



Systems Implementation Office

# Statewide Access Management

WEBINAR SERIES

# Webinar Staff



Gina Bonyani



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Jenna Bowman



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# Agenda

How to Participate

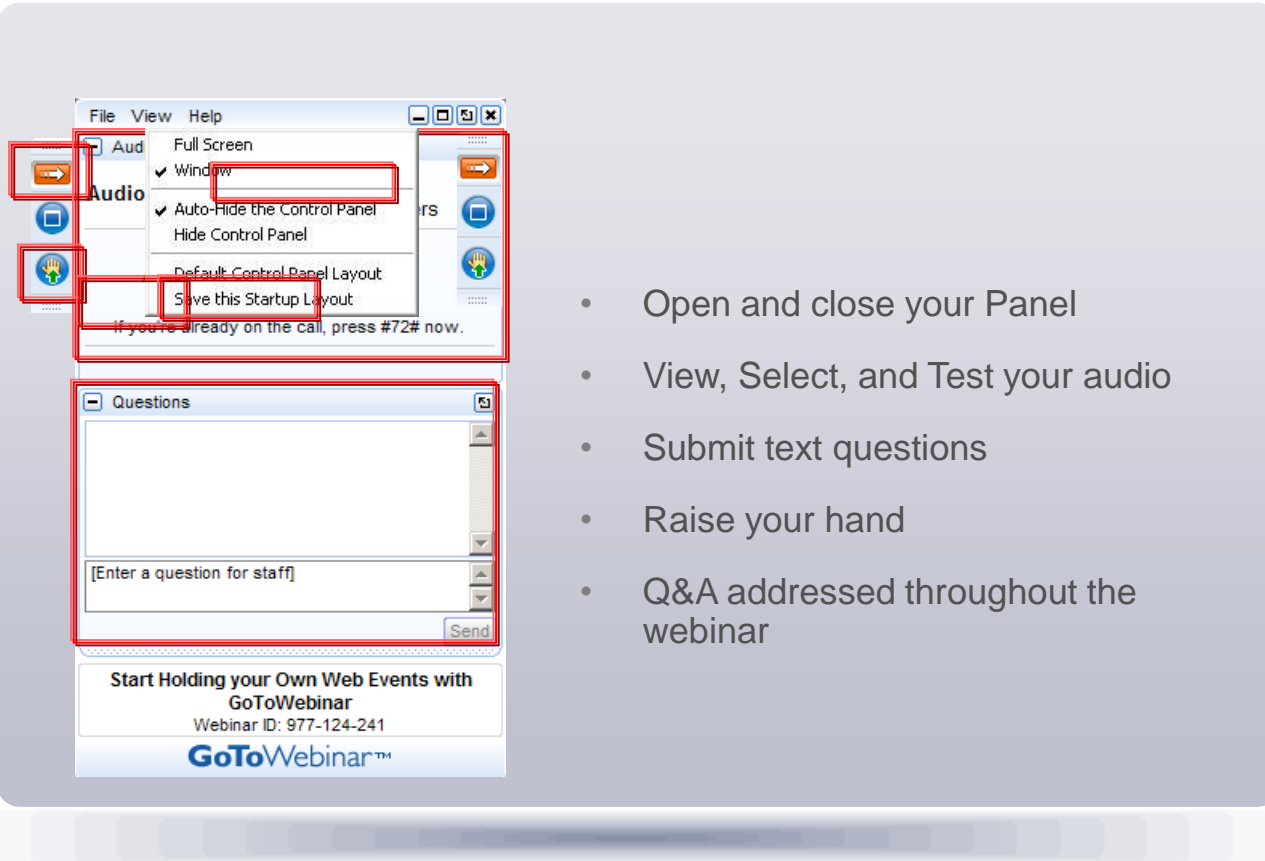
Credits and Webinar Material

STEP: Safety Transportation for Every Pedestrian

Questions

Contact Info

# How to Participate Today



The screenshot displays the GoToWebinar interface. The 'Audio' menu is open, showing options: 'Full Screen', 'Window' (checked), 'Auto-Hide the Control Panel' (checked), 'Hide Control Panel', 'Default Control Panel Layout', and 'Save this Startup Layout'. A red box highlights the 'Audio' button on the left. Another red box highlights the 'Window' option in the menu. A third red box highlights the 'Questions' panel below the audio menu. The 'Questions' panel has a text input field with the placeholder '[Enter a question for staff]' and a 'Send' button. At the bottom, there is a banner for 'Start Holding your Own Web Events with GoToWebinar' and the Webinar ID: 977-124-241.

- Open and close your Panel
- View, Select, and Test your audio
- Submit text questions
- Raise your hand
- Q&A addressed throughout the webinar





# Statewide Access Management

## — WEBINAR SERIES —

**The FDOT Access Management Webinar Series 2019-2020 have been scheduled for the following dates:**

Tue, Aug, 27, 2019 | 2:00PM - 3:30PM EDT

Tue, Nov 12, 2019 | 2:00PM - 3:30PM EST

Tue, Feb 11, 2020 | 2:00PM - 3:30PM EST

**NEXT! Tue, May 12, 2020 | 2:00PM - 3:30PM EDT**

# Learning Curve

FDOT's Systems Implementation Office is utilizing the **Learning Curve** system for participant communications and management of the Statewide Access Management Quarterly Webinar.



# Credits Information

- Credits will be distributed four to **five** business days after the webinar, through [Learning Curve](#).
  - PDH's Credits, AICP Credits Information, and Course Certificates
- Your participation will be recorded by [GoToWebinar](#).
  - You will need to attend to the **entire webinar** with the **unique link** provided by GoToWebinar.

# Webinar Material

- Webinar materials will be sent via the **Learning Curve System**.
- Recorded webinars and presentation material will be posted on the Systems Implementation Office website:
  - [Training & Webinars](#)
    - Access Management



**How familiar  
are you with  
STEP?**

Very Familiar

Somewhat Familiar

Not Familiar



# Statewide Access Management

## WEBINAR

### Today's Webinar

**Step: Safe Transportation for Every Pedestrian- How Florida is implementing Step**

Tuesday, February 11, 2019

2:00PM – 3:30 PM, EDT

Credits: 1.5

Speaker:

Joseph B. Santos, PE  
*FDOT Transportation Safety Engineer*





# : Safe Transportation for Every Pedestrian - How Florida is Implementing STEP



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# Presenter

Florida Department Of Transportation

- Joseph Santos, PE, State Safety Engineer, State Safety Office, aka “Joe Safe”



# Poll Slide

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What agency do you work for?

- a) Federal
- b) State
- c) County or City
- d) MPO
- e) Consultant

# Poll Slide

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What area of work do you specialize in?

- a) Design
- b) Traffic Operations
- c) Planning
- d) Maintenance
- e) Enforcement

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# Points of Contact

## Florida Department Of Transportation

- Alan El-Urfali, PE, State Traffic Services Program Engineer, Traffic Operations Office
- Gevin McDaniel, PE, Roadway Design Criteria Administrator, Roadway Design Office
- DeWayne Carver, AICP, State Complete Streets Program Manager, Roadway Design Office
- Mary OBrien, AICP, CPH, State Bicycle Pedestrian Coordinator, Roadway Design Office
- Jenna Bowman, PE, Systems Management Manager, Systems Implementation Office

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# Agenda Outline

- A. Welcome & Introductions
- B. Why STEP
- C. Crossing laws & principles
- D. Intro to FDOT standards
- E. Spectacular 7
  - 1. Visibility Enhancements
  - 2. Raised Crosswalks
  - 3. Pedestrian Refuge
  - 4. RRFB
  - 5. PHB/HAWK
  - 6. Road Diets
  - 7. LPI
- F. STEP Guide / Resources

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# What is “*Every Day Counts*”(EDC)?

State-based model to identify and rapidly deploy proven but underutilized innovations to:

- ✓ shorten the project delivery process
- ✓ enhance roadway safety
- ✓ reduce congestion
- ✓ improve environmental sustainability

- EDC Rounds: two year cycles
- 5<sup>th</sup> Round (2019-2020)

Other Safety EDC Innovations Current & Past:  
RRRDepartures, DDSAnalysis, RDiets, HFSTreatment,  
I&IGeometrics, SEdge



[https://www.fhwa.dot.gov/innovation/everydaycounts/edc\\_5/](https://www.fhwa.dot.gov/innovation/everydaycounts/edc_5/)



# Why is pedestrian safety and accessibility important?

Too many people dying on our roadways

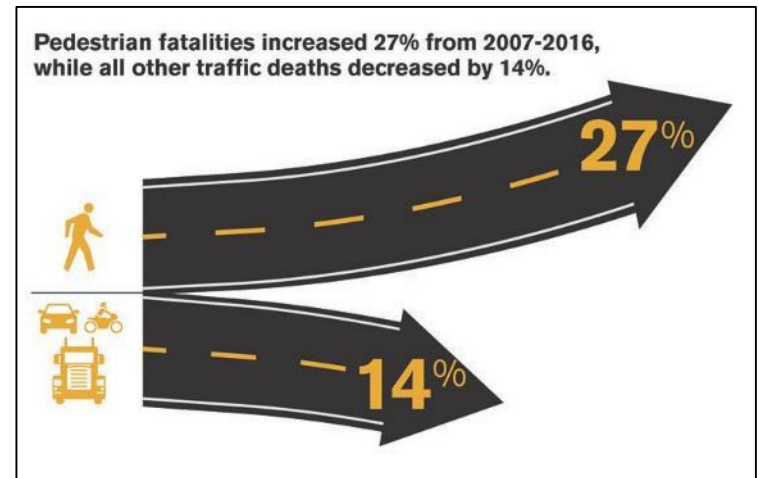


Photo Credit: GHSA

Pedestrians now account for a larger proportion of traffic fatalities (16%) than they have in the past 33 years

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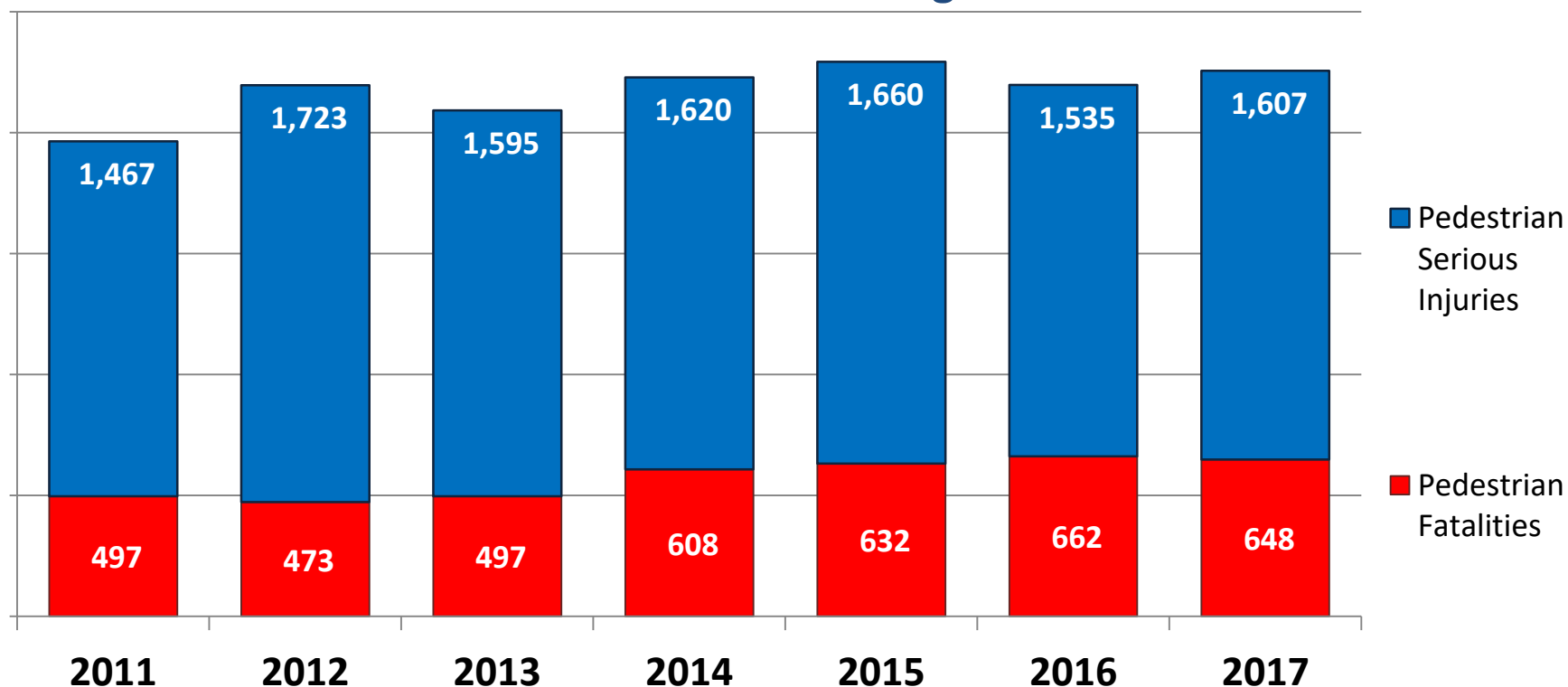
# NHTSA October 22, 2019 Press Release

- 2018 – 2.4% decline overall fatalities
  - 913 lives saved
  - 2018 - 36,560 people died
  - 2017 - 37,473 people died
- People who walk - more than 3.4% increase
  - 6,283 – deaths
  - most deaths since 1990

# Florida Data - Pedestrians

## Florida Annual Fatalities and Serious Injuries for Pedestrians

Statewide for 2011 through 2017



Counts from FDOT State Safety Office Crash Analysis and Reporting (CAR) system



# Poll Slide

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Who has been involved in a crash or knows someone involved in a crash?

- a) Yes
- b) No

# Why?



Because many people do not drive

# Why?



Because other modes depend on walking



# Why?



Because it's good for business – people walk into stores

# Why?



Photo Credit: Dan Burden

Because walking is healthy exercise



# Why?



Because we are all pedestrians

# So Therefore ...

All roads should be designed with the premise that there will be pedestrians, that they must be able to cross the street, and that they must be able to do it safely.

For transportation professionals, the question then becomes, “*How can this task best be accomplished?*”



- 
- ✓ Pedestrians are legitimate users of the transportation system and should be included as design users for all roads where peds are legally permissible.
  - ✓ Transportation agencies should consider pedestrian safety needs when designing roads.
  - ✓ Transportation agencies should consider pedestrian convenience (such as delay, travel distance, etc.) when designing and operating intersections and pedestrian crossing locations so that pedestrians may travel to their intended destinations without unreasonable delay.

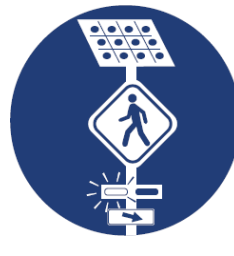
Discussion on if there are questions, concerns, obstacles to achieving, etc...



