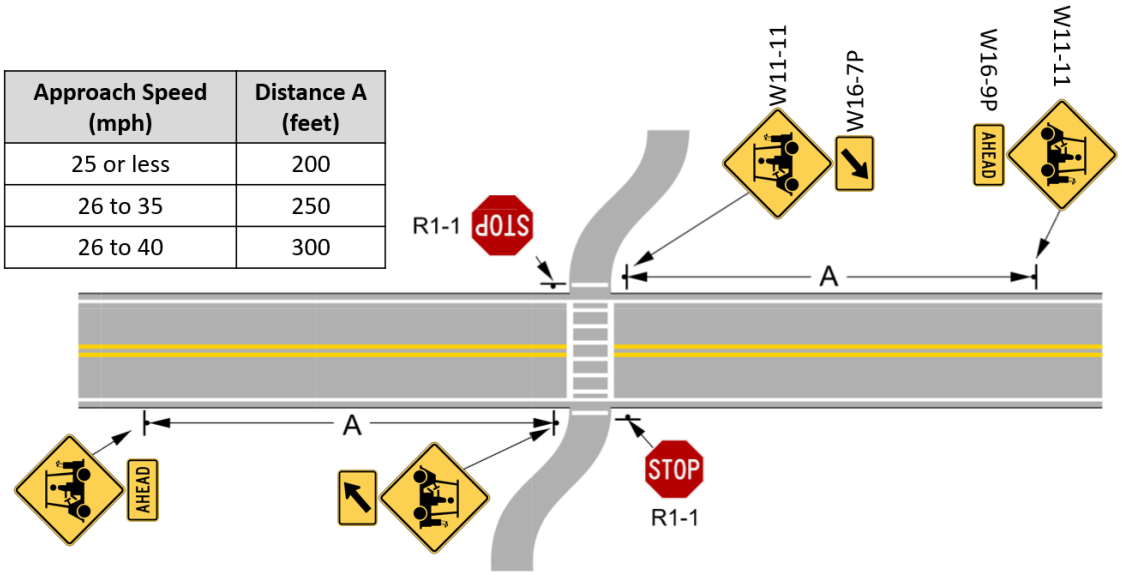
Sign details are available in the ***Standard Plans, Index 700-102*** and ***FDOT's Sign Library***.

5.1.5.1 Midblock Crossing

Golf carts may cross a state road at a midblock 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:

- Roadway segment vehicular volume of 15,000 Average Daily Traffic (ADT) or less.
- 40 mph posted speed limit or less.
- Crossing distance is three lanes or less, excluding bike lanes.
- 15 feet median width or less.
- The minimum distance to the nearest driveway, access point, or crosswalk is 350 feet.
- The crossing must be on a straight road segment, with the nearest point of curvature at least 350 feet away.
- Clear and unobstructed view of the roadside on the approach to the crossing.
- Place *GOLF CART* signs (***W11-11***), *AHEAD* plaques (***W16-9P***), and downward arrow plaques (***W16-7P***) on the street approach, as shown in ***Figure 5.1-2***.
- Golf carts are the only motor vehicles permitted to use the designated crossing or traverse the State's right of way.

Figure 5.1-2. Midblock Crosswalk



Approach Speed (mph)	Distance A (feet)
25 or less	200
26 to 35	250
26 to 40	300

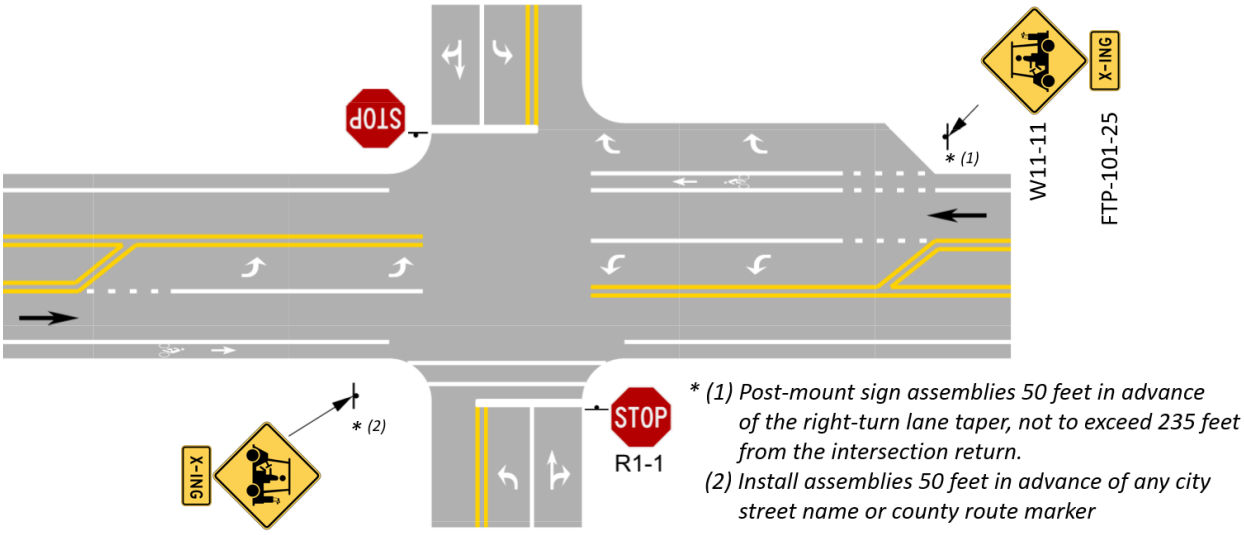
Note: *See FDOT Standard Plans, Index 711-001 for pavement marking application details*

5.1.5.2 Side Street Stop-Controlled Intersections

Golf cart crossings at roadway intersections with side street stop control along any state road must meet the following criteria:

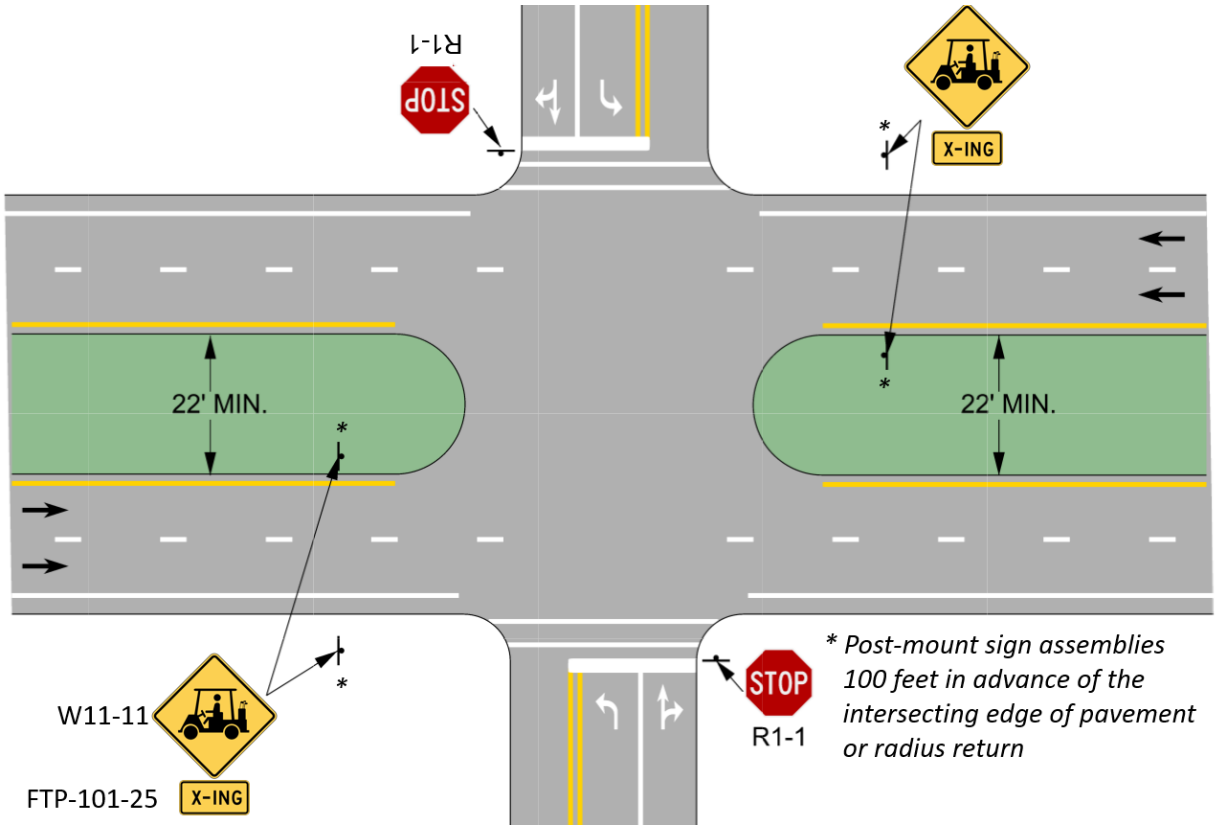
- Side street vehicular volume of 1,200 ADT or less.
- Side street vehicular volume of 110 vehicles per hour or less per approach during the AM and PM peak hours.
- Side street approaches have an exclusive left-turn lane.
    - Side street alignment angle to the mainline tangent is 90 degrees (±15 degrees).
    - Offset intersections are not considered for golf cart crossings.
- Crossing distance for undivided roadways is three lanes or less, excluding right-turn lanes, bike lanes, and crosswalks (***Figure 5.1-3***). For divided roadways of four lanes or fewer, a 22-foot minimum median width is required.
- Main street's posted speed limit is 35 mph or less.
- Place *GOLF CART* signs (***W11-11***) and *X-ING* plaque (***FTP-204-25***) on the mainline approach, as shown in ***Figure 5.1-3*** and ***Figure 5.1-4***.

Figure 5.1-3. Stop-Controlled Crossing



Note: *See FDOT Standard Plans, Index 711-001 for pavement marking application details*

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

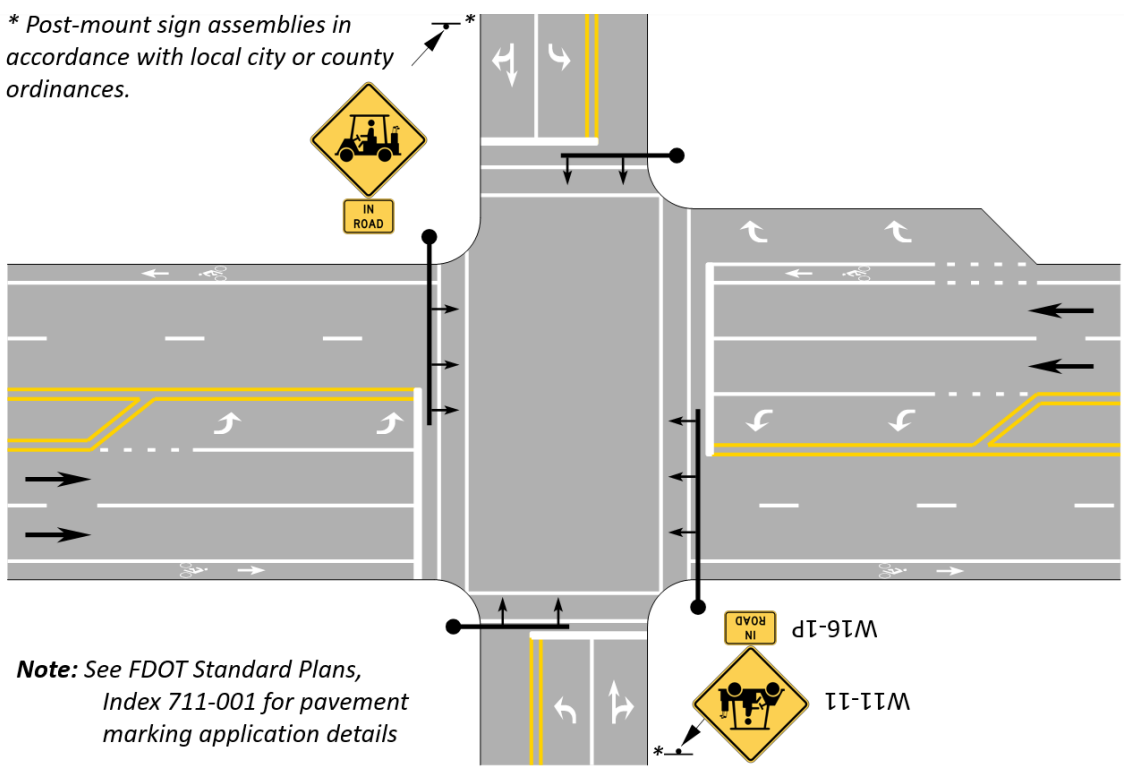


5.1.5.3 Signalized Intersections

Golf cart crossings at signalized intersections must meet the following criteria:

- Side street vehicular volume of 1,500 ADT or less.
- Side street vehicular volume of 200 vehicles per hour or less per approach during the AM and PM peak hours.
- Side street posted speed limit is 35 mph or less.
- Side street approaches have an exclusive left-turn lane.
- Side street alignment angle to the mainline tangent is 90 degrees (±15 degrees).
- Offset or T-intersections are not considered for golf cart crossings. A proposed fourth leg at signalized T-intersections for exclusive golf cart use will not be considered.
- Crossing distance is five lanes or less, excluding right-turn lanes, bike lanes, and crosswalks.
- Golf carts are not allowed to use crosswalks or sidewalk ramps to cross the mainline.
- Place *GOLF CART* signs (***W11-11***) and *IN ROAD* plaques (***W16-1P***) on the side street approach, as shown in ***Figure 5.1-5***.

Figure 5.1-5. Traffic Signal Controlled Crossing



5.1.6 OPERATION OF GOLF CARTS ON SIDEWALKS

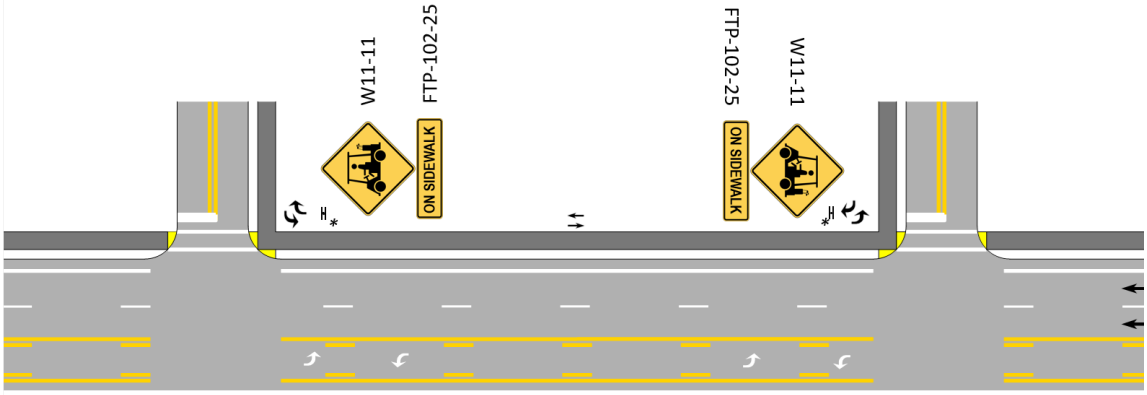
Title 23 of the United States Code, Section 217 prohibits using motorized vehicles, such as golf carts, on existing and proposed non-motorized trails and pedestrian walkways that use federal transportation funds. However, exceptions can be authorized through a framework developed by the Federal Highway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

5.1.6.1 Safety and Operational Recommendations

Consider the following when requesting approval of golf cart operation on sidewalks adjacent to a state road by local government ordinance:

- Golf carts are only allowed to access state-maintained sidewalks from sidewalks along county- or city-maintained side streets intersecting the state road. Provide a minimum unobstructed sidewalk width of 8 feet; separation from the back of curb or edge of shoulder by at least 5 feet is recommended.
- Per ***Section 316.212, F.S.***, golf carts' speeds are not to exceed 15 mph when operated on sidewalks.
- Golf carts are not allowed to access state-maintained sidewalks using curb ramps. FDOT will not approve golf cart crossings on a state road from county- or city-maintained streets or sidewalks to state-maintained sidewalks.
- Provide a minimum 4-foot width of grassed or stabilized, relatively flat area beyond the outside edge of sidewalks for recovery or stalled golf carts. Do not include adjacent drainage features or fencing as part of the minimum requirement.
- Terminate golf cart operation on state-operated sidewalks at a connecting county- or city-maintained sidewalk.
- Install *GOLF CART* signs *(**W11-11**)* and *ON SIDEWALK* plaques (***FTP-205-25***) along state-operated sidewalks, as shown in ***Figure 5.1-6***.

Figure 5.1-6. Golf Cart Operation on Sidewalks



** Post-mount double-sided sign assemblies at 200-foot intervals.*
Use the same configuration at T-intersections and driveways.

Section 5.2

CROSSWALK TREATMENTS AT MIDBLOCK LOCATIONS AND UNSIGNALIZED INTERSECTIONS

5.2.1 PURPOSE

This section establishes criteria and guidelines for installing and operating pedestrian treatments at midblock locations and unsignalized intersections on the State Highway System. Treatments can include marked crosswalks, signs, beacons, and signals, among other traffic control devices. Crosswalk details at roundabouts can be found in the ***FDOT Design Manual (FDM) Chapter 213.***

5.2.2 GENERAL

A crosswalk is a designated location for pedestrians to cross a roadway that helps concentrate crossing activity. Crosswalks and other pedestrian treatments at midblock locations and unsignalized intersections are designed to enhance pedestrian connectivity, reduce confusion, and decrease the number of unpredictable crossings, reducing the number of collisions between pedestrians and motorists.