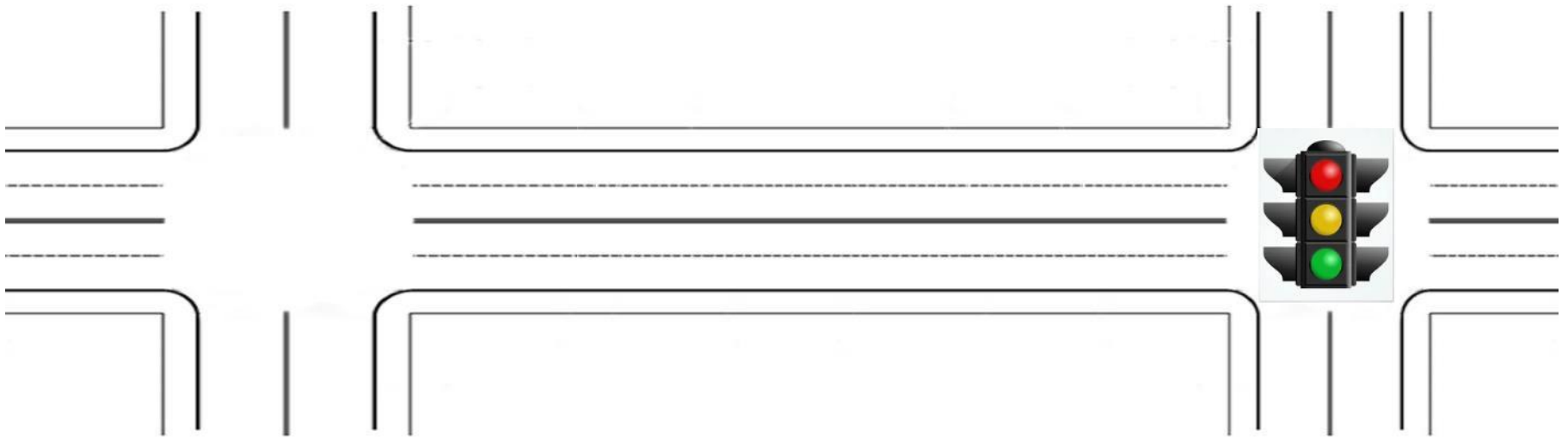


## Why STEP?

- More than **72%** of pedestrian fatalities occurred at non-intersection locations (mid-block)
- Roughly **27%** of pedestrian fatalities occurred at intersections



# What is the **STEP** innovation? Enhanced Crossings at Crossing Locations



## Question / Discussion:

How far are you willing to go out of your way for an “improved” crossing?

Would you walk: 25' 50' 75' 100' 125'



# Poll Slide

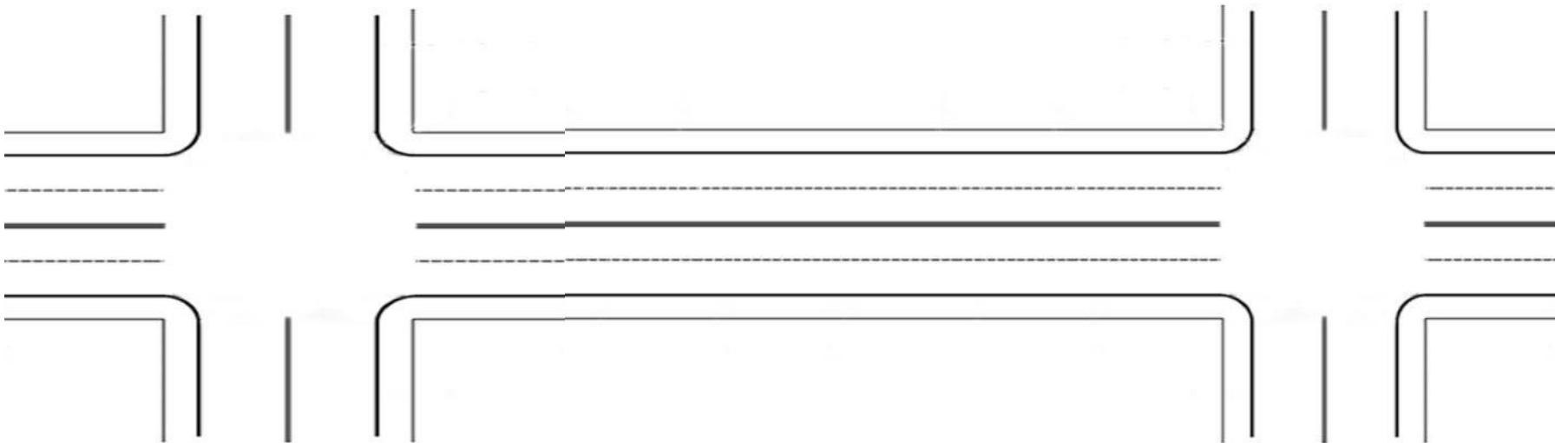
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How far are you willing to go out of your way for an “improved” crossing?

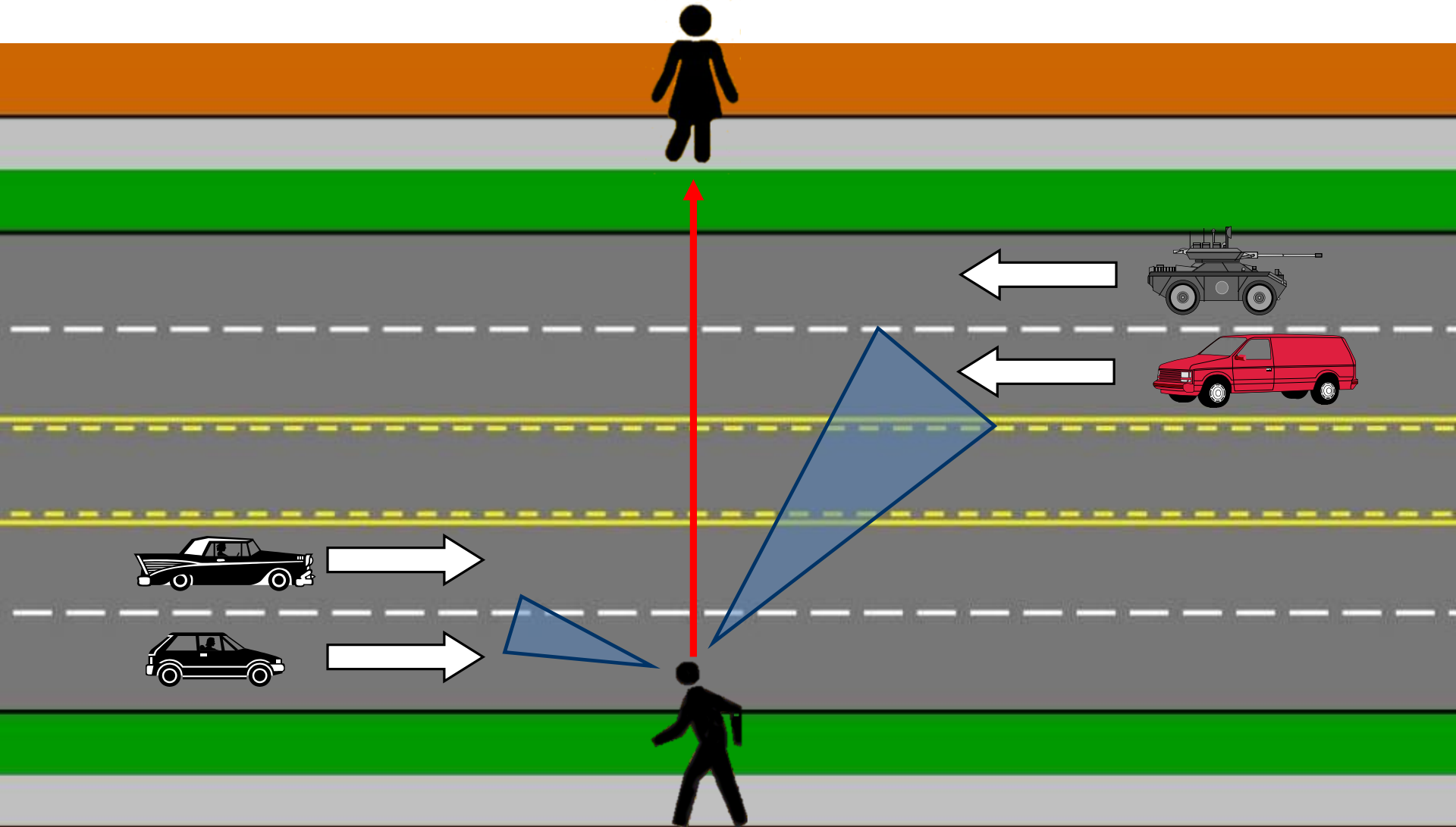
- a) 25'
- b) 50'
- c) 75'
- d) 100'
- e) 125'

# Midblock vs. Intersection

What is the relative risk of crossing midblock vs. crossing at an intersection?

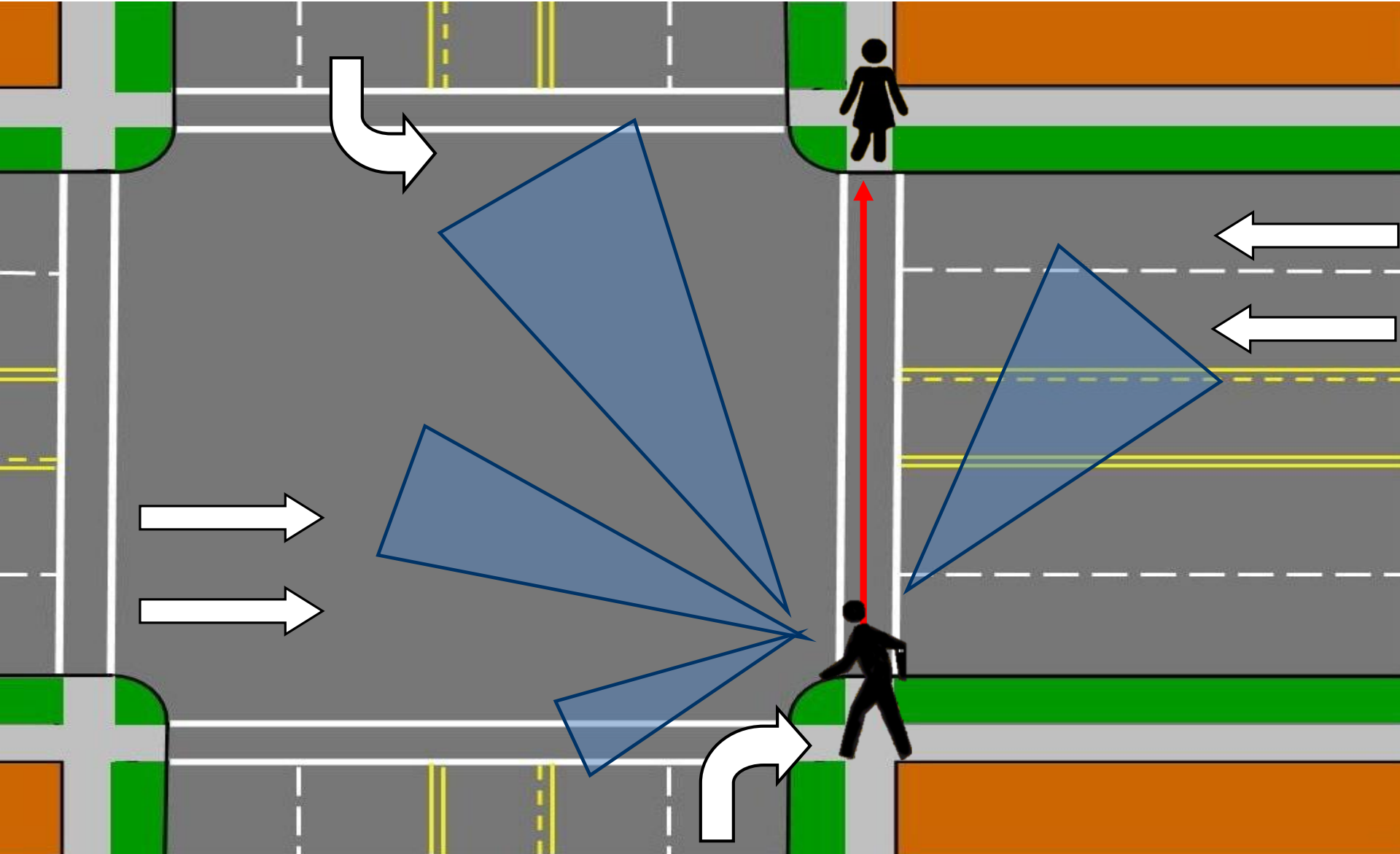


# Midblock: Pedestrian faces 2 directions of traffic





# Intersection: pedestrian faces other conflicts





# The 2018 Florida Statutes

## Title XXIII Chapter 316

### 316.130 Pedestrians; traffic regulations



# What is a crosswalk?

Florida Statutes Section 316.003 Defines a Crosswalk as:

- That part of a roadway at an intersection included within the connections of the lateral lines of the sidewalks on opposite sides of the highway, measured from the curbs or, in the absence of curbs, from the edges of the traversable roadway.
- Any portion of a roadway at an intersection or elsewhere distinctly indicated for pedestrian crossing by lines or other markings on the surface.

In simpler words:

- At an intersection, a crosswalk is defined as the extension of the sidewalk (or the shoulder) across the intersection, regardless of whether it is marked or not.
  - In most places it is legal for pedestrians to cross the street at any intersection (whether marked or not), unless the pedestrian crossing is specifically prohibited.
- The only way a crosswalk can exist at a midblock location is if it is marked.

## 316.130 Pedestrians; traffic regulations

(7)(a) The driver of a vehicle at an intersection that has a traffic control signal in place **shall stop** before entering the crosswalk and **remain stopped** to allow a pedestrian, with a permitted signal, to cross a roadway when the pedestrian is in the crosswalk or steps into the crosswalk and is upon the half of the roadway upon which the vehicle is traveling or when the pedestrian is approaching so closely from the opposite half of the roadway as to be in danger.

(b) The driver of a vehicle at any crosswalk where signage so indicates **shall stop** and **remain stopped** to allow a pedestrian to cross a roadway when the pedestrian is in the crosswalk or steps into the crosswalk and is **upon the half of the roadway upon which the vehicle is traveling** or when the pedestrian is approaching so closely from the opposite half of the roadway as to be in danger.

## 316.130 Pedestrians; traffic regulations

(c) When traffic control signals **are not in place** or in operation and there is no signage indicating otherwise, the driver of a vehicle **shall yield** the right-of-way, slowing down or stopping if need be to so yield, to a pedestrian crossing the roadway **within a crosswalk** when the pedestrian is upon the half of the roadway upon which the vehicle is traveling or when the pedestrian is approaching so closely from the opposite half of the roadway as to be in danger. Any pedestrian crossing a roadway at a point where a pedestrian tunnel or overhead pedestrian crossing has been provided shall yield the right-of-way to all vehicles upon the roadway.

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## 316.130 Pedestrians; traffic regulations

(8) No pedestrian shall suddenly leave a curb or other place of safety and walk or run into the path of a vehicle which is so close that it is impossible for the driver to yield.

(9) Whenever any vehicle is stopped at a marked crosswalk or at any unmarked crosswalk at an intersection to permit a pedestrian to cross the roadway, the driver of any other vehicle approaching from the rear shall not overtake and pass such stopped vehicle.