Consider context classification and documented pedestrian demand when deciding whether to install a crosswalk at a midblock location or an unsignalized intersection. Pedestrians risk crossing at unmarked locations when the nearest controlled crossing feels far away. They may cross unexpectedly, creating unexpected crossings and increasing the potential for crashes. Adding marked crosswalks and other supplemental treatments at these locations may be appropriate.

Supplemental signage can improve safety and compliance at marked crosswalks regardless of the control type. Crosswalk design treatments, including refuge islands, curb extensions, street lighting, and raised crosswalks, also support pedestrian visibility and safety. ***Table 5.2-1*** summarizes some of these treatments and their application.

Despite their safety and connectivity benefits, crosswalks are not suitable for all locations. Before requesting to install a crosswalk on a state road, evaluate the context classification and expected levels of pedestrian crossing demand, the safety characteristics of the crossing location, and design considerations for the crossing control type.

5.2.3 DEFINITIONS

Alternative Pedestrian Crossing Location: A controlled crossing with a *STOP* sign (***R1-1***), traffic signal, or grade-separated pedestrian bridge or tunnel.

Average Day: A day with traffic volumes normally and repeatedly found at an intersection or location. Weekdays, with volumes influenced by travel to and from work, and weekend

days, with volumes influenced by entertainment or recreation, represent two types of average days. Weather is also a factor to consider.

Context Classification: Description of a roadway's general land use characteristics, development patterns, and roadway connectivity. Roadways are designed to match the characteristics and demands of their context classification. See ***FDM 200*** for additional information.

Controlled Approach: All directional traffic lanes moving toward an intersection or a midblock location (including adjacent parking lanes) controlled by a sign, traffic signal, marking, or other traffic control device.

In-Roadway Warning Lights (IRWLs): A traffic control device installed on the roadway surface to warn users they are approaching a condition on or adjacent to the roadway that might not be readily apparent and require the road user to slow down or stop.

Marked Crosswalk: A portion of a roadway segment designated as a pedestrian crossing by pavement markings. Marked crosswalks guide pedestrians, define and delineate crossing paths, and define intersections. Pavement markings may be supplemented by contrasting pavement structure, style, or color.

Midblock Crosswalk: A location with a marked crosswalk (signalized or unsignalized) between intersections.

Midblock Pedestrian Signal (MPS): A hybrid non-motorist-actuated traffic control device that alternately directs traffic to stop and flashes a *RED* indication during the pedestrian clearance interval. This traffic control device is currently under an FHWA Request to Experiment (RTE) and requires prior approval coordinated through the State Traffic Engineering and Operations Office before installation.

Midblock Traffic Control Signal: A non-motorist-actuated traffic signal used to warn and control traffic at midblock crosswalks.

Passive Detection: A system that detects the presence and direction of non-motorists and activates the traffic control device without manual actuation.

Pedestrian Attractor: A residential, commercial, office, recreational, or other location that is expected to be a destination for pedestrian trips.

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

Pedestrian Hybrid Beacon (PHB): A non-motorist-actuated traffic control device used to warn and control traffic at an unsignalized location when pedestrians cross a marked crosswalk. It is also known as a High-Intensity Activated Crosswalk (HAWK). A PHB is typically installed on mast arms above the controlled roadway. The PHB faces consist of three signal sections: two horizontally aligned circular red indications and a circular yellow

indication centered below. A PHB installation requires a minimum of two faces for each major street approach.

Rectangular Rapid Flashing Beacon (RRFB): A non-motorist-actuated traffic control device with two rapidly and alternately flashing rectangular yellow indications 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. A shared-use path can be located within the right-of-way or have an independent alignment. Shared-use paths are used by pedestrians (including skaters, users of manual and motorized wheelchairs, and joggers), bicyclists, and other authorized users.

Two-Stage Pedestrian Crossing: A marked crosswalk with a median refuge island and an RRFB, PHB, MPS, or midblock traffic control signal. A two-stage pedestrian crossing may have less impact on vehicle delay than a single-stage crossing since the traffic control device serves each direction independently, while the median allows pedestrians to pause midway before completing their crossings.

Uncontrolled Approach: All directional traffic lanes moving toward an unsignalized intersection or a midblock location (including any adjacent parking lane) that are not controlled by signs, signals, markings, or other traffic control devices.

Unmarked Crosswalk: The legal crossing area at an intersection connecting opposite sides of the roadway without pavement markings or signs.

Unsignalized Intersection: An at-grade junction of two or more public roads where a traffic signal does not control the right of way for motorists, bicyclists, or pedestrians.

5.2.4 PROCEDURE

These procedures apply to midblock and unsignalized intersection marked crosswalks:

- Contact the ***District Traffic Operations Office*** to request an evaluation of a marked crosswalk or other treatments.
- The ***DTOE*** reviews and approves proposed marked crosswalks or treatments at midblock locations or unsignalized intersections on the State Highway System.
- For existing midblock or unsignalized intersection marked crosswalks, conduct an engineering study or warrant analysis to justify installing midblock traffic control signals or PHBs. Refer to ***TEM 5.2.5*** for guidance.
- Before approving a proposed marked crosswalk or treatment for an existing crosswalk, the ***District Traffic Operations Office*** will coordinate with the local agency responsible for the maintenance agreement.

5.2.5 SELECTION CRITERIA

5.2.5.1 Marked Crosswalk

Validate the need for marked crosswalks at midblock and uncontrolled approaches with an engineering study. When available, review the local strategic plan for non-motorist connectivity needs. Consider marked crosswalks under the following conditions:

- Proximity to significant pedestrian generators and attractors
    - Midblock locations or uncontrolled approaches 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
        - A well-defined pattern of existing pedestrian crossings
- Identify and document pedestrian generators and attractors in an engineering study to illustrate potential pedestrian routes in relation to proposed marked crosswalk locations, as described in ***TEM 5.2.6***.
- Recommended Levels of Pedestrian Demand
- The pedestrian volume threshold for a proposed 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 using the methods outlined in ***TEM 5.2.6***.
    - Pedestrian volume demand data is not needed under school zones or under the following Context Classifications:
    - C2T - Rural Town
    - C3C - Suburban Commercial
    - C4 - Urban General
    - C5 - Urban Center
    - C6 - Urban Core
- Shared-use path connection at midblock locations or unsignalized intersections
    - Supports the use of a shared-use path
    - Proposed marked crosswalks connecting to a shared-use path may apply a 50 percent reduction to the recommended levels of pedestrian demand
    - Review the local strategic plan when proposing crossing locations
- Nature-based trail crossings
    - Before the ***DTOE*** approves a new nature-based trail crossing, they should evaluate whether installing the crossing on the State Highway System is appropriate

- See ***TEM 2.33*** and ***FDM 230*** for additional information on nature-based trail crossings
- Minimum Location Characteristics
- Vehicular volume of 2,000 ADT or greater along the roadway segment
    - The distance between the proposed marked crosswalk and the nearest existing intersection or crossing is 300 feet or greater per FDM 222
        - FDOT may consider a proposed crossing location between 100 and 300 feet from an alternative crossing if it is more practical for non-motorist use; document this justification in the engineering study
- Adjacent signalized intersection
    - The proposed location is outside the influence area of adjacent signalized intersections, including the limits of turn lanes

5.2.5.2 Beacons and Signals

Use yellow flashing beacons to make standard signs more conspicuous, in accordance with ***MUTCD Section 2A.11***.

Rectangular Rapid Flashing Beacon (RRFB)

Limit RRFB use to roadways with the following conditions:

- Posted speed limit of 35 mph or lower
- Marked crosswalks with special emphasis pavement markings
- Four through lanes (both directions) or less regardless of median presence, or five lanes with a median refuge island. For facilities with five lanes, including a two-way left-turn lane, a refuge island or raised median must be present for RRFB application.

For use of RRFBs at locations that do not meet the minimum requirements stated above, obtain approval for a variation from the ***State Traffic Engineering and Operations Office***. Include the following information in the request for variation:

- AADT
- Sight distance
- Speed data
- Five years of crash data
- Supplemental information, including location description, Context Classification, and observations

Pedestrian Hybrid Beacon (PHB)

When installing a PHB, place it at least 100 feet away from side streets or driveways controlled by *STOP* (***R1-1***) or *YIELD* (***R1-2***) signs. Install *STOP HERE ON RED (**R10-6a**)* and *CROSSWALK - STOP ON RED (**R10-23**)* signs to inform drivers of the crossing. Avoid installing PHBs at intersections.

If the location is less than 100 feet from side streets or driveways controlled by a stop sign, install additional treatments to reduce the risk of pedestrian-vehicle conflicts. Side street and driveway treatments may include blank-out signs, static signs, and pavement markings.

Consider installing a PHB when an engineering study, per ***MUTCD Section 4J.01***, identifies the following conditions:

- Where a midblock traffic control signal is not justified under ***MUTCD Chapter 4C*** signal warrants and gaps in traffic are not adequate to permit pedestrians to cross.
- Where the approaching vehicle speed on the major street is too high to permit pedestrians to cross.
- Where pedestrian delay is excessive.

See ***MUTCD Chapter 4J*** for PHB volume guidance. This guidance is summarized in ***Figure 5.2-1***. At a location under C2T, C4, C5, or C6 context classification that meets the PHB warrants stated above, the PHB may be substituted with a midblock traffic control signal using ***MUTCD Warrant 8, Roadway Network***.

Follow ***MUTCD Section 4J.02*** for a PHB sequence; ***MUTCD Figure 4J-3*** provides a visual of the PHB sequence.

- Keep the signal dark outside the activation window.
    - 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 and a maximum of 6 seconds (see ***MUTCD Section 4F.17***). Use longer intervals on approaches with higher speeds.
    - Make the minimum duration of steady red equal to the pedestrian walk interval.
- Make the duration of the alternating flashing red equal to the pedestrian clearance interval.
- Guidance for these intervals is provided in ***MUTCD Section 4J.03***.

Midblock Traffic Control Signal

To provide a safe pedestrian crossing, traffic control signals at midblock crosswalks must be positioned at least 300 feet away from side streets or driveways with *STOP* (***R1-1***) or *YIELD* (***R1-2***) signs. For midblock crosswalks over 300 feet from the nearest signalized intersection, consider the distance to adjacent signals and available gaps for pedestrian crossing to determine whether a signal is required.

To meet the criteria for safe pedestrian crossing, traffic control signals at midblock crosswalks must comply with ***MUTCD Warrant 4, Pedestrian Volume***. ***Figure 5.2-1*** summarizes this warrant for **(a)** 35 mph or less and **(b)** greater than 35 mph roadways.

The minimum pedestrian volume threshold under ***MUTCD Warrant 4*** may be reduced:

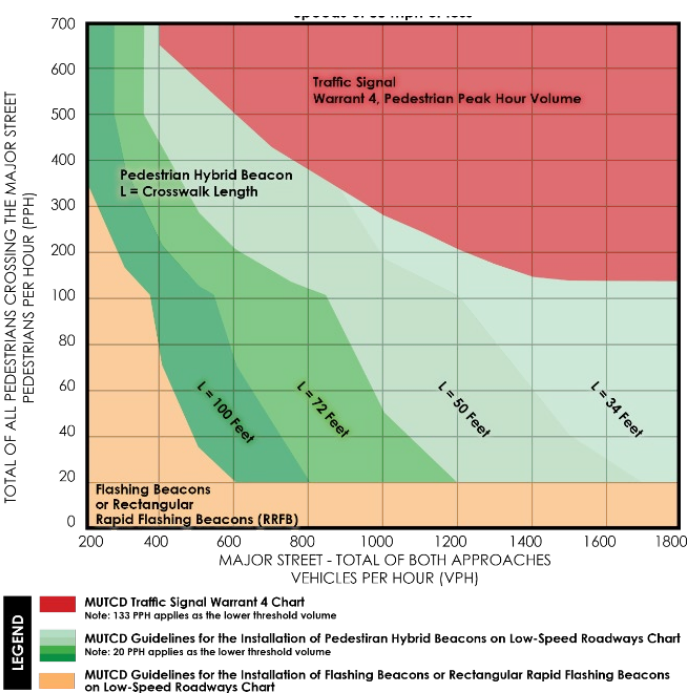
- Up to 50 percent when the 15th percentile crossing speed is below 3.5 feet per second.
- Up to 30 percent when the 85th percentile speed on the major street is greater than 35 mph or when the midblock crosswalk is in a built-up area of an isolated community with fewer than 10,000 inhabitants.

The 30 and 50 percent reductions can be combined if the corresponding criteria are met.

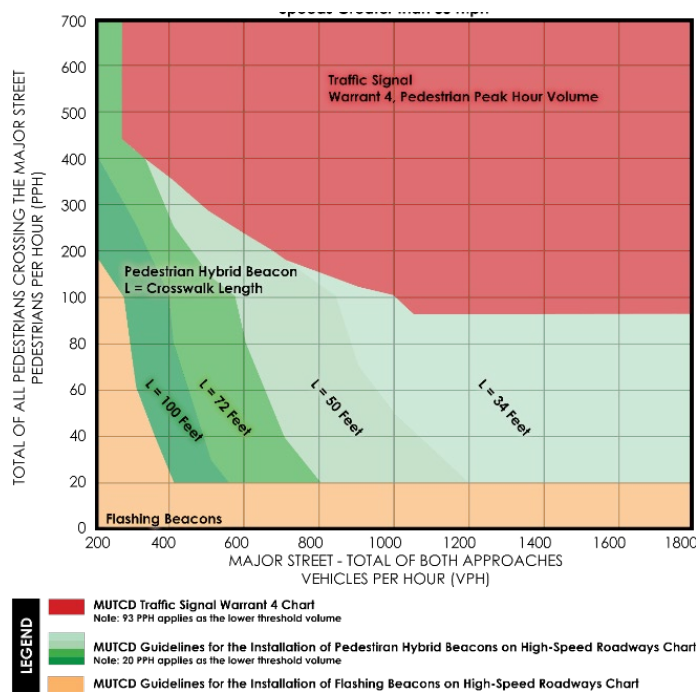
For details on requirements for traffic control signals at intersections, refer to ***TEM 3.3***.

Figure 5.2-1. Guidelines for the Installation of Pedestrian Treatments

(a) 35 mph or Less



***(b)* Greater than 35 mph**



5.2.6 ENGINEERING STUDY

Conduct an engineering study before installing a marked crosswalk or other pedestrian treatments at a midblock location or unsignalized intersection. The study should identify treatments based on pedestrian and vehicular volumes, roadway characteristics, and environmental factors documented in the study. Include the following information in the engineering study:

- Field data demonstrating the need for a marked crosswalk based on pedestrian volumes. See ***TEM 5.2.5.1*** for more information.
    - Base data collection on pedestrian volumes observed crossing the roadway outside a crosswalk at or in the vicinity of the proposed location. If applicable, a cyclist can be counted as a pedestrian.
    - See FDOT's ***Manual on Uniform Traffic Studies (MUTS)*** for additional information on obtaining pedestrian group size and vehicle gap size to assess opportunities for safe crossings. In addition, the ***FDOT TDA Non-Motorized Traffic Monitoring*** Dashboard may be used as a resource for volume data.
    - When recommending an RRFB, PHB, MPS (RTE approval required), or midblock traffic control signal, document the necessary location characteristics following ***TEM 5.2.5.2***.
- Field data to estimate individual pedestrian walking speeds, pedestrian speed cumulative curve, and the 15th percentile pedestrian crossing speed. ***MUTS Chapter 9*** provides additional information on the procedure and method for calculating the parameters of pedestrian walking speed.
- Potential links between pedestrian generators and attractors to confirm existing pedestrian crossing patterns. Generators and attractors should be identified on an aerial to illustrate potential pedestrian routes in relation to the proposed marked crosswalk location.
- Proximity to intersection conflict areas and safety considerations, including:
    - Stopping sight distance
    - Sidewalk connectivity
    - Adequate lighting and illumination levels at the crosswalk
    - Refuge island or raised median for roads with five or more lanes to facilitate two-stage crossing
    - Suitable bus stop location to minimize conflicts with transit vehicles
- Proposed crossing location and corresponding traffic control devices:
    - Provide a schematic layout over aerial imagery or survey to show the proposed signs, pavement markings, approach traffic control devices, other treatments (e.g., bulb-outs), and existing traffic control devices within the influence area of the proposed crosswalks.

- Treatments are dependent on site context, vehicle operating speeds, roadway cross-section, pedestrian volumes, and other variables. Treatments may include midblock traffic control signals or other warning devices to enhance driver-yielding behavior. Other treatments, such as median refuge islands, curb extensions, raised crosswalks, and supplemental signing and pavement markings, may also be applicable at some locations to reduce crossing distance and enhance pedestrian visibility. See ***TEM 5.2.7*** for treatment options and selection guidance.

- Document the latest five years of non-motorist-vehicle crashes in the vicinity of the proposed crosswalk, including frequency, crash type, lighting, and pavement conditions. Refer to the ***FDOT State Safety Office*** ***Crash Data Guidance*** for additional crash attribute considerations. Supplement the crash summary with any information regarding the nature of conflicts based on field observations.
- Transit route data and the location of transit stops in the vicinity of the proposed crosswalk.

Consider an alternative control strategy to resolve the need for an intersection or midblock crosswalk. FDOT's ***Manual on Intersection Control Evaluation*** offers a procedure and analysis tools for conducting alternative analyses at intersections.

5.2.7 TREATMENT OPTIONS

5.2.7.1 Pavement Markings

See ***Standard Plans, Index 711-001*** for pavement marking details.