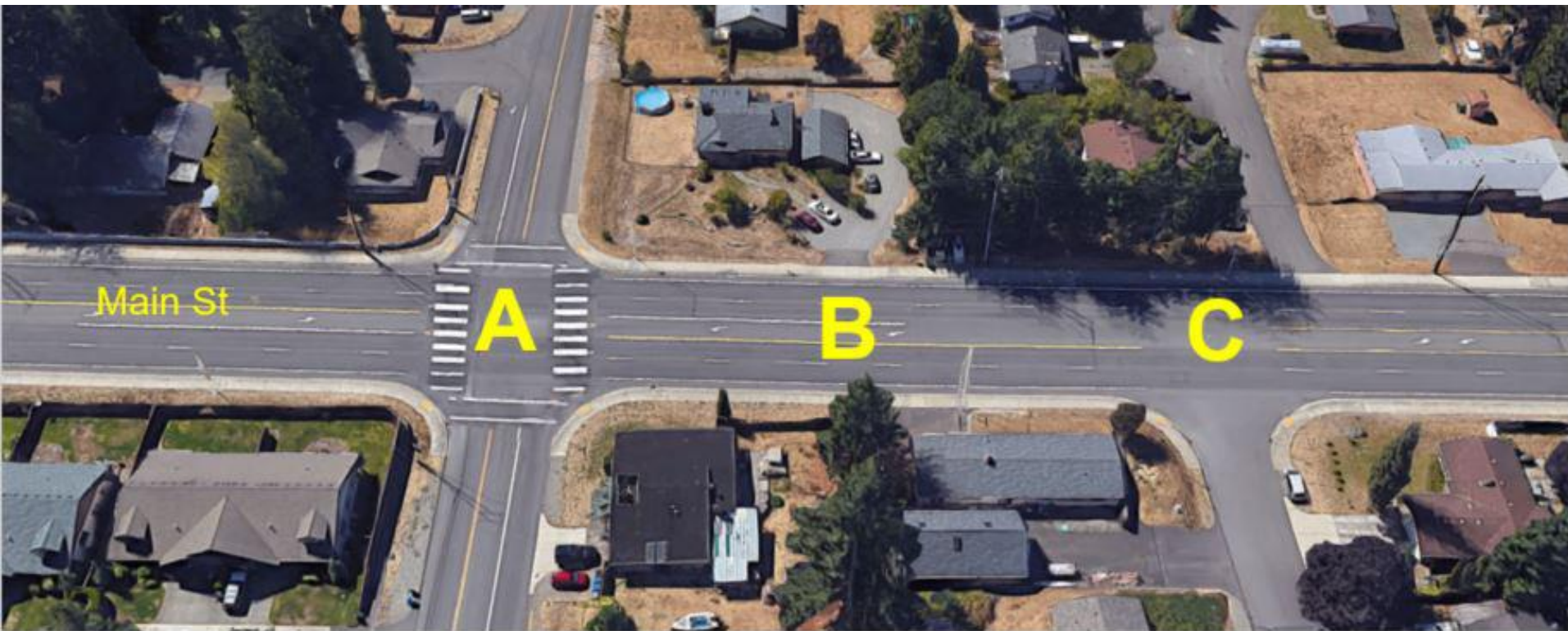
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## 316.130 Pedestrians; traffic regulations

(10) Every pedestrian crossing a roadway at **any point other than within a marked crosswalk or within an unmarked crosswalk at an intersection shall yield** the right-of-way to all vehicles upon the roadway.

(11) Between adjacent intersections at which traffic control signals are in operation, pedestrians **shall not cross** at any place except in a marked crosswalk.

# Who has the Right of Way at A, B, C crossing Main St?





# Can you cross legally at A or B?



# Poll Slide

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Can you cross legally at A or B?

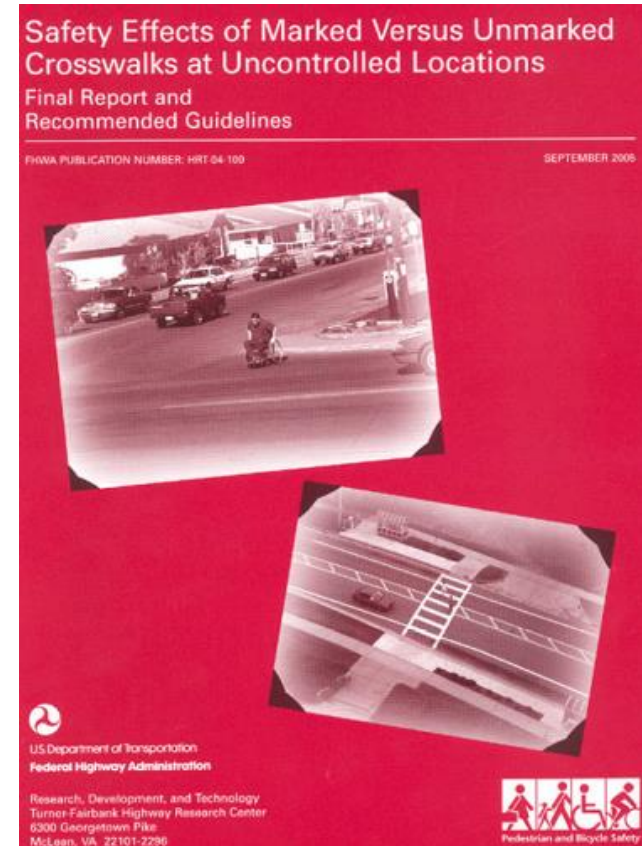
- a) No, I cannot cross legally at A or B
- b) Yes, I can cross legally at A or B
- c) I can cross legally at A but not B
- d) I can cross legally at B but not A



# Marked vs. Unmarked Crosswalks at Uncontrolled Locations

## Marked vs. Unmarked Analysis Speeds $\leq$ 40 mph

- Two-lane roads: No significant difference in crash rate
- Multilane roads (3 or more lanes)
  - Under 12,000 ADT: no significant difference in crash rate
  - Over 12,000 ADT w/ no median: crashes marked > crashes unmarked
  - Over 15,000 ADT & w/ median: crashes marked > crashes unmarked



<https://www.fhwa.dot.gov/publications/research/safety/04100/>

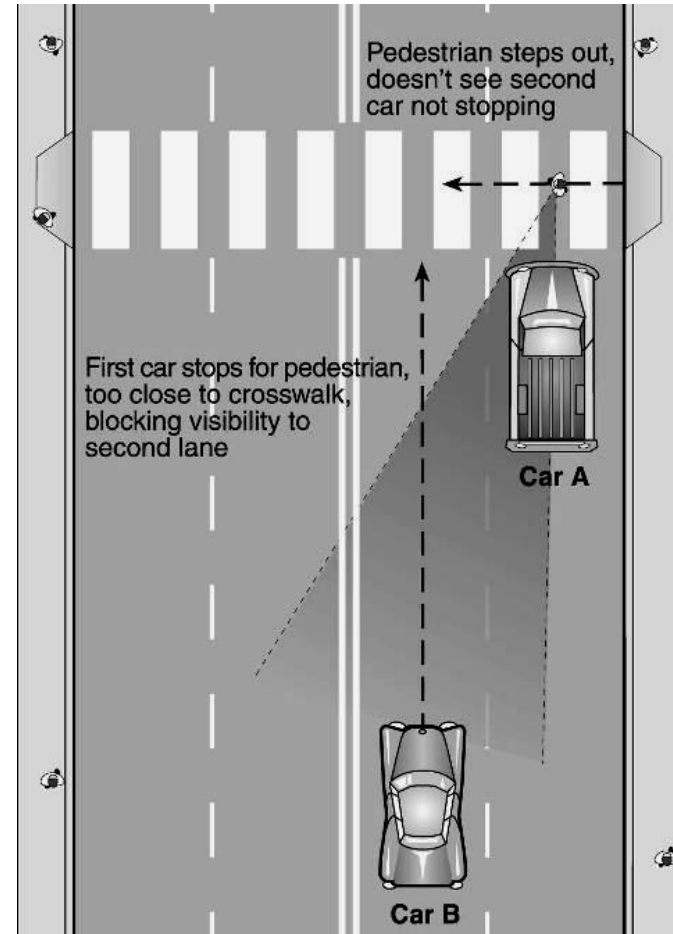
# One explanation of higher crash rate at marked crosswalks: multiple-threat crash



1st vehicle stops and “masks” visibility for driver in 2nd lane  
Solution: advance stop bar (we’ll discuss later...)

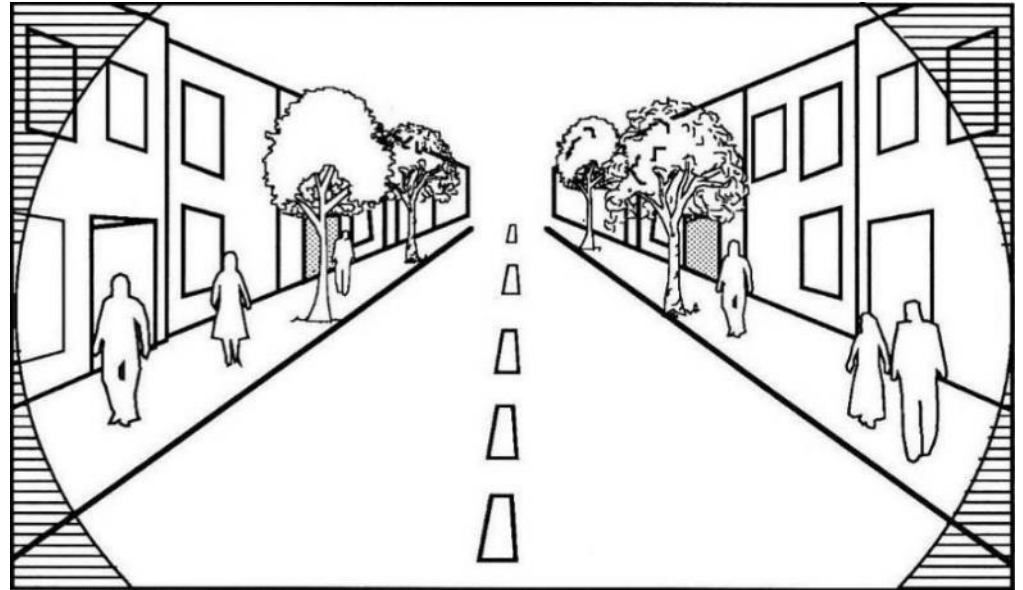
# Multiple Threat Crash Problem

- 1st car stops to let pedestrian cross, blocking sight lines
- 2nd car doesn't stop, hits pedestrian at high speed



# Speed Matters

- Drivers' field of vision to see pedestrians
- Drivers' ability to react and avoid a crash
- Crash Severity



**15 MPH**



— PEDESTRIAN FATALITY & SERIOUS INJURY RISK +

18%



50%



77%



20  
MPH

30  
MPH

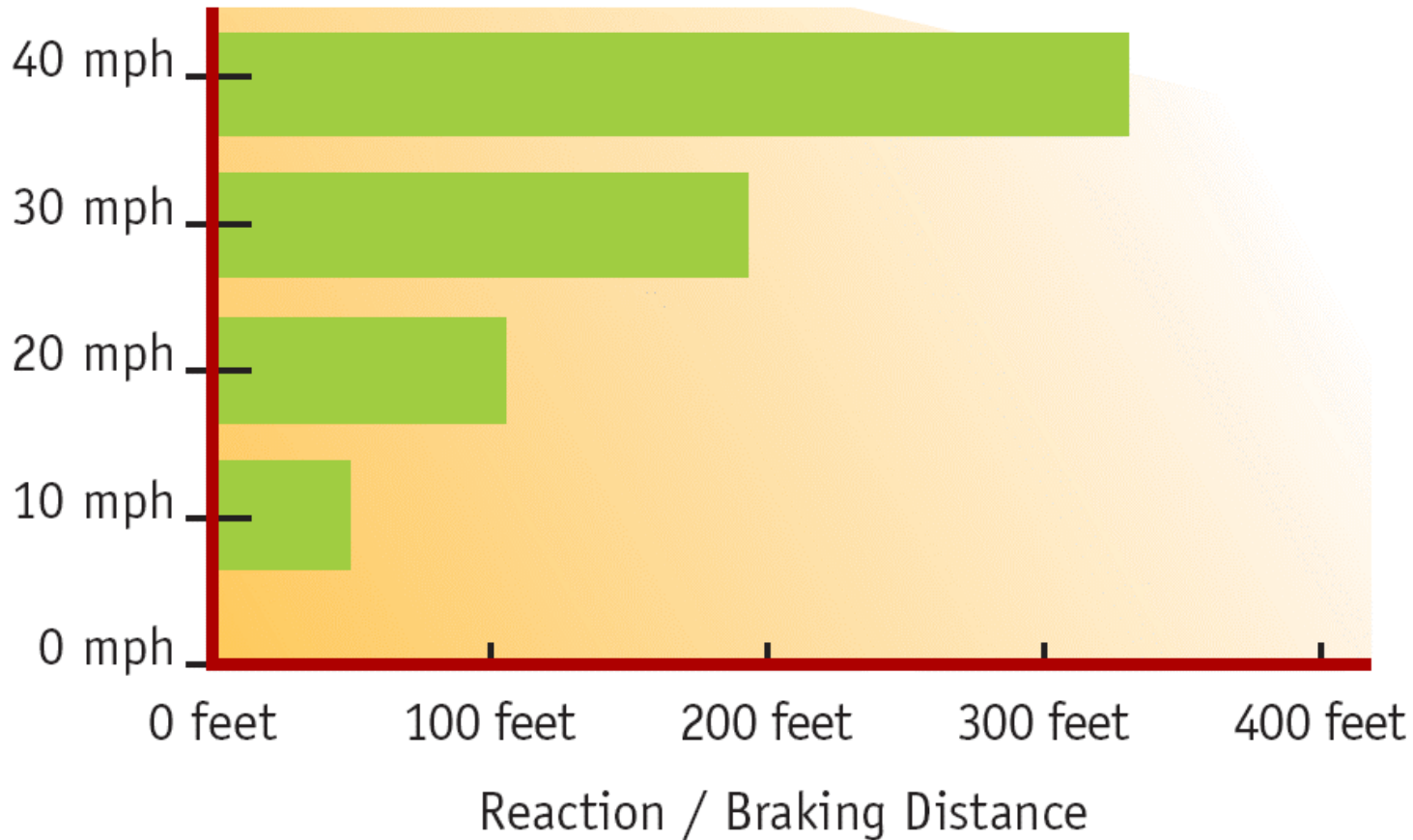
40  
MPH



CONE OF VISION

As motor vehicle speeds increase, the risk of serious injury or fatality for a pedestrian also increases (*AARP Impact Speed and a Pedestrian's Risk of Severe Injury or Death 2011, p. 1*). Also, motorist visual field and peripheral vision is reduced at higher speeds.