Marked Crosswalks

Install special emphasis crosswalks at midblock crossings and uncontrolled approaches. Follow ***TEM 5.2.4*** procedure to install marked crosswalks on the State Highway System.

Install standard crosswalks at stop-controlled approaches, consistent with ***FDM 230***. An engineering study is not required to install standard crosswalks at stop-controlled approaches.

In-Pavement Warning Marking

In-pavement warning markings can supplement existing signage where high vehicular volumes and high operational speeds are reported approaching a marked crosswalk. These markings can use the *BICYCLE* (***W11-1***), *PEDESTRIAN* (***W11-2***), and *COMBINED BICYCLE / PEDESTRIAN* (***W11-15***) crossing symbols, as shown in ***Figure 5.2-2***.

Complete an engineering study and obtain ***DTOE*** approval to install the in-pavement warning markings. Once approved, coordinate installation with the District Maintenance Office.

Consider installing in-pavement warning markings when the following conditions are present at a marked crosswalk.

- Multi-lane roadway with a posted speed of 45 mph or greater
- Rural two-lane roadway with a posted speed of 50 mph or greater
- Crosswalks with restricted sight distance due to obstructions (e.g., trees).
- Reported behavior of drivers not yielding at the crosswalk.

When approved, install in-pavement warning markings as follows. For an example, see ***Figure 5.2-3***.

- Center the markings in the travel lane(s) on the approach to the crosswalk and in alignment with adjacent lanes when used on multi-lane approaches.
- Place no more than one set of markings on each approach and do not mix symbol and word in-pavement markings (see ***TEM 4.2***).
- Follow ***MUTCD Table 2C-3*** to determine how far in advance to place markings based on the posted or 85th percentile speed coming to a full stop.

Figure 5.2-2. In-Pavement Warning Marking Details

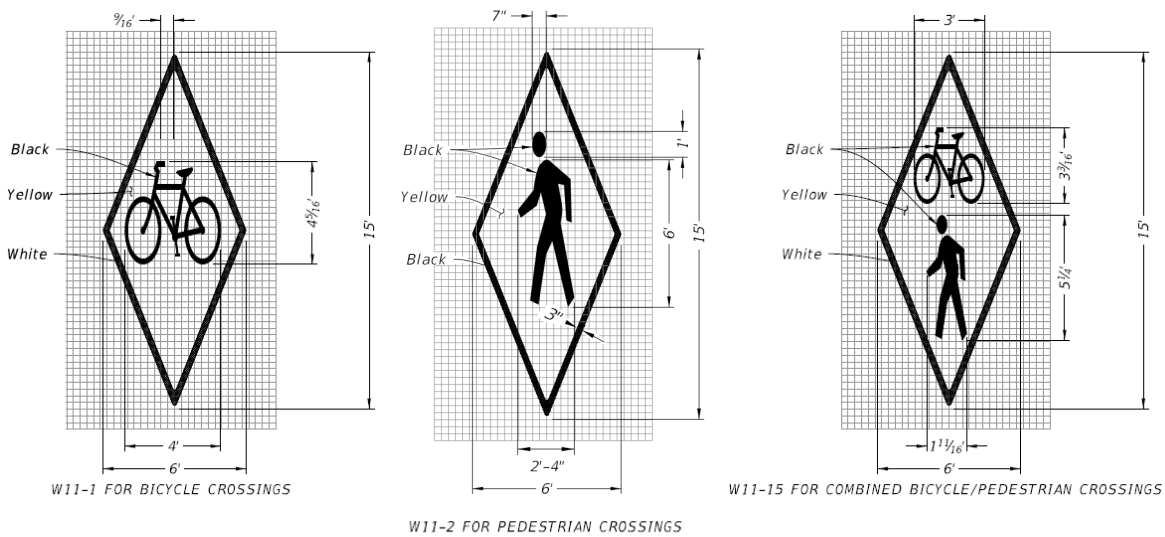


Figure 5.2-3. Pedestrian In-Pavement Warning (*W11-2*) Markings

5.2.7.2 Signs

The signs in this subsection may be installed at midblock crosswalks and unsignalized intersections to improve driver yielding and stopping behavior at marked crosswalks. See ***FDM 230*** for sign placement details. Sign details are available in the ***Standard Plans, Index 700-102*** and ***FDOT's Sign Library***.

For greater visibility, install highlighted signs and flashing beacons, as described in ***MUTCD Sections 2A.11 and 2A.12***.

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

On multilane approaches, add a stop line with the *STOP HERE FOR PEDESTRIANS* sign (***R1-5b***), as directed in ***MUTCD Section 2B.19***. Place the stop line 40 feet before the marked crosswalk. Parking is prohibited between the stop line and the marked crosswalk. Use a solid lane line between the stop line and the crosswalk.

Regardless of the number of lanes, use the *STOP HERE FOR PEDESTRIANS* sign (***R1-5b***) with the *PEDESTRIAN CROSSING* sign (***W11-2***) and diagonal downward arrow plaque (***W16-7P***), as shown in ***Figure 5.2-4***. Do not use the *STOP HERE FOR PEDESTRIANS* sign (***R1-5b***) with a traffic signal or PHB.

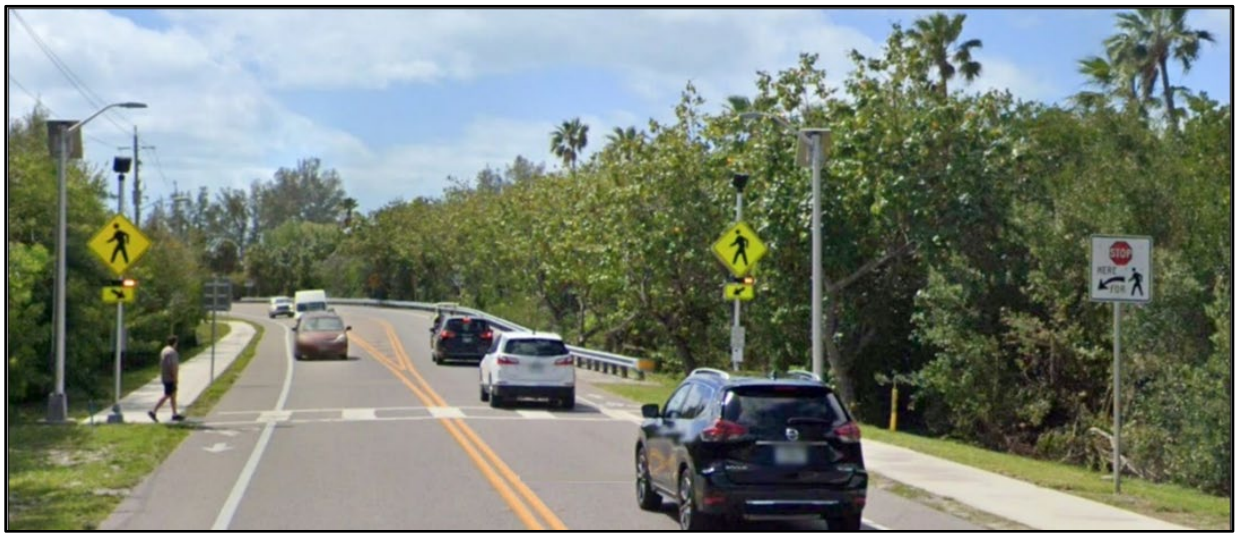
The *STOP HERE FOR PEDESTRIANS* sign (***R1-5b***) may be added at existing midblock crosswalks where motorists routinely fail to stop for pedestrians. Install as follows:

- One sign in each direction
- Install signs within 100 feet before the crosswalk
- Do not install these signs where they interfere with required signs

***STOP HERE FOR SCHOOL CROSSING* Sign (*R1-5c*)**

For school crossings, use the *STOP HERE FOR SCHOOL CROSSING* sign (***R1-5c***) with the *SCHOOL* sign (***S1-1***) instead of the *STOP HERE FOR PEDESTRIANS* (***R1-5b***) and *PEDESTRIAN CROSSING* (***W11-2***) signs.

Figure 5.2-4. RRFB with *STOP HERE FOR PEDESTRIANS* (*R1-5b*) and *PEDESTRIAN CROSSING* (*W11-2*) Signs



IN-STREET PEDESTRIAN CROSSING Sign (*R1-6a*)

IN-STREET PEDESTRIAN CROSSING signs (***R1-6a***) are useful on low-speed roadways to remind drivers of right-of-way laws at midblock or unsignalized crosswalks. See ***Figure 5.2-5***. Engineers may use the *IN-STREET PEDESTRIAN CROSSING* sign ***FTP-029-25*** in lieu of ***R1-6a*** at locations with constrained geometric conditions. Use these signs on roadways with four or fewer through lanes and a posted speed of 35 mph or less.

Coordinate with the District Maintenance Office prior to requesting ***DTOE*** approval to use this sign type.

Do not post mount *IN-STREET PEDESTRIAN CROSSING* signs (***R1-6a*** or ***FTP-029-25***). Place them in one of the following locations:

- On a two-way road, place the sign in the roadway at the marked crosswalk location on the centerline
- On a one-way road, place the sign on a lane line
- Place the sign on a median island as allowed by ***MUTCD Section 2B.20***

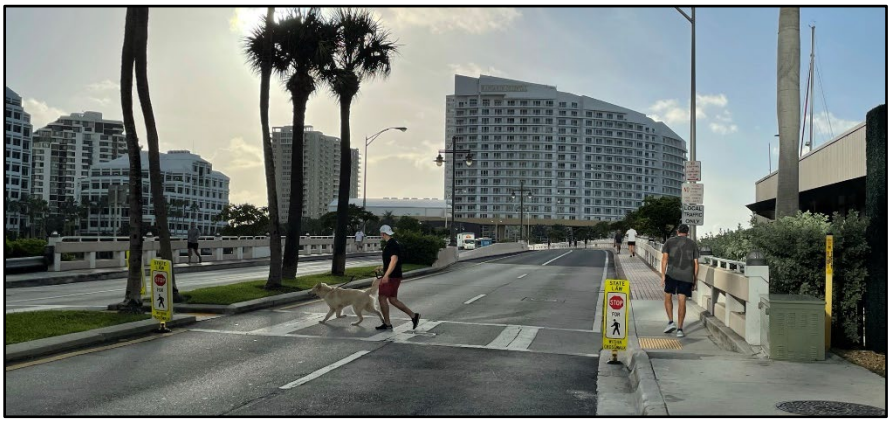
Tubular markers may be used to supplement *IN-STREET PEDESTRIAN CROSSING* signs (***R1-6a*** or ***FTP-029-25***) either on the centerline, lane line, or median island. When used, tubular markers should not be installed on the same pavement marking line as the sign. Match tubular marker color to the pavement marking they supplement, in accordance with ***MUTCD Section 3I.01***.

IN-STREET PEDESTRIAN CROSSING signs (***R1-6a*** or ***FTP-029-25***) on lane lines may be substituted for tubular markers to reduce maintenance and replacement costs from motor vehicle impacts. For further guidance on tubular marker substitution, see ***TEM 5.2.7.2***.

IN-STREET SCHOOL CROSSING Sign (*R1-6c*)

For school crossings, use the in-street *SCHOOL CROSSING* sign (***R1-6c***) instead of the *IN-STREET PEDESTRIAN CROSSING* sign (***R1-6a***).

Figure 5.2-5. *IN-STREET PEDESTRIAN CROSSING* (*R1-6a*)

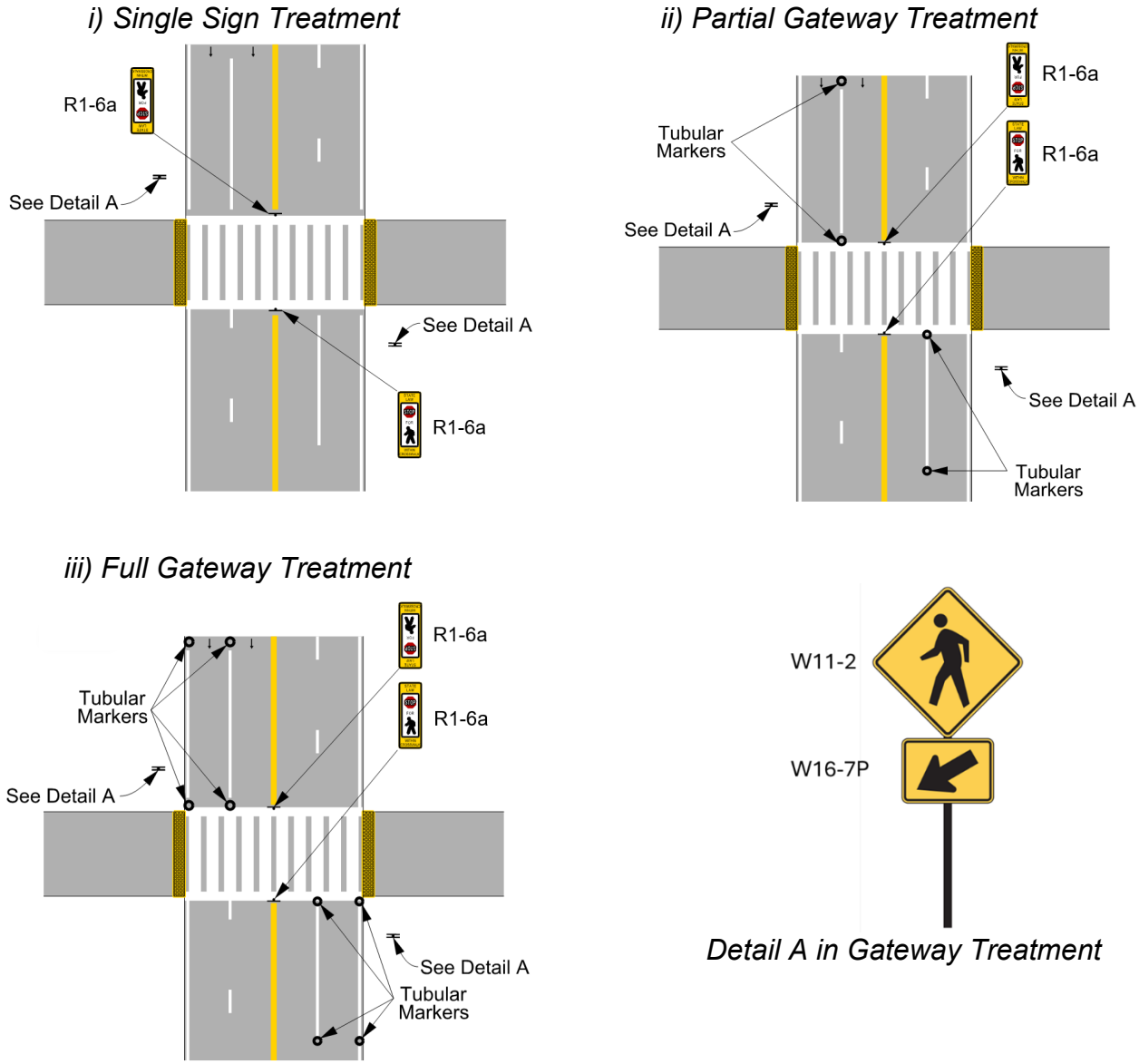


Tubular Marker Gateway Treatment

To further emphasize the midblock pedestrian crossing and to channelize and potentially calming traffic, supplement *IN-STREET PEDESTRIAN* and *SCHOOL CROSSING* signs (***R1-6a*** and ***R1-6c***) with tubular markers on the lane lines or edge lines. See **Figure 5.2-6** for illustrations of tubular markers used to supplement *IN-STREET PEDESTRIAN CROSSING* signs (***R1-6a***).

Tubular markers can supplement the ***R1-6*** gateway treatment per FHWA ***Official Ruling 3(09)-61 (I) – Channelizing Devices at Midblock Pedestrian Crossings in Conjunction with IN-STREET PEDESTRIAN CROSSING (R1-6 Series) Signs***.

Figure 5.2-6. R1-6 Gateway Treatments with Tubular Markers



STATE LAW STOP FOR PEDESTRIANS IN CROSSWALKS Sign (*FTP-030-25*)

Install the *STATE LAW STOP FOR PEDESTRIANS IN CROSSWALKS* Sign *(FTP-030-25)* sign at marked, unsignalized crosswalks.

5.2.7.3 Beacons (Signal Warrant Analysis Not Required)

If a location does not meet the requirements for traffic signals or PHBs, engineers can use other pedestrian-activated devices to warn drivers and draw attention to people using marked crosswalks. Other treatments not listed here may be appropriate depending on the site's features.

Rectangular Rapid Flashing Beacons (RRFB)

RRFBs are activated by crosswalk users and installed in pairs below the *PEDESTRIAN CROSSING* sign (***W11-2***) and above the diagonal downward arrow plaque (***W16-7P***) for post-mounted RRFBs. They flash when activated by a non-motorist.

At school or trail crossings, a *SCHOOL CROSSING* sign (***S1-1***) or *TRAIL CROSSING* sign (***W11-15***) may be installed with RRFBs instead of a *PEDESTRIAN CROSSING* sign (***W11-2***).

Mount a pedestrian instruction sign (***FTP-033-25***) adjacent to the RRFB or integrate it with the corresponding pedestrian push button. Sign details are available in the ***Standard Plans, Index 700-102***. The instruction sign has a three-line legend, as shown in ***Figure 5.2-7***.

Figure 5.2-7. RRFB Push-Button Sign (*FTP-033-25)*

Install RRFB push buttons with 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***.

On multilane undivided roadways, consider installing overhead RRFBs unless design constraints or engineering documentation preclude overhead installation. Overhead RRFBs enhance visibility for approaching drivers and align with the installation of overhead school zone warning signs on multilane roadways. When overhead RRFBs are used, combine these with ground-mounted devices when feasible.