# Speed Affects Crash Avoidance



High speeds equate to greater reaction and stopping distance

# MUTCD Section 3B.18 Crosswalk Markings

New marked crosswalks **alone, without other measures** designed to reduce traffic speeds, shorten crossing distances, enhance driver awareness of the crossing, and/or provide active warning of pedestrian presence, should not be installed across uncontrolled roadways where the speed limit exceeds 40 mph and /or either:

- Has 4 or more lanes without a raised median or island and ADT of 12,000 or more, or
- 4 or more lanes with raised median island and ADT of 15,000 or more



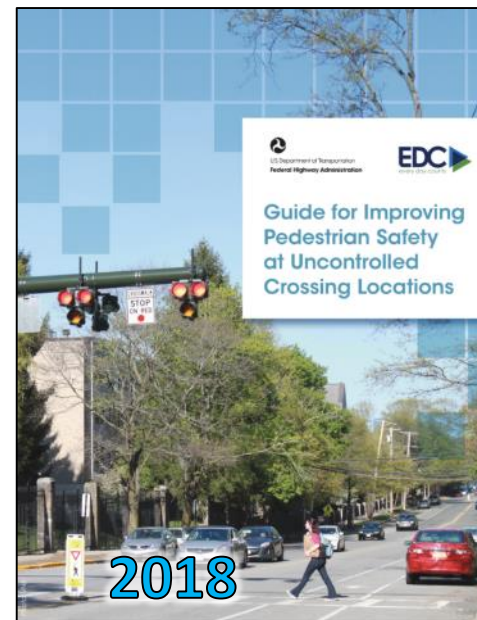


Table 11. Recommendations for installing marked crosswalks and other needed pedestrian improvements at uncontrolled locations.\*

Roadway Type (Number of Travel Lanes and Median Type)	Vehicle ADT ≤ 9,000			Vehicle ADT >9,000 to 12,000			Vehicle ADT >12,000-15,000			Vehicle ADT > 15,000		
	Speed Limit**											
	≤ 48.3 km/h (30 mi/h)	56.4 km/h (35 mi/h)	64.4 km/h (40 mi/h)	≤ 48.3 km/h (30 mi/h)	56.4 km/h (35 mi/h)	64.4 km/h (40 mi/h)	≤ 48.3 km/h (30 mi/h)	56.4 km/h (35 mi/h)	64.4 km/h (40 mi/h)	≤ 48.3 km/h (30 mi/h)	56.4 km/h (35 mi/h)	64.4 km/h (40 mi/h)
Two lanes	C	C	P	C	C	P	C	C	N	C	P	N
Three lanes	C	C	P	C	P	P	P	P	N	P	N	N
Multilane (four or more lanes) with raised median***	C	C	P	C	P	N	P	P	N	N	N	N
Multilane (four or more lanes) without raised median	C	P	N	P	P	N	N	N	N	N	N	N

\* These guidelines include intersection and midblock locations with no traffic signals or stop signs on the approach to the crossing. They do not apply to school crossings. A two-way center turn lane is not considered a median. Crosswalks should not be installed at locations that could present an increased safety risk to pedestrians, such as where there is poor sight distance, complex or confusing design, a substantial volume of heavy trucks, or other dangers, without first providing adequate design features and/or traffic control devices. Adding crosswalks alone will not make crossings safer, nor will they necessarily result in more vehicles stopping for pedestrians. Whether or not marked crosswalks are installed, it is important to consider other pedestrian facility enhancements (e.g., raised median, traffic signal, roadway narrowing, enhanced overhead lighting, traffic-calming measures, curb extensions), as needed, to improve the safety of the crossing. These are general recommendations; good engineering judgment should be used in individual cases for deciding where to install crosswalks.

\*\* Where the speed limit exceeds 64.4 km/h (40 mi/h), marked crosswalks alone should not be used at unsignalized locations.

\*\*\* The raised median or crossing island must be at least 1.2 m (4 ft) wide and 1.8 m (6 ft) long to serve adequately as a refuge area for pedestrians, in accordance with MUTCD and American Association of State Highway and Transportation Officials (AASHTO) guidelines.

C = Candidate sites for marked crosswalks. Marked crosswalks must be installed carefully and selectively. Before installing new marked crosswalks, an engineering study is needed to determine whether the location is suitable for a marked crosswalk. For an engineering study, a site review may be sufficient at some locations, while a more in-depth study of pedestrian volume, vehicle speed, sight distance, vehicle mix, and other factors may be needed at other sites. It is recommended that a minimum utilization of 20 pedestrian crossings per peak hour (or 15 or more elderly and/or child pedestrians) be confirmed at a location before placing a high priority on the installation of a marked crosswalk alone.

P = Possible increase in pedestrian crash risk may occur if crosswalks are added without other pedestrian facility enhancements. These locations should be closely monitored and enhanced with other pedestrian crossing improvements, if necessary, before adding a marked crosswalk.

N = Marked crosswalks alone are insufficient, since pedestrian crash risk may be increased by providing marked crosswalks alone. Consider using other treatments, such as traffic-calming treatments, traffic signals with pedestrian signals where warranted, or other substantial crossing improvement to improve crossing safety for pedestrians.

Table 1. Application of pedestrian crash countermeasures by roadway feature.

Roadway Configuration	Posted Speed Limit and AADT											
	Vehicle ADT <9,000			Vehicle ADT 9,000-15,000			Vehicle ADT >15,000					
	≤30 mph	35 mph	≥40 mph	≤30 mph	35 mph	≥40 mph	≤30 mph	35 mph	≥40 mph	≤30 mph	35 mph	≥40 mph
2 lanes (1 lane in each direction)	1 2 3 4 5 6 7 8 9 10 11 12	1 2 3 4 5 6 7 8 9 10 11 12	1 2 3 4 5 6 7 8 9 10 11 12	1 2 3 4 5 6 7 8 9 10 11 12	1 2 3 4 5 6 7 8 9 10 11 12	1 2 3 4 5 6 7 8 9 10 11 12	1 2 3 4 5 6 7 8 9 10 11 12	1 2 3 4 5 6 7 8 9 10 11 12	1 2 3 4 5 6 7 8 9 10 11 12	1 2 3 4 5 6 7 8 9 10 11 12	1 2 3 4 5 6 7 8 9 10 11 12	1 2 3 4 5 6 7 8 9 10 11 12
3 lanes with raised median (1 lane in each direction)	1 2 3 4 5 6 7 8 9 10 11 12	1 2 3 4 5 6 7 8 9 10 11 12	1 2 3 4 5 6 7 8 9 10 11 12	1 2 3 4 5 6 7 8 9 10 11 12	1 2 3 4 5 6 7 8 9 10 11 12	1 2 3 4 5 6 7 8 9 10 11 12	1 2 3 4 5 6 7 8 9 10 11 12	1 2 3 4 5 6 7 8 9 10 11 12	1 2 3 4 5 6 7 8 9 10 11 12	1 2 3 4 5 6 7 8 9 10 11 12	1 2 3 4 5 6 7 8 9 10 11 12	1 2 3 4 5 6 7 8 9 10 11 12
3 lanes w/o raised median (1 lane in each direction with a two-way left-turn lane)	1 2 3 4 5 6 7 8 9 10 11 12	1 2 3 4 5 6 7 8 9 10 11 12	1 2 3 4 5 6 7 8 9 10 11 12	1 2 3 4 5 6 7 8 9 10 11 12	1 2 3 4 5 6 7 8 9 10 11 12	1 2 3 4 5 6 7 8 9 10 11 12	1 2 3 4 5 6 7 8 9 10 11 12	1 2 3 4 5 6 7 8 9 10 11 12	1 2 3 4 5 6 7 8 9 10 11 12	1 2 3 4 5 6 7 8 9 10 11 12	1 2 3 4 5 6 7 8 9 10 11 12	1 2 3 4 5 6 7 8 9 10 11 12
4+ lanes with raised median (2 or more lanes in each direction)	1 2 3 4 5 6 7 8 9 10 11 12	1 2 3 4 5 6 7 8 9 10 11 12	1 2 3 4 5 6 7 8 9 10 11 12	1 2 3 4 5 6 7 8 9 10 11 12	1 2 3 4 5 6 7 8 9 10 11 12	1 2 3 4 5 6 7 8 9 10 11 12	1 2 3 4 5 6 7 8 9 10 11 12	1 2 3 4 5 6 7 8 9 10 11 12	1 2 3 4 5 6 7 8 9 10 11 12	1 2 3 4 5 6 7 8 9 10 11 12	1 2 3 4 5 6 7 8 9 10 11 12	1 2 3 4 5 6 7 8 9 10 11 12
4+ lanes w/o raised median (2 or more lanes in each direction)	1 2 3 4 5 6 7 8 9 10 11 12	1 2 3 4 5 6 7 8 9 10 11 12	1 2 3 4 5 6 7 8 9 10 11 12	1 2 3 4 5 6 7 8 9 10 11 12	1 2 3 4 5 6 7 8 9 10 11 12	1 2 3 4 5 6 7 8 9 10 11 12	1 2 3 4 5 6 7 8 9 10 11 12	1 2 3 4 5 6 7 8 9 10 11 12	1 2 3 4 5 6 7 8 9 10 11 12	1 2 3 4 5 6 7 8 9 10 11 12	1 2 3 4 5 6 7 8 9 10 11 12	1 2 3 4 5 6 7 8 9 10 11 12
<p>Given the set of conditions in a cell,</p> <ul style="list-style-type: none"> <li>Signifies that the countermeasure is a candidate treatment of a marked uncontrolled crossing location.</li> <li>Signifies that the countermeasure should always be considered, but not mandated or required, based upon engineering judgment at a marked uncontrolled crossing location.</li> <li>Signifies that crosswalk visibility enhancements should always occur in conjunction with other identified countermeasures.</li> </ul> <p>The absence of a number signifies that the countermeasure is generally not an appropriate treatment, but exceptions may be considered following engineering judgment.</p>												
<p>1 High visibility crosswalk markings, parking restrictions on crosswalk approach, adequate nighttime lighting levels, and crossing warning sign</p> <p>2 Raised crosswalk</p> <p>3 Advance Yield Here To (Stop Here For) Pedestrians sign and yield (stop) line</p> <p>4 In-Street Pedestrian Crossing sign</p> <p>5 Curb extension</p> <p>6 Pedestrian refuge island</p> <p>7 Rectangular Rapid-Flashing Beacon (RRFB)**</p> <p>8 Road Diet</p> <p>9 Pedestrian Hybrid Beacon (PHB)**</p>												

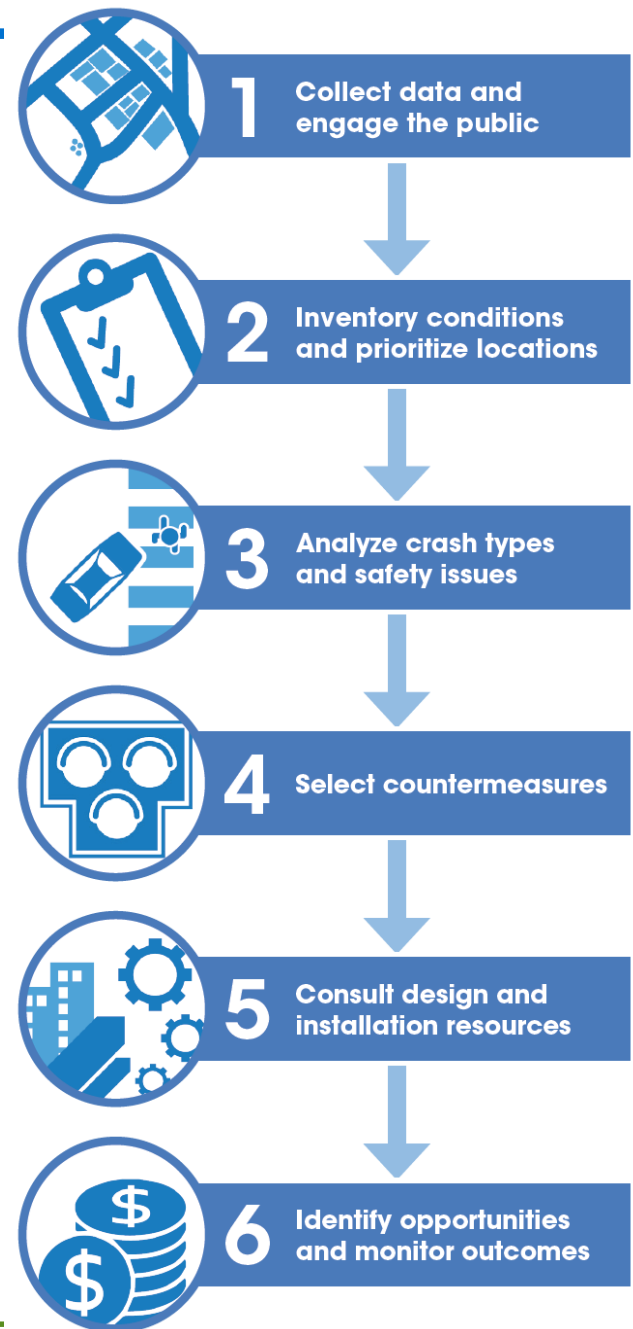
\*\* Refer to Chapter 4, Using Table 1 and Table 2 to Select Countermeasures, for more information about using multiple countermeasures.

\*\* The PHB and RRFB are not both installed at the same crossing location.





# Guide for Improving Pedestrian Safety at Uncontrolled Crossing Locations





# 4

## Select countermeasures

of pedestrian crash countermeasures by roadway feature.

Roadway Configuration	Posted Speed Limit and AADT								
	Vehicle AADT <9,000			Vehicle AADT 9,000–15,000			Vehicle AADT >15,000		
	≤30 mph	35 mph	≥40 mph	≤30 mph	35 mph	≥40 mph	≤30 mph	35 mph	≥40 mph
<b>2 lanes</b> (1 lane in each direction)	① 2 4 5 6	① 5 6 7 9	① 5 6 ⑦ ⑨	① 4 5 6	① 5 6 7 9	① 5 6 ⑦ ⑨	① 4 5 6 7 9	① 5 6 7 9	① 5 6 ⑨
<b>3 lanes with raised median</b> (1 lane in each direction)	① 2 3 4 5	① ③ 5 7 9	① ③ 5 ⑦ ⑨	① 3 4 5 7 9	① ③ 5 ⑦ ⑨	① ③ 5 ⑦ ⑨	① ③ 4 5 7 9	① ③ 5 ⑦ ⑨	① ③ 5 ⑨
<b>3 lanes w/o raised median</b> (1 lane in each direction with a two-way left-turn lane)	① 2 3 4 5 6 7 9	① ③ 5 6 7 9	① ③ 5 6 ⑨	① 3 4 5 6 7 9	① ③ 5 6 ⑦ ⑨	① ③ 5 6 ⑨	① ③ 4 5 6 7 9	① ③ 5 6 ⑨	① ③ 5 6 ⑨
<b>4+ lanes with raised median</b> (2 or more lanes in each direction)	① ③ 5 7 8 9	① ③ 5 7 8 9	① ③ 5 8 ⑨	① ③ 5 7 8 9	① ③ 5 ⑦ 8 ⑨	① ③ 5 8 ⑨	① ③ 5 ⑦ 8 ⑨	① ③ 5 8 ⑨	① ③ 5 8 ⑨
<b>4+ lanes w/o raised median</b> (2 or more lanes in each direction)	① ③ ① ③ 5 6 5 ⑥ 7 8 9 7 8 9	① ③ ① ③ 5 ⑥ 5 ⑥ 7 8 9 7 8 9	① ③ ① ③ 5 ⑥ 5 ⑥ 8 ⑨ 8 ⑨	① ③ ① ③ 5 ⑥ 5 ⑥ 7 8 9 ⑦ 8 9	① ③ ① ③ 5 ⑥ 5 ⑥ ⑦ 8 9 8 ⑨	① ③ ① ③ 5 ⑥ 5 ⑥ 8 ⑨ ⑦ 8 ⑨	① ③ ① ③ 5 ⑥ 5 ⑥ ⑦ 8 ⑨ 8 ⑨	① ③ ① ③ 5 ⑥ 5 ⑥ 8 ⑨ 8 ⑨	① ③ ① ③ 5 ⑥ 5 ⑥ 8 ⑨ 8 ⑨
<p>Given the set of conditions in a cell,</p> <ul style="list-style-type: none"> <li># Signifies that the countermeasure is a candidate treatment at a marked uncontrolled crossing location.</li> <li>● Signifies that the countermeasure should always be considered, but not mandated or required, based upon engineering judgment at a marked uncontrolled crossing location.</li> <li>○ Signifies that crosswalk visibility enhancements should always occur in conjunction with other identified countermeasures.*</li> </ul> <p>The absence of a number signifies that the countermeasure is generally not an appropriate treatment, but exceptions may be considered following engineering judgment.</p>									
<ul style="list-style-type: none"> <li>1 High-visibility crosswalk markings, parking restrictions on crosswalk approach, adequate nighttime lighting levels, and crossing warning sign</li> <li>2 Raised crosswalk</li> <li>3 Advance Yield Here To (Stop Here For) Pedestrians sign and yield (stop) line</li> <li>4 In-Street Pedestrian Crossing sign</li> <li>5 Curb extension</li> <li>6 Pedestrian refuge island</li> <li>7 Rectangular Rapid-Flashing Beacon (RRFB)**</li> <li>8 Road Diet</li> <li>9 Pedestrian Hybrid Beacon (PHB)**</li> </ul>									

\*Refer to Chapter 4, "Using Table 1 and Table 2 to Select Countermeasures," for more information about using multiple countermeasures.

\*\*The PHB and RRFB are not both installed at the same crossing location.

## STEP's Spectacular Seven



Crosswalk Visibility Enhancements



Raised Crosswalks



Pedestrian Refuge Islands



Rectangular Rapid Flashing Beacon



Pedestrian Hybrid Beacon (PHB)



Road Diets



Leading Pedestrian Interval (LPI)

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# Intro to FDOT Design Standards

## Design

- **AASHTO Green Book**
  - Contains the current design research and practices for highway and street geometric design.
- **Florida Design Manual (FDM) - Florida**
  - Represents requirements for the State Highway System must be met for the design of FDOT projects
  - Replaced the Plans Preparation Manual (Effective Beginning January 2018)
- **Manual of Uniform Minimum Standards for Design, Construction and Maintenance (Florida Greenbook)**
  - Provides criteria for public streets, roads, highways, bridges, sidewalks, curbs and curb ramps, crosswalks, bicycle facilities, underpasses, and overpasses used by the public for vehicular and pedestrian travel.

# Intro to FDOT Operation Standards

## Operations

- Manual Uniform Traffic Control Devices (MUTCD)
  - defines the standards used by road managers nationwide to install and maintain traffic control devices on all public streets, highways, bikeways, and private roads open to public travel.
- Manual Uniform Traffic Studies (MUTS) - Florida
  - Establish minimum standards for conducting traffic engineering studies on roads under the jurisdiction of the Department of Transportation.
  - In addition, local governmental traffic engineering agencies are recommended and encouraged to use the MUTS as a guideline in conducting studies within their area of responsibility.
- Speed Zone Manual - Florida
  - Promote uniformity in the establishment of state, municipal, and county speed zones throughout the State of Florida.



# Intro to FDOT Operation Standards (cont'd)

## Operations

### Traffic Engineering Manual (TEM) - Florida

Provide traffic engineering standards and guidelines to be used on the State Highway System.

<https://www.fdot.gov/traffic/trafficservices/studies/tem/tem.shtm>

eTraffic - GIS website that shows on the state-maintained system various applications including the location of mid block treatments

<https://fdot.maps.arcgis.com/apps/webappviewer/index.html?id=ed2ff4aba7bd4345a089d821fbf667e4>



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## TEM and FDM Updates

If you are interested in receiving an email update when new bulletins or an update is issued, please **sign up to receive E-updates through the Contact Mailer**. Once registered, click on the Traffic Engineering Manual and/or Florida Design Manual under Publications.

Contact Mailer -

**<https://fdotewp1.dot.state.fl.us/ContactManagement/>**



# Spectacular Seven



## Crosswalk Visibility Enhancements



## Raised Crosswalks



## Pedestrian Refuge Islands



## RRFB



## PHB



## Road Diets



## LPI



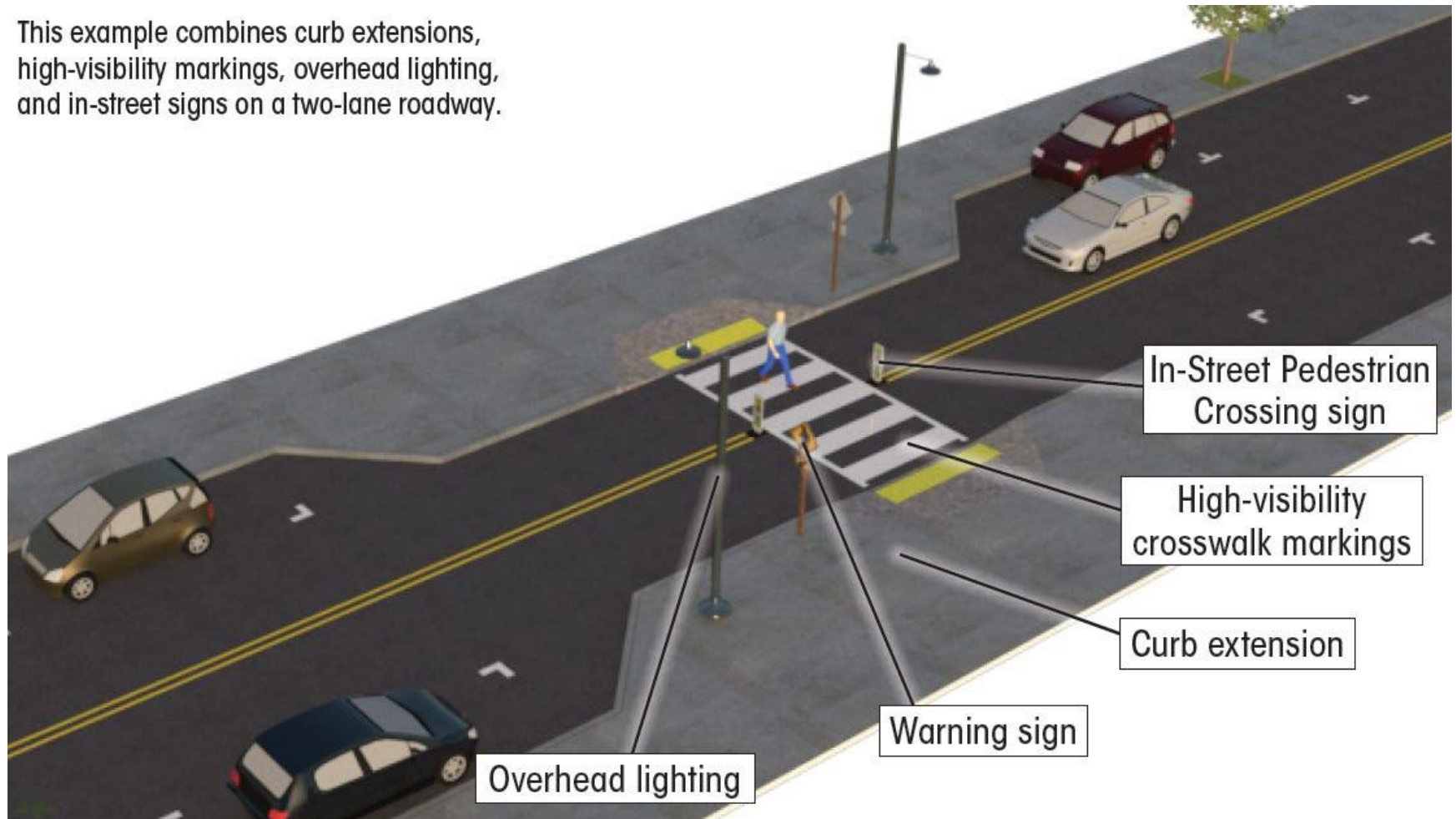
# Crosswalk Visibility Enhancements



- Crosswalk Marking Style
- Advance Stop or Yield Lines with Signs (e.g., “Stop Here for Crosswalk”)
- Lighting
- Curb Extensions
- Parking Restrictions on Crosswalk Approach
- Pedestrian Warning Signs on Approach and at Crosswalk
  - Size and Placement
  - Enhanced Conspicuity (flashing beacons, embedded LEDs)
- In-Street Pedestrian Crossing Signs

# Crosswalk Visibility Enhancements

This example combines curb extensions, high-visibility markings, overhead lighting, and in-street signs on a two-lane roadway.



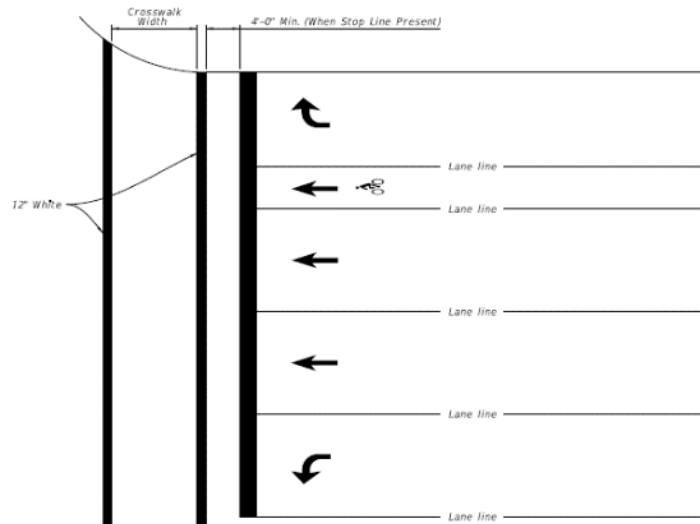
---

# Crosswalk Markings – FDOT Design Manual

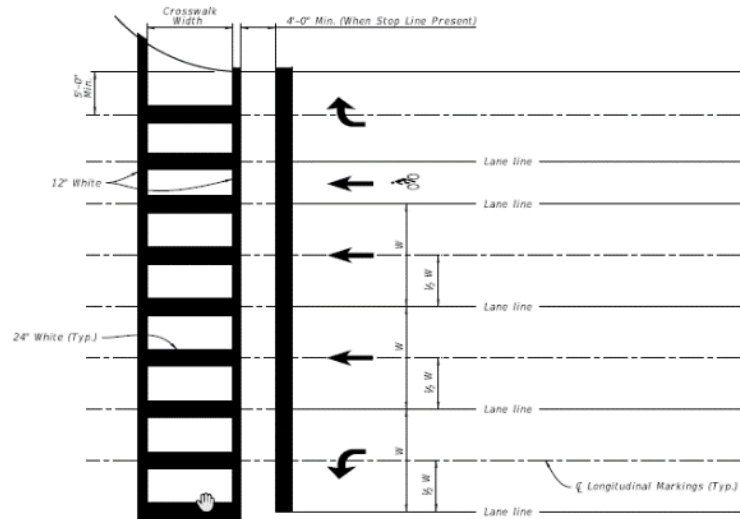
FDM 222 (Pedestrian Facilities) provides criteria and guidance for crosswalks

- References to other publications for critical information
  - Standard Plans for construction details
  - Traffic Engineering Manual 3.8
  - Speed Zoning Manual for School Zone Crossings
- Criteria for:
  - Signalized Intersections
  - Roundabouts
  - Stop and Yield Controlled Intersections
  - Midblock Crosswalks

# Crosswalk Markings – FDOT Standard Plans



STANDARD CROSSWALK DETAILS



SPECIAL EMPHASIS CROSSWALK DETAILS

## NOTES:

1. For crosswalk width, exceed width of the adjacent sidewalk, but do not make width less than 6' for intersection crosswalks and 10' for midblock crosswalks. Measure width from the inside of the transverse crosswalk markings.
2. When the Special Emphasis Crosswalk is not perpendicular to the lane lines, make the longitudinal markings parallel to the lane lines.
3. Refer to Index 522-002 when Curb Ramps are present.

LAST  
REVISION  
11/01/18

DESCRIPTION:  
NOTIFIED



FY 2019-20  
STANDARD PLANS

PAVEMENT MARKINGS

INDEX  
711-001

SHEET  
10 of 13



# Crosswalk Visibility Enhancements

## High Visibility Crosswalk

### What Pedestrians See

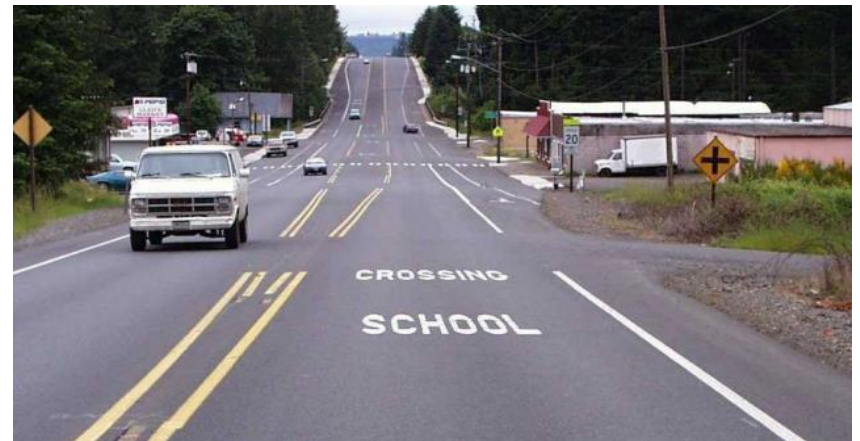
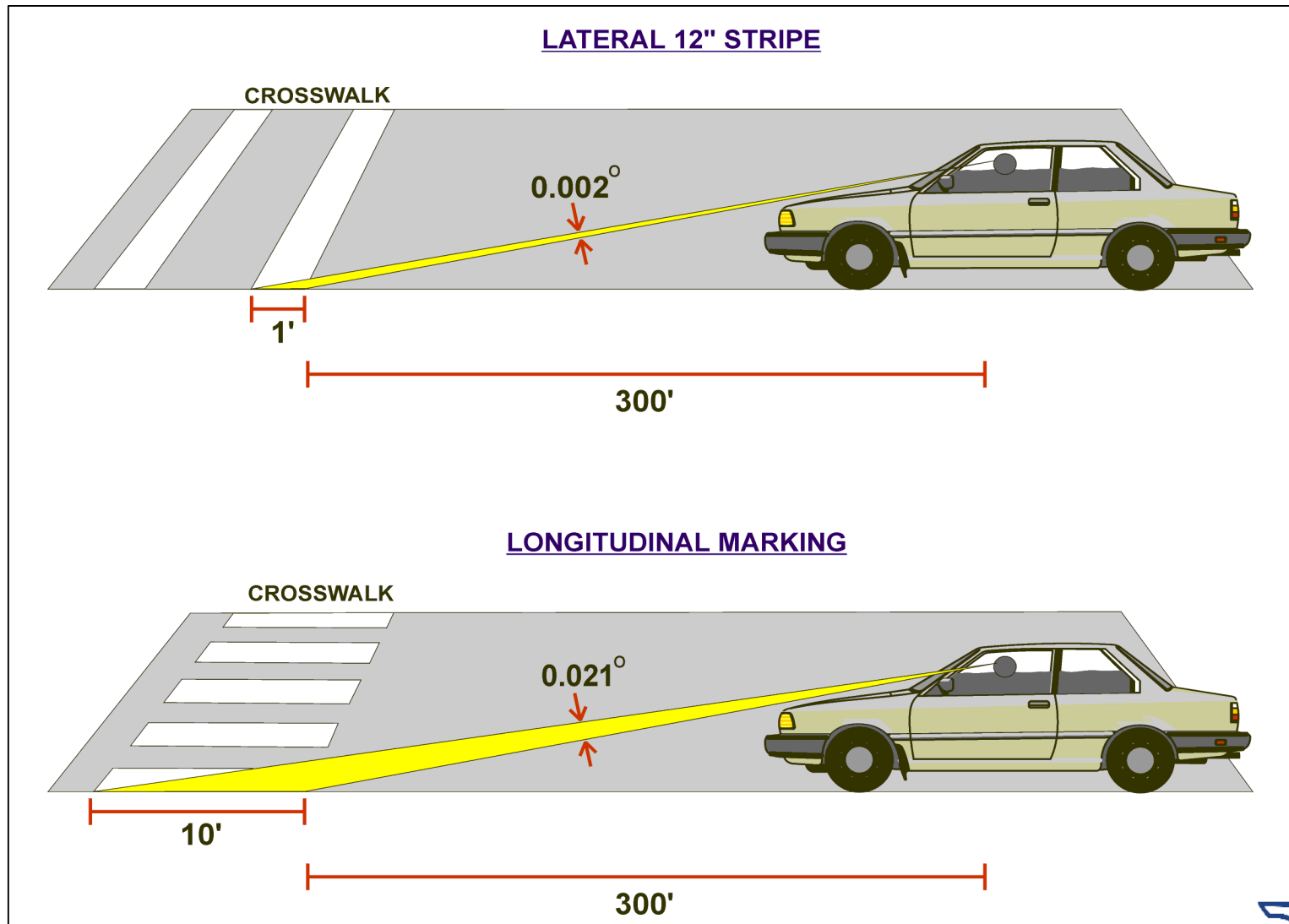


Photo Source all 4: Michael Ronkin

### What Drivers See

# Crosswalk Visibility Study



# Pedestrian Warning Signs – MUTCD 2C.50

“... may be used to alert road users in advance of locations where unexpected entries into the roadway might occur or where shared use of the roadway by pedestrians, animals, or equestrians might occur.”