Consider advance warning signs with RRFBs on multilane approaches, especially those with higher traffic volumes and speeds.

Detailed conditions of use, including sign/beacon assembly, dimensions, placement, and flashing rates, are provided in ***MUTCD Chapter 4L***. Refer to the following resources for more guidance on the RRFB design:

- ***Standard Plans, Index 654-001***
- ***FDM 941***
- ***Standard Specifications, Section 654***

Figure 5.2-8. Rectangular Rapid Flashing Beacons (RRFB)

Flashing Yellow Beacons

At locations where traffic signals are not warranted, engineers may consider installing a flashing yellow beacon to supplement the appropriate warning or regulatory signs at a marked crosswalk. See ***MUTCD Chapter 4S*** for a complete list of requirements. Refer to ***Standard Plans, Index 700-120*** for design and installation details.

A flashing yellow beacon may be overhead or post-mounted. Post-mounting the beacon is preferred as it may prevent confusing it with a flashing traffic signal.

- Install post-mounted flashing yellow beacons with two vertically aligned beacons operating in an alternating flash pattern.
- Pair overhead-mounted, flashing yellow beacons with an overhead *STOP FOR PEDESTRIANS* sign (***R1-9a***), continuously lit at night.

In-Roadway Warning Lights (IRWLs)

IRWLs are installed in the pavement to warn road users that they are approaching a condition that requires them to slow down or stop. Based on an engineering study, engineers may recommend installing IRWLs at uncontrolled marked crosswalks.

Operate IRWLs in a flashing pattern (50 to 60 flash periods per minute). When installing IRWLs with overhead or post-mounted LED-highlighted signs or flashing yellow beacons, match the flashing rates. See ***MUTCD Chapter 4U*** for detailed guidance on this treatment.

Consider installing IRWLs in locations where overhead lighting is not provided. Use the following criteria:

- Coordinate with the District Maintenance Office prior to seeking ***DTOE*** approval.
- 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 *STOP* signs (**R1-1**), *YIELD* signs (**R1-2**), or traffic control signals.
    - A Request to Experiment (RTE) approval from FHWA is required to install IRWLs with traffic signals or PHBs.

Include an ***FTP-033-25*** sign or a *PUSH BUTTON TO TURN ON WARNING LIGHTS* sign (***R10-25***) on non-motorist-actuated installations.

5.2.7.4 Beacons and Signals (Warrant Analysis Required)

Pedestrian Hybrid Beacon (PHB)

A PHB is a special type of hybrid beacon used to warn and control traffic at an unsignalized location to assist pedestrians in crossing a roadway at a marked crosswalk. Install PHBs only at marked crosswalks. See ***Figure 5.2-9*** for a PHB example. See ***MUTCD Chapter 4J*** for PHB guidance and criteria.

For six-lane roadways or crossing distances exceeding 80 feet, consider a two-stage pedestrian crossing with a 6-foot minimum median refuge island where a warranted PHB controls the marked crossing.

Include the *CROSSWALK, STOP ON RED, PROCEED ON FLASHING RED WHEN CLEAR* sign (***FTP-028-25***) or the *CROSSWALK, STOP ON RED* sign (***R10-23***) in PHB treatments.

Figure 5.2-9. Pedestrian Hybrid Beacons (PHB)

Midblock Traffic Control Signal

Where pedestrian volumes meet ***MUTCD Signal Warrant 4***, engineers may install a midblock traffic control signal, in accordance with ***MUTCD Section 4C.05, Warrant 4, Pedestrian Volume***. See FDOT's ***Manual on Uniform Traffic Studies (MUTS)*** for guidance on conducting Pedestrian Group Size and Vehicle Gap Size studies supporting the documentation for Warrant 4.

Coordinate with the District Access Management Review Committee and the ***DTOE*** when selecting signalized control for a pedestrian crossing.

Install a signal that is compatible with the existing signal system along the corridor.

For six-lane divided roadways or crossing distances exceeding 80 feet, consider a two-stage pedestrian crossing with a 6-foot minimum median refuge island, where a warranted traffic control signal controls the proposed marked crossing.

To improve pedestrian compliance at the crosswalk, install a feedback device with the traffic control signal push button to give them confirmation of their call. See ***TEM 3.7*** for information on the use of accessible pedestrian signals.

A traffic control signal may not be needed at a midblock location if adjacent coordinated traffic control signals consistently provide adequate gaps for pedestrians to cross the roadway.

See ***Standard Plans, Index 653-001*** for details on installing midblock traffic control signals. A midblock traffic control signal treatment example is shown in ***Figure 5.2-10.***

Figure 5.2-10. Midblock Traffic Control Signal

5.2.7.5 Other Treatments

In addition to pedestrian refuge islands, raised medians, curb extensions, and raised crosswalks (see ***Figure 5.2-11***), the following treatments enhance visibility, support pedestrian travel, and increase driver awareness of pedestrians at crossings. See ***FDM 222*** for pedestrian treatment design criteria. See ***FDM 202*** for other speed management treatments.

Figure 5.2-11. Raised Crosswalk

Crosswalk Illumination

For crosswalks serving environmentally sensitive areas or facilities that are open only during daylight hours, the engineer may omit lighting if ***DTOE*** approves. Consider IRWLs at crosswalk locations without illumination.

Provide crosswalk illumination in accordance with ***FDM 222*** and ***FDM 231***.

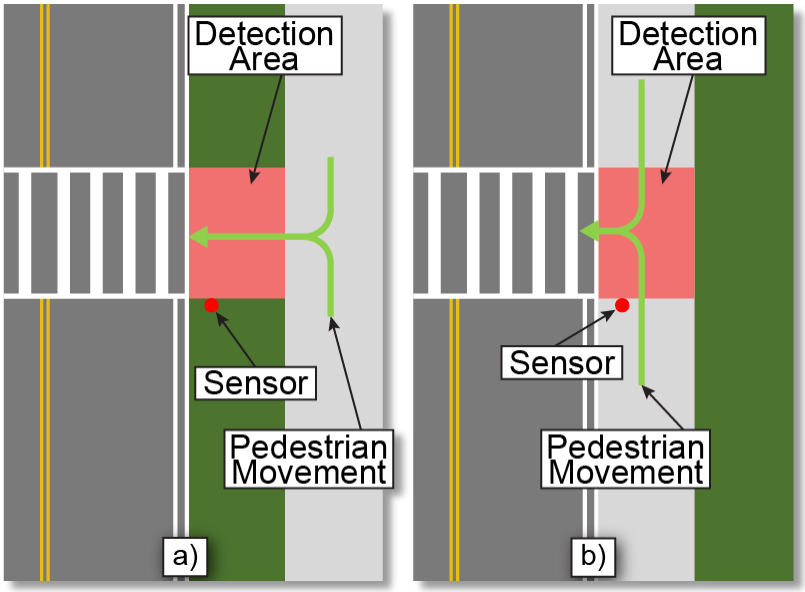
Passive Pedestrian Detection

Passive pedestrian detection is a system that detects the presence and direction of pedestrians and activates the traffic control device. This system does not require manual actuation. Consider passive pedestrian detection where low actuation (push-button activation) has been documented. Passive pedestrian detection implementation may be particularly beneficial for crosswalks used by children, teenagers, or older adults, and those at school crossings.

In addition to pedestrian actuation, engineers may install passive pedestrian detection at RRFBs, PHBs, MPSs (RTE approval required), and midblock traffic control signals. When installing passive pedestrian detection:

- Provide adequate passing width around the waiting detection area on the sidewalk.
- Install overhead lighting to increase pedestrian visibility and detector accuracy.
- Provide adequate installation height, detection distance, and detector position/angle to recognize pedestrian features.
    - If there are no existing poles or infrastructure at the site, consider a supplemental pole or an extended arm from an existing pole.
- Calibrate the detector after installation to cover the pedestrian waiting area.
- Place the detector facing the sidewalk, as shown in ***Figure 5.2-12***.
    - If possible, maintain a buffer between the sidewalk and the road. The space leading towards the crosswalk can be used as the detection area.
    - If the sidewalk is adjacent to the curb without any buffer, pedestrians walking past the crosswalk may trigger false detections. Consider this limitation when implementing passive pedestrian detection.
- For shared-use paths where bicyclists are to be detected:
    - Place the passive detection devices adjacent to the expected path of bicyclists.
    - Supplement the detection with signing and pavement markings to inform bicyclists where to wait.
    - At signalized shared-use path crossings, consider installing advance detection on the shared-use path approach to extend or actuate the signal phase and allow continuous through movements.
    - Certain loop configurations are better at detecting bicyclists than others. Consider the amount of metal in typical bicycles when designing loop detectors. Adjust the loop detectors' settings to accurately detect bicycles.

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



Raised Rumble Strips

Raised rumble strips, also known as transverse rumble strips, can improve driver awareness when placed ahead of rural stop-controlled intersections. Consider applying this treatment upstream of midblock crosswalks and unsignalized intersections where the other treatments described in this section have not improved driver-yielding behavior. Install raised rumble strips according to ***Standard Plans, Index 546-001*** and ***Standard Specifications, Section 546***.

Consider the following factors when installing transverse rumble strips near midblock or unsignalized crosswalks:

- Evaluate the noise impact that transverse rumble strips would have on nearby residential areas before installation.
- Coordinate with the District Maintenance Office prior to ***DTOE*** approval for using transverse rumble strips.
- There are two basic layouts for transverse rumble strips: extending across the entire traffic lane or placed only in the wheel tracks. The wheel track layout is preferred because it allows drivers who do not need any additional warning to avoid the rumbles without driving into adjacent lanes.
- Use the transverse rumble strips with *PEDESTRIAN CROSSING* signs (***W11-2***).

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***.

Table 5.2-1 has been designed to help engineers select treatment options. This matrix summarizes the procedures, selection criteria, and treatment requirements identified in ***TEM 5.2***.

5.2.9 OUTREACH COORDINATION

To promote smooth implementation in coordination with local agencies and law enforcement, follow these public notification procedures before installing a new RRFB, PHB, midblock traffic control signal, MPS (RTE approval required), flashing yellow beacon, or other midblock or uncontrolled crosswalk.

- Notify the District Public Information Office of the programmed treatment at least two weeks before activating the new traffic control device.
- Inform the District Community Traffic Safety Team (CTST) Coordinator about the new traffic control device. Request that they coordinate with local law enforcement, local government agencies, and the District Law Enforcement Liaison at least two weeks before activating the new traffic control device.

Portable Changeable Message Sign (PCMS)

Apply the following criteria when using a Portable Changeable Message Sign (PCMS):

- New RRFBs, PHBs, midblock traffic control signals, MPSs (RTE approval required), flashing yellow beacons, and any other type of midblock crosswalks require a PCMS to inform the traveling public of a new traffic control pattern.
- Display the following safety message on the PCMS:
  - *NEW SIGNAL mm/dd* or *NEW CROSSWALK mm/dd*
  - *PREPARE TO STOP*
- Deploy the PCMS two weeks prior to activating the new traffic control device and retain it in place for a minimum of one week after installing the marked crosswalk treatment.

Table 5.2-1. Guidance Matrix for Pedestrian Treatments at Midblock Crosswalks and Unsignalized Intersections

TEM 5.2 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							
			≤35 mph	40-45 mph	>45 mph	≤35 mph		All Speeds		
Pavement Markings	Special emphasis crosswalk	Midblock	M	M	M	M	M	M	M	
		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	N	N	R	N	N	N	
Emphasis / Enhancements	Audible message		N/A	N/A	N/A	M	M	N	N	
	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	**M**andatory if applied
R	**R**ecommended Option
O	**O**ptional
N	**N**ot to be Applied
N/A	**N**ot **A**vailable Option(1)

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

PEDESTRIAN AND BICYCLIST TREATMENTS ON MOVABLE BRIDGES

5.3.1 PURPOSE

This section establishes criteria and guidelines for the consistent installation and operation of pedestrian treatments on movable bridges. These treatments include swing-style pedestrian gates, signs, and advance detection systems such as LiDAR and thermal imaging cameras. See ***FDOT Structures Manual, Volume 1 - Structures Design Guidelines, Chapter 8.1.9*** for more design information.

5.3.2 GENERAL

Signs and swing-style pedestrian gates can significantly improve non-motorists' safety on movable bridges. Advance detection systems help bridge tenders detect non-motorists and prevent the bridge from opening when non-motorists are in the vulnerable zones of the movable span. See ***Figure 5.3-1*** for typical detection zones.

5.3.3 DEFINITIONS

Advance Detection System: A passive detection system that can identify, target, track, and alert if a moving or still person is spatially referenced within a predetermined area during any weather condition.

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 (Drawtender): Operator of the movable bridge according to U.S. Coast Guard regulations (***Code of Federal Regulations, Title 33, Section 117***) and ***Florida Statutes***.

Lift Bridge: A vertical-lift bridge, or just a 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. These include lift, bascule, and swing bridges.

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, usually at or near its center of gravity, and a swing span (turning span) that pivots horizontally around it.

Swing-Style Pedestrian Gate: A gate that opens and closes automatically by electronic, hydraulic, or mechanical means. Swing-style pedestrian gates open on the vertical axis, allowing them to swing toward or away from pedestrians.

Vulnerable Zones: Areas of high risk for pedestrians, bicyclists, and motorists during bridge openings.

5.3.4 TREATMENT OPTIONS

5.3.4.1 Swing-Style Pedestrian Gate

Install a swing-style pedestrian gate on a movable bridge in accordance with ***FDOT Structures Manual, Volume 1 - Structures Design Guidelines, Chapter 8.1.9***.

5.3.4.2 Signage

Install a *NO PEDESTRIANS OR BICYCLES BEYOND GATE* sign (***FTP-036-25***) on a movable bridge swing-style pedestrian gate as shown in ***TEM 2.6.7***. Sign details are available in the ***FDOT's Sign Library***.

5.3.4.3 Advance Detection Systems

These passive thermal or laser-based systems identify, target, track, and alert the bridge tender station if they detect pedestrians or bicyclists in the movable bridge's vulnerable zones.

- The thermal camera system is an advance detection system that uses infrared radiation to detect and locate objects with a heat signature.
- The LiDAR camera system is an advance detection system that uses **Li**ght **D**etection **a**nd **R**anging technology. It emits pulsed laser beams in a predetermined geographic space and measures the time taken for each pulse of laser light to be reflected from the environment and objects of interest, creating a 3D image of the target.

The sensor data from the advance detection system is processed by a computer in the bridge tender house with an uninterruptible power supply, and the feed is displayed. These systems, including all integrated components, are on the FDOT's ***Approved Products List (APL)***.

The ***DTOE*** approves the selection of the advance detection system technology. ***State Traffic Operations Engineer (STOE)*** approval is required to select technology not covered in this section.

Systems may include:

- Thermal camera, or LiDAR camera
- Controller or server cabinet
- Communication system (wired, 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

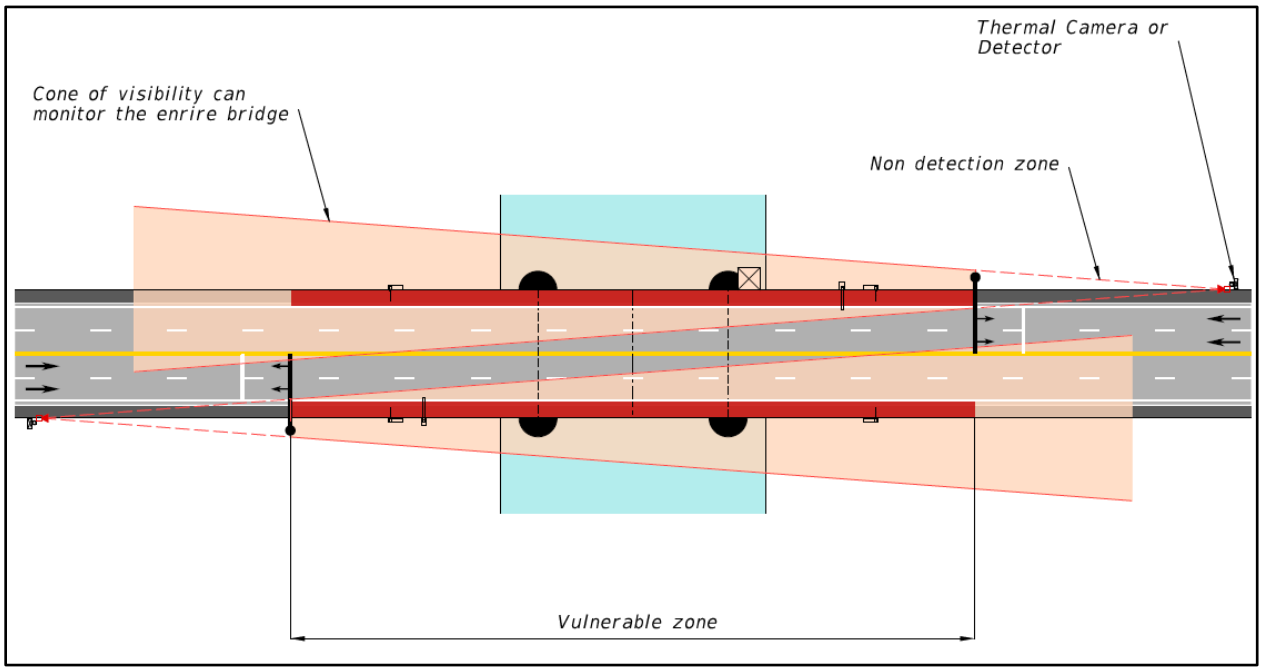



Figure 5.3-1. Typical Detection Zones