## Guidance:

*If used in advance of a pedestrian, snowmobile, or equestrian crossing, the W11-2, W11-6, W11-7, and W11-9 signs should be supplemented with plaques (see Section 2C.55) with the legend AHEAD or XX FEET to inform road users that they are approaching a point where crossing activity might occur.*



W11-2\*

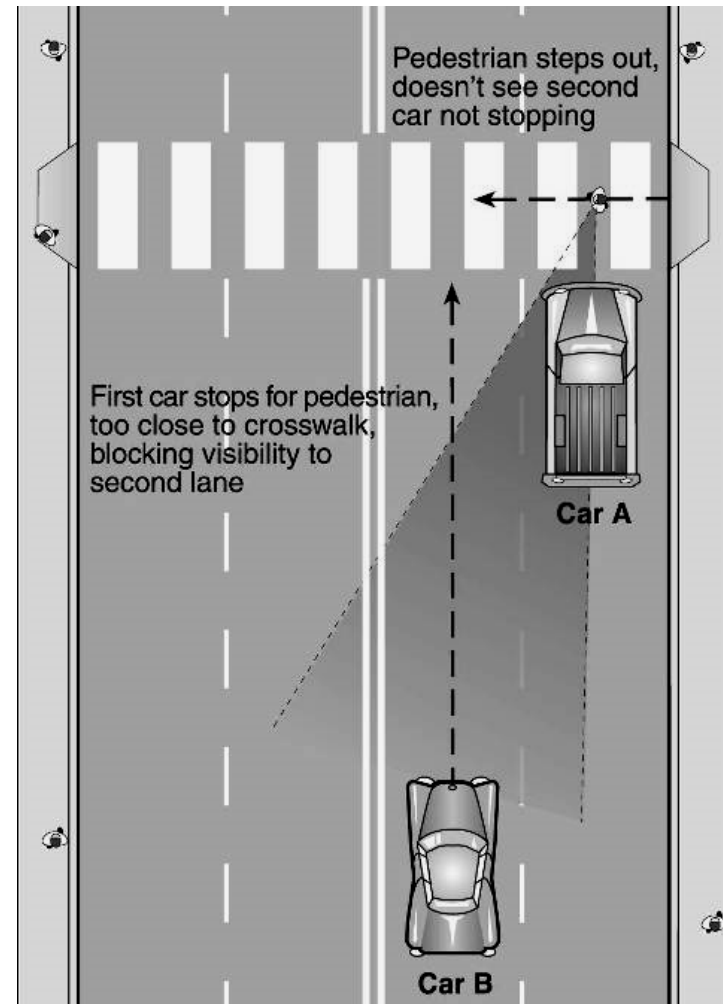
\* A fluorescent yellow-green background color may be used for this sign or plaque.

## Guidance:

*When a fluorescent yellow-green background is used, a systematic approach featuring one background color within a zone or area should be used. The mixing of standard yellow and fluorescent yellow-green backgrounds within a selected site area should be avoided.*

# Multiple Threat Crash Problem

- 1st car stops to let pedestrian cross, blocking sight lines
- 2nd car doesn't stop, hits pedestrian at high speed

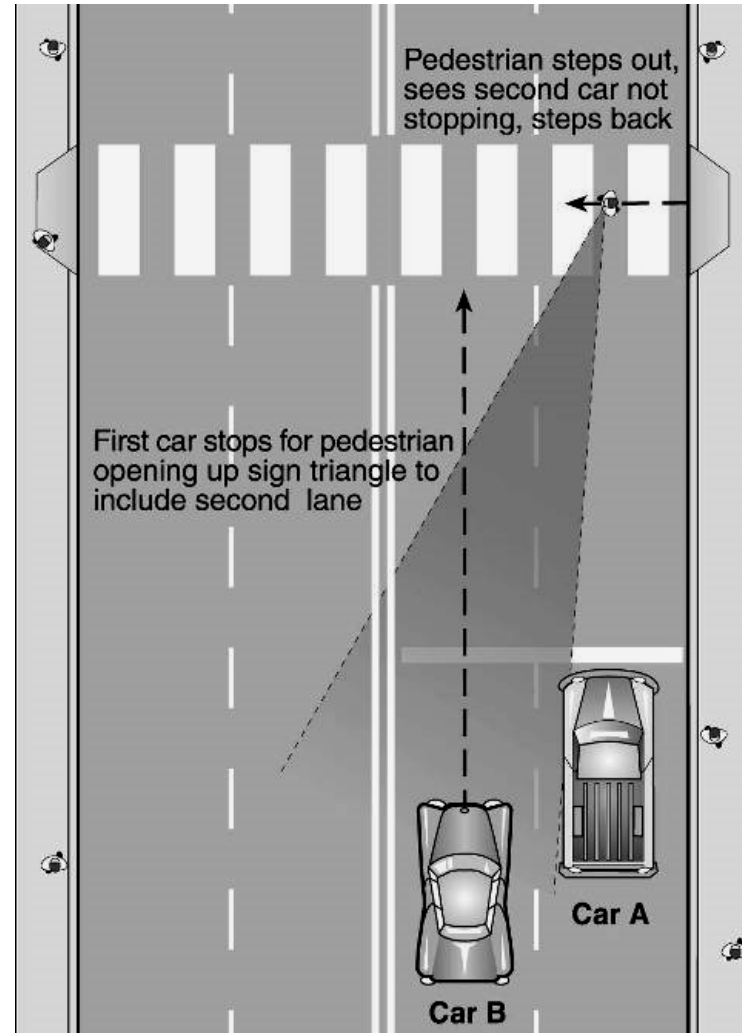




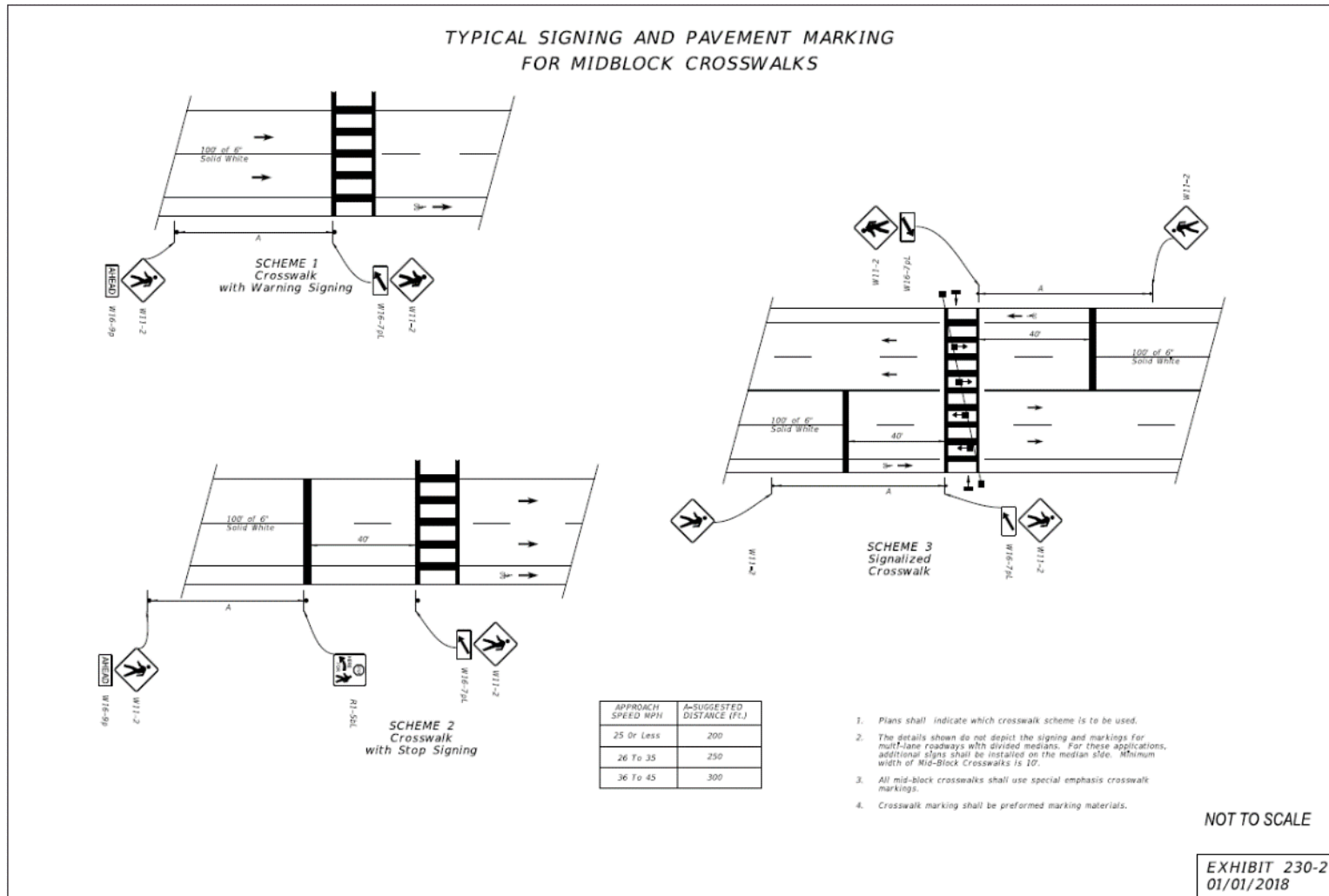
# Multiple Threat Crash Solution

Advance stop or yield line

- 1st car stops further back, opening up sight lines
- 2nd car can be seen by pedestrian



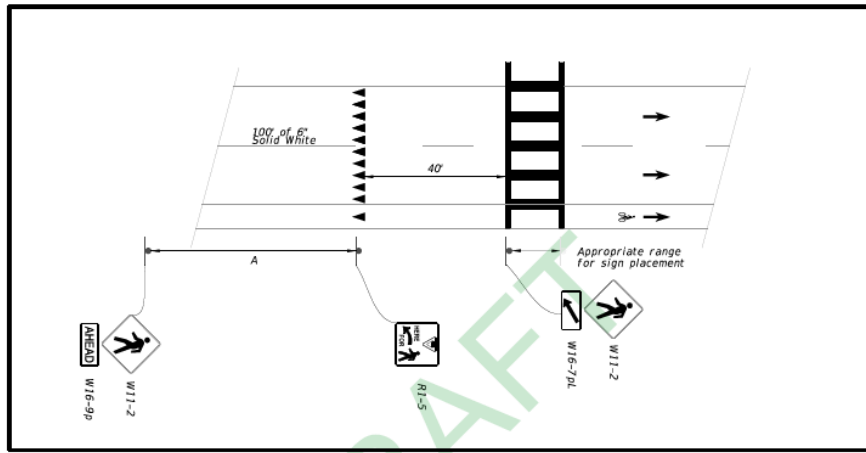
# Crosswalk Markings – FDOT Design Manual





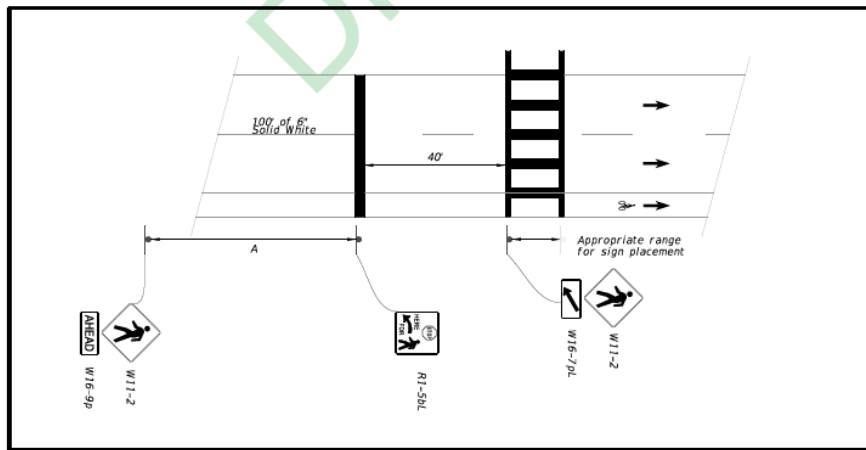
# Crosswalk Markings – Draft 2018 Florida Greenbook

Figure 3 – 12 Pedestrian Crossing with Refuge Island (Yield Condition)



Option to use  
either yield or  
stop conditions

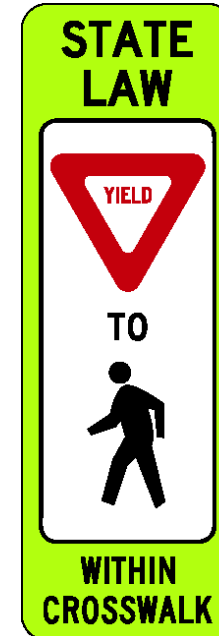
Figure 3 – 13 Pedestrian Crossing with Refuge Island (Stop Condition)





- Advance yield line (shark's teeth) & sign
- Consider double white lines for no passing

# In-street pedestrian crossing signs



R1-6



R1-6a

MUTCD signs

Yield or Stop depends  
on state law



# In Street Gateway Treatment



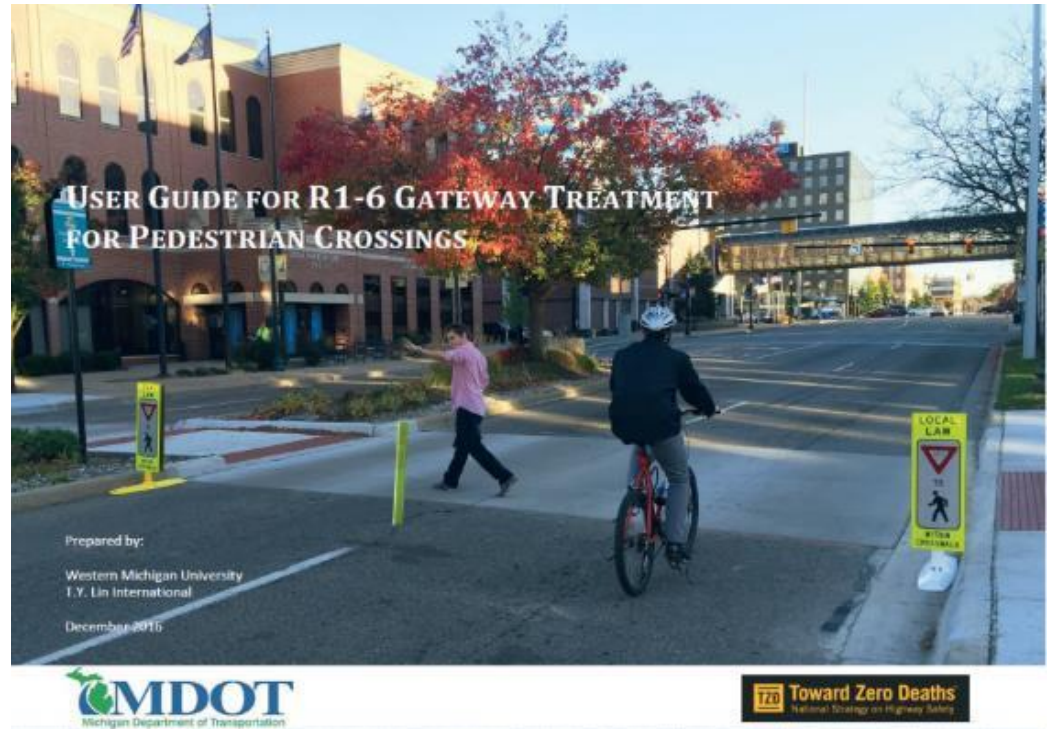
## Resources

Pedestrian Gateway Treatment Technical Memo

Gateway Treatment for Pedestrian Crossings Presentation

User Guide for R1-6 Gateway Treatment for Pedestrian Crossing

<http://aii.transportation.org/Pages/Pedestrian-Gateway-Treatment.aspx>



[http://aii.transportation.org/documents/User%20Guide\\_2018\\_0503\\_Final\\_UPDATED%20CDM%20Edgeline%20Clarification.pdf](http://aii.transportation.org/documents/User%20Guide_2018_0503_Final_UPDATED%20CDM%20Edgeline%20Clarification.pdf)

# Research Abstract key points

- **Increase** in the percentage of **drivers yielding** to pedestrians at midblock and multilane urban and suburban locations **from 15% to 70%** and that these increases endured **without** any **decrement** over the spring, summer and fall of **2016**.
- Speed data collected at each site showed 4 to 5 mph reduction in mean when motorists traversed the crosswalk when pedestrians were absent. These speed changes persisted over time.
- An additional study showed that placing the signs between 5, 10, 20, 30, and 50 ft in advance of the crosswalk were equally effective and they enticed drivers to yield further ahead of the crosswalk.

# Gateway Treatment, Three-Lane Configuration Without Refuge Island

Travel Lanes	2
Passing/Turn Lanes	1
R1-6 Signs	4
Flexible Delineators	0
Yielding Compliance	Between 60% and 90% compliance rate if speed limit is 30mph or less for ADT up to 25,000.  If the speed limit is 35 mph expect similar results if ADT is 12,000 or less. UNKNOWN above 12,000 ADT.

Approximate Cost	\$1,200 for materials 20-minute installation 8 minutes to remove for winter 8 minutes to reinstall in spring
------------------	---

## General Description:

Note: By installing the gateway on the near side of the intersection, both crosswalks are covered with only four signs. Data show that a gateway at the near side crosswalk continues to be effective for the far side of the intersection, as the motorist on the far side has already passed through a gateway on the near side.

The signs on the curb side in the gutter pan would have a better chance of survival if they are moved placed between 3 and 50 feet in Advance of the crosswalk markings. This would reduce the chance of the sign being struck by a turning vehicle. Figure 6b shows a typical installation.



Figure 6a

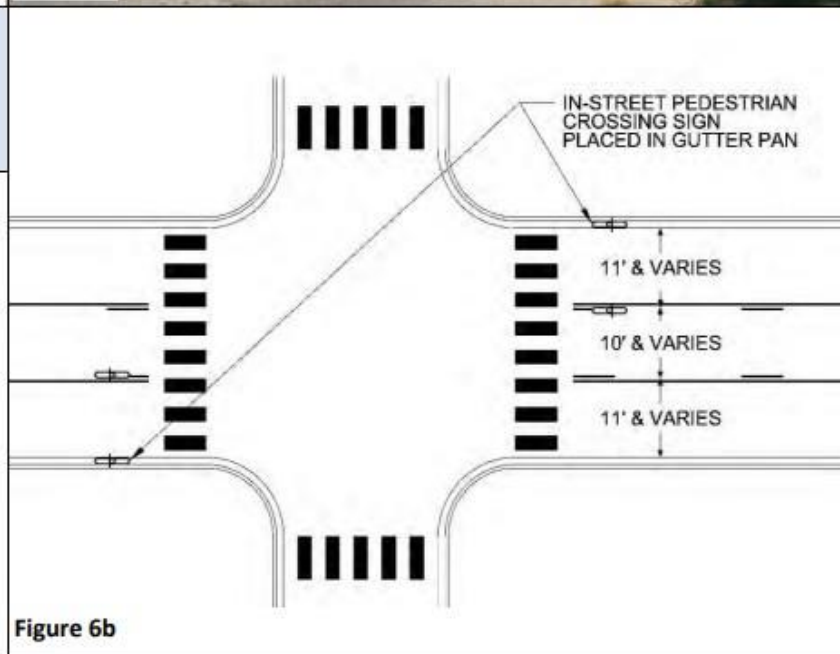


Figure 6b



# Crosswalk Visibility Enhancements

## Crosswalk Lighting



- CRF 42% to 59%
  - Lighting at intersections
  - 4 star rating
  - Vehicle/ped crashes

# Lighting Over Crosswalks

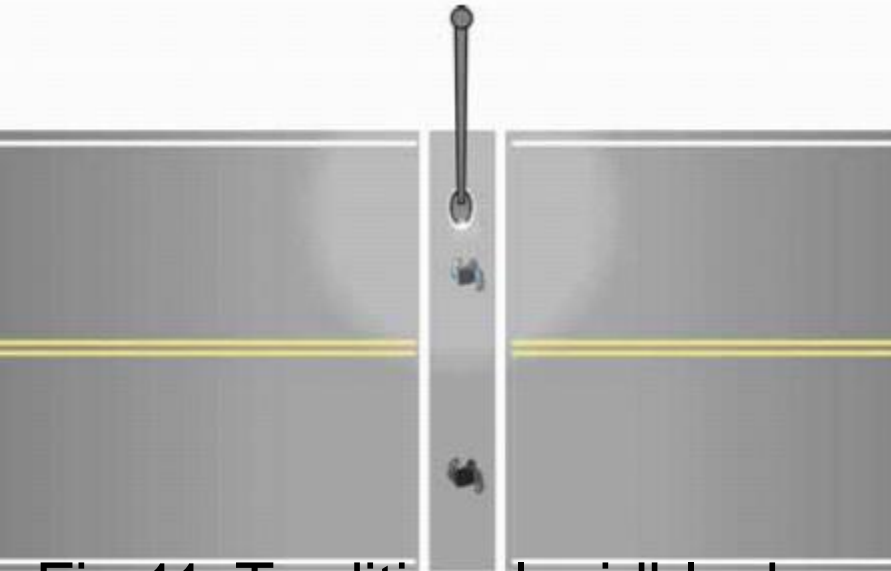


Fig 11. Traditional midblock crosswalk lighting layout

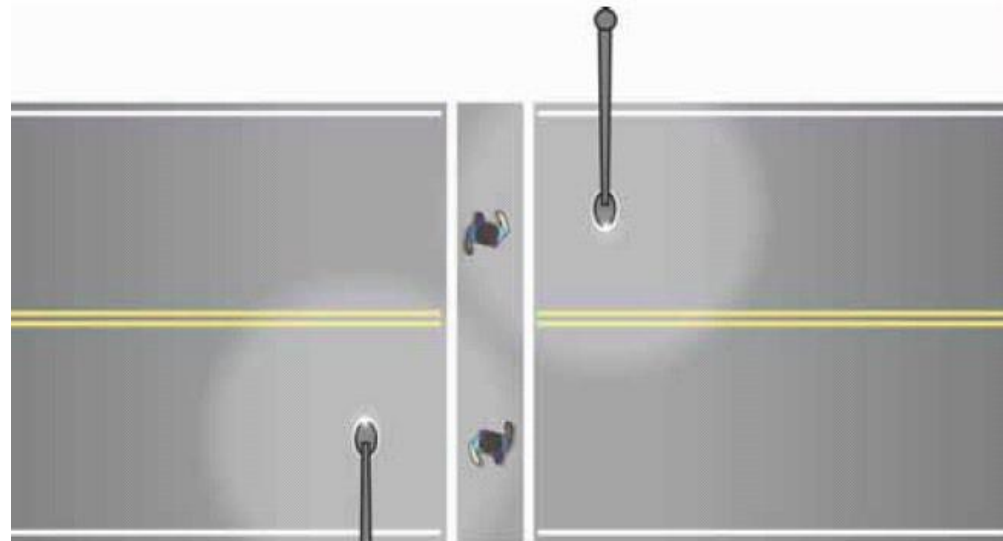


Fig 12. New design for midblock crosswalk lighting layout



Recommended lighting level: 20 lux at 5' above pavement

# Crosswalk Lighting - FDOT Design Manual

**Table 231.2.1 Lighting Initial Values**

Roadway Classification	Illumination Level Average Foot Candle		Illumination Uniformity Ratios		Veiling Luminance Ratio
Or Project Type	Horizontal (H.F.C.)	Vertical (V.F.C.)	Avg./Min.	Max./Min.	L <sub>V(MAX)</sub> /L <sub>AVG</sub>
Signalized Intersection Lighting					
New Reconstruction	3.0	2.3	4:1 or Less	10:1 or Less	N/A
Lighting Retrofit	1.5 Std. 1.0 Min.	1.5 Std. 1.0 Min.			
Midblock Crosswalk Lighting					
Low Ambient Luminance	N/A	2.3	N/A	N/A	N/A
Medium & High Ambient Luminance		3.0			

1 foot-candle = 10.764 lux

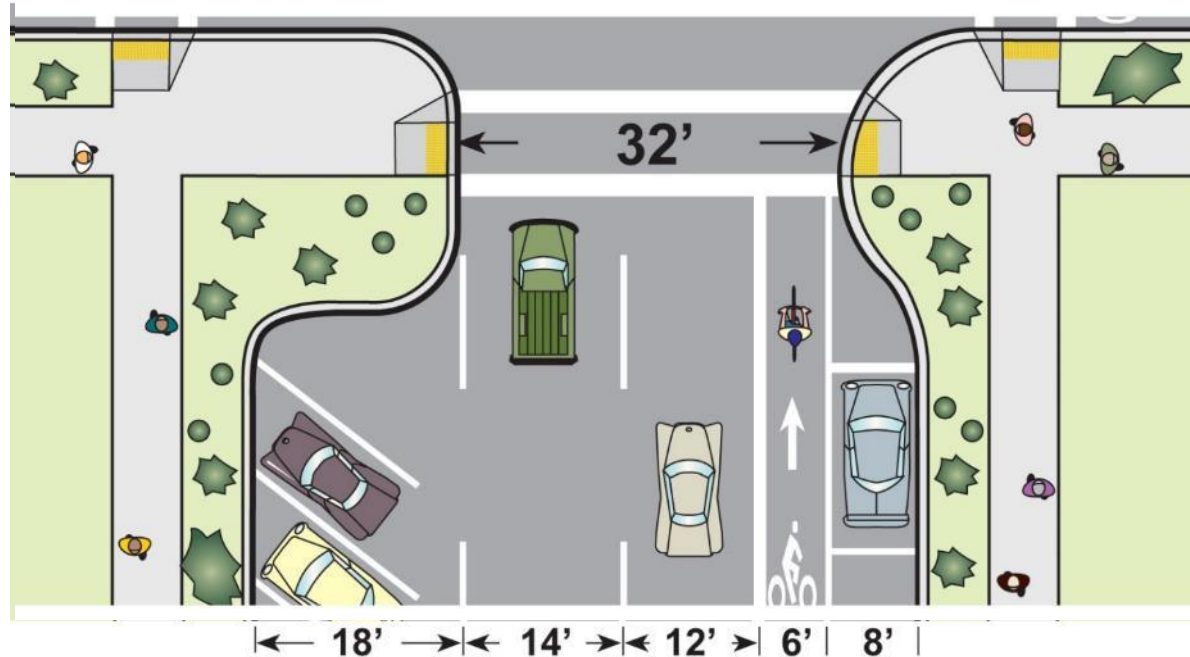
## Curb extensions

Most focus is on reduced crossing distance

### Other advantages:

- Better visibility between peds and motorists
- Traffic calming
- Room for street furniture

**Curb extensions should be the width of the parking lane and not encroach on bike lanes or travel lanes**





---

# Curb Extensions – FDOT Design Manual

## 222.2.6 Curb Extensions (Bulb-Outs)

Curb extensions (a.k.a., bulb-outs) may be used in conjunction with on-street parking at intersections or midblock locations where there is a crosswalk, provided there is adequate width for existing traffic movements. Curb extensions shorten the crossing distance, and provide additional space at intersections, allowing pedestrians to see and be seen before entering a crosswalk.

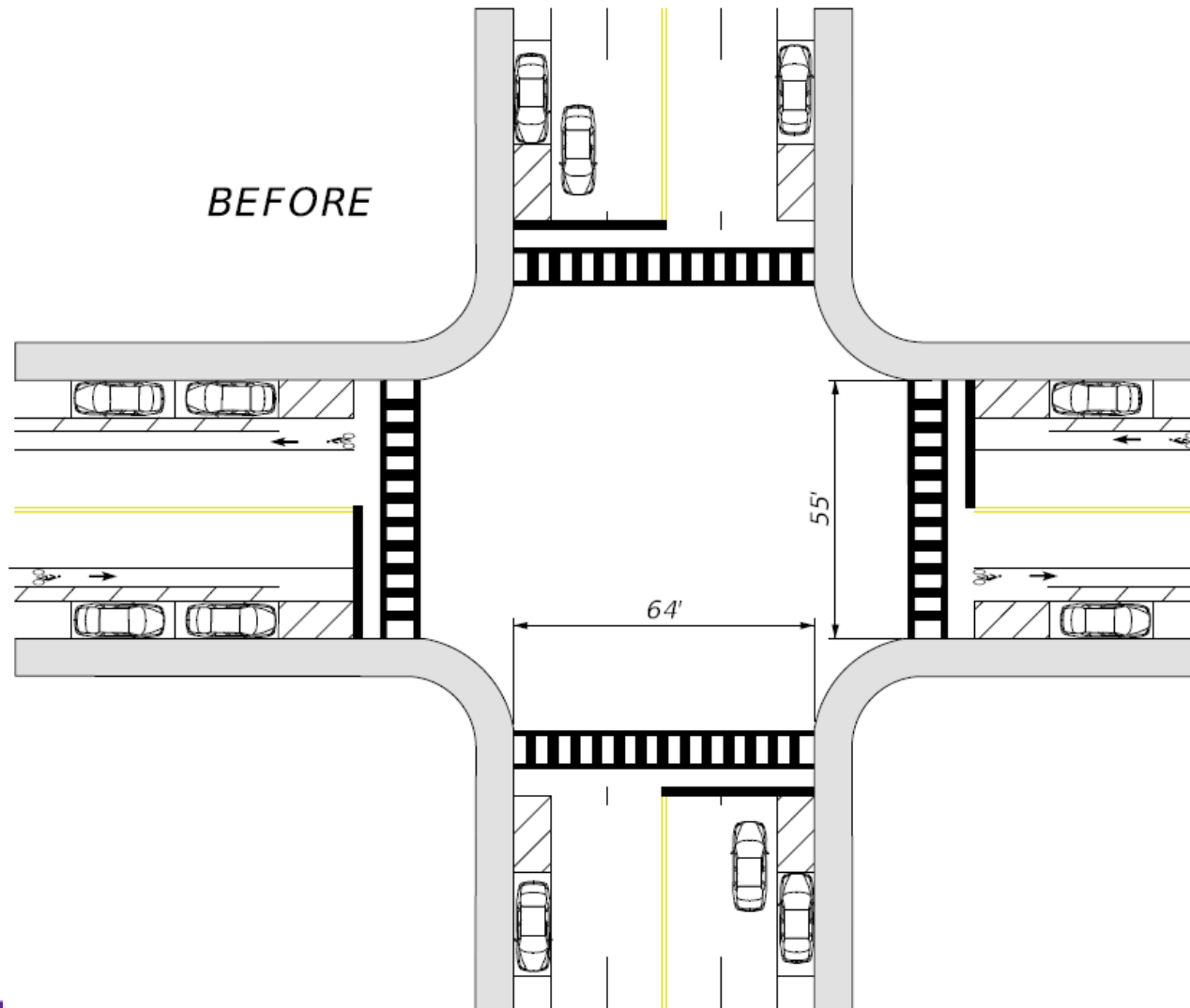
The design of curb extensions must take into consideration the needs of transit vehicles, drainage, and bicyclists. See *Figure 222.2.3*.

---

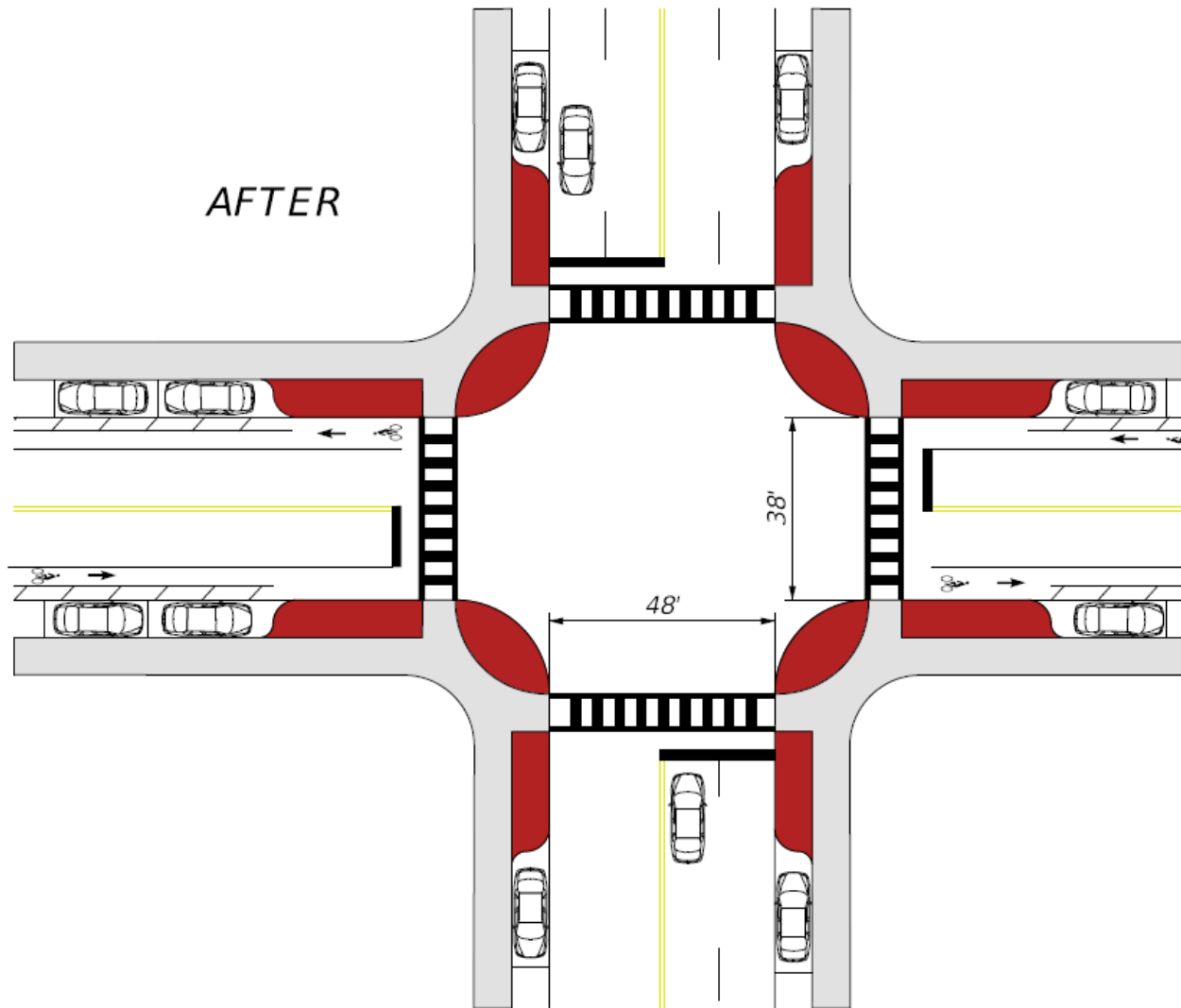
222-Pedestrian Facilities



# Curb Extensions – FDOT Design Manual



# Curb Extensions – FDOT Design Manual





Drainage solutions: Additional inlet



# Drainage solutions for retrofits





After: curb extension integral to sidewalk  
Street looks narrow even with no parked cars





Curb extension integrated into sidewalk



# Fixed objects

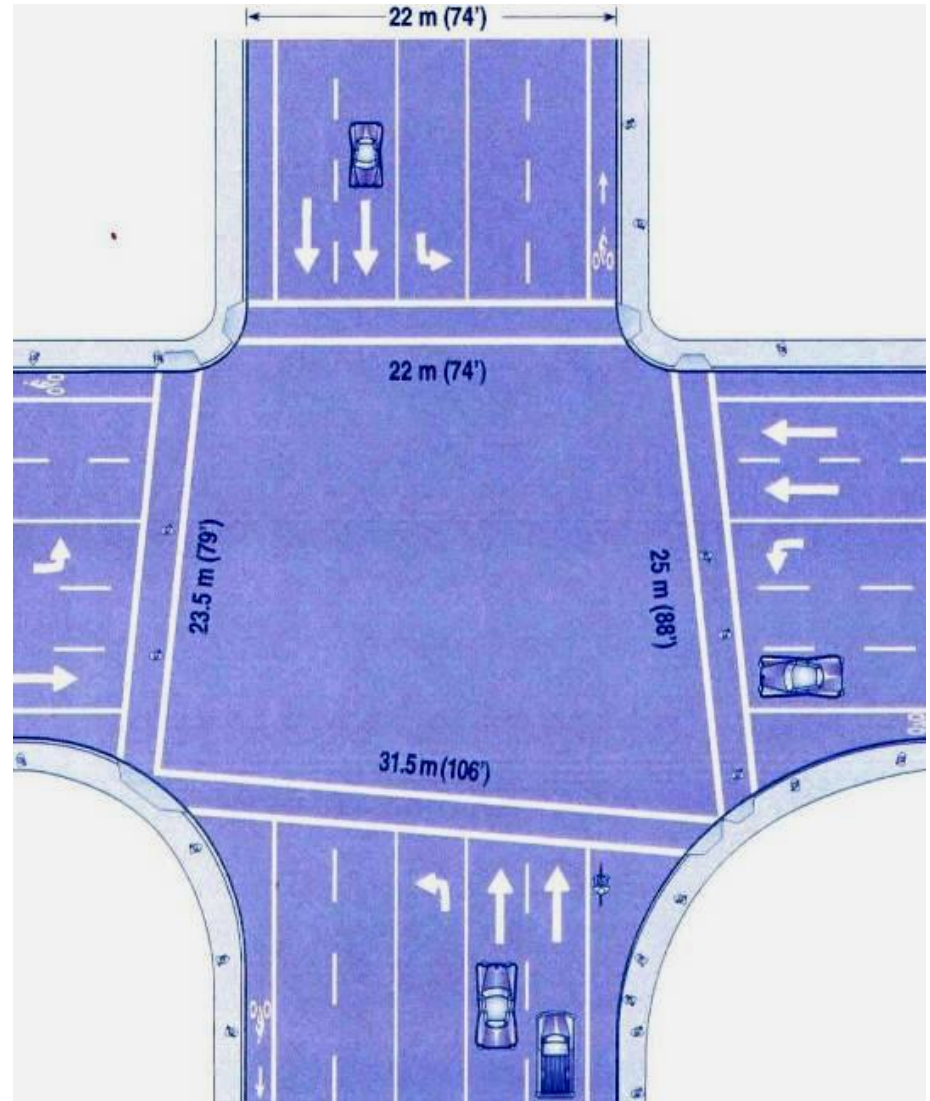


Warren & Smith Streets, Brooklyn DOT

Bollards, planters, & other fixed objects may be placed at the back of curb to protect pedestrians and prevent vehicles from driving onto the sidewalk.

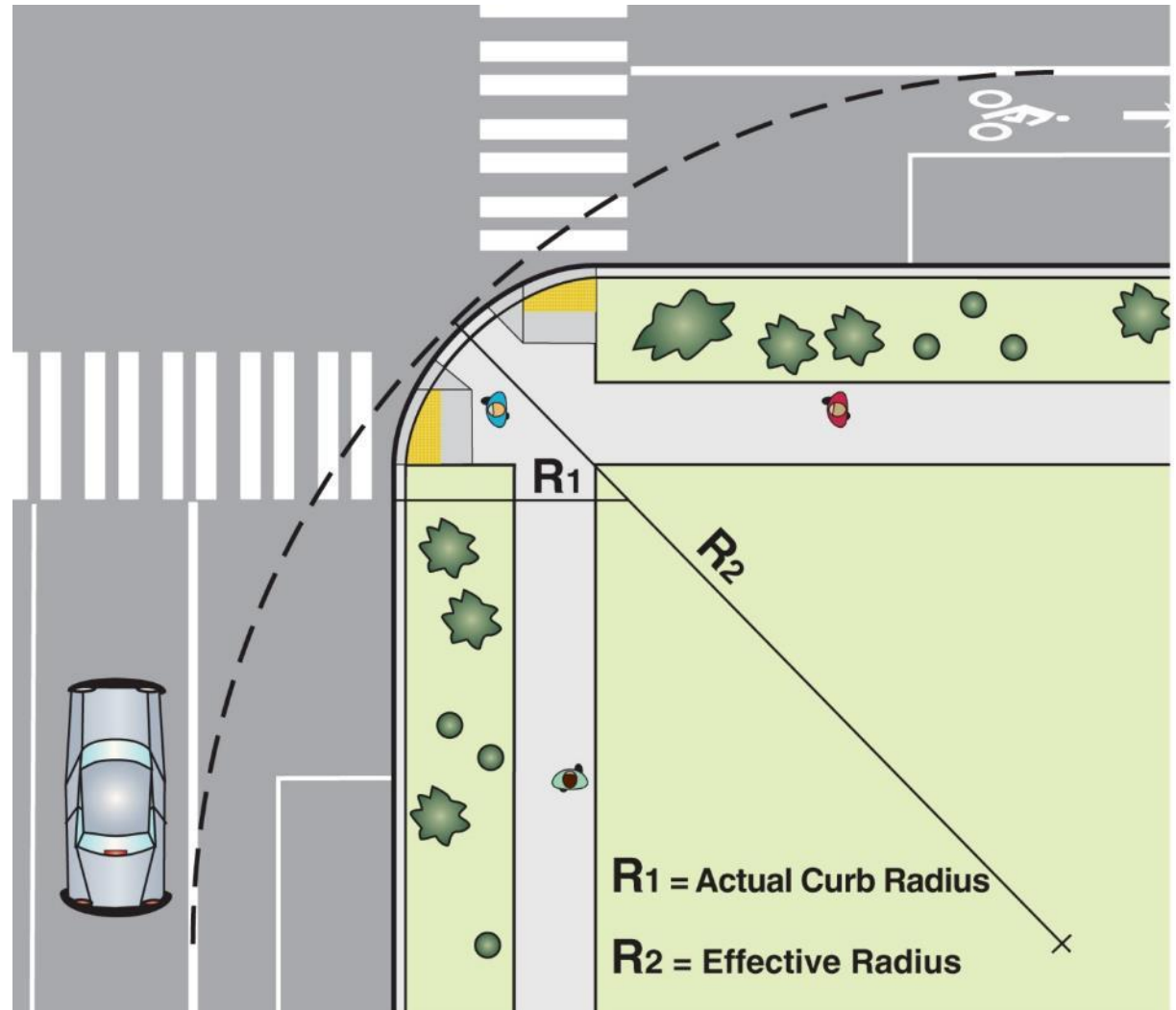
# Curb radius – small radii are safer for pedestrians

- Large radii:
- Increases crossing distance
- Makes crosswalk & ramp placement more difficult



# Minimize curb radius

Calculate effective radius:  
Larger than built radius if travel lanes offset from curb with parking and/or bike lane





# Effective Curb Radius



# Minimize Curb Radius w/Truck Apron





# Spectacular Seven



Crosswalk Visibility Enhancements



**Raised Crosswalks**



Pedestrian Refuge Islands



RRFB



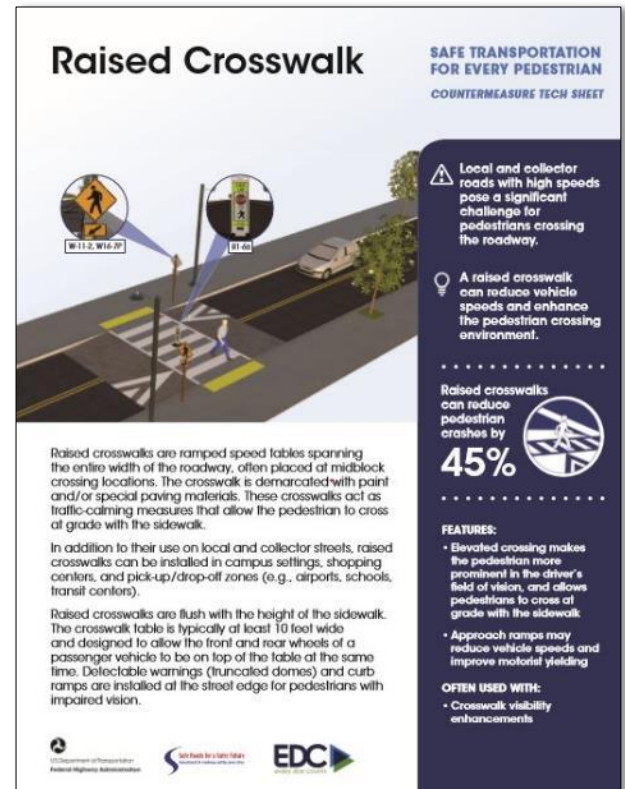
PHB



Road Diets



LPI



# Raised Crosswalks

May be appropriate for roads with:

- Two or three lanes
- Speed limits of 30 mph or less
- AADT below 9,000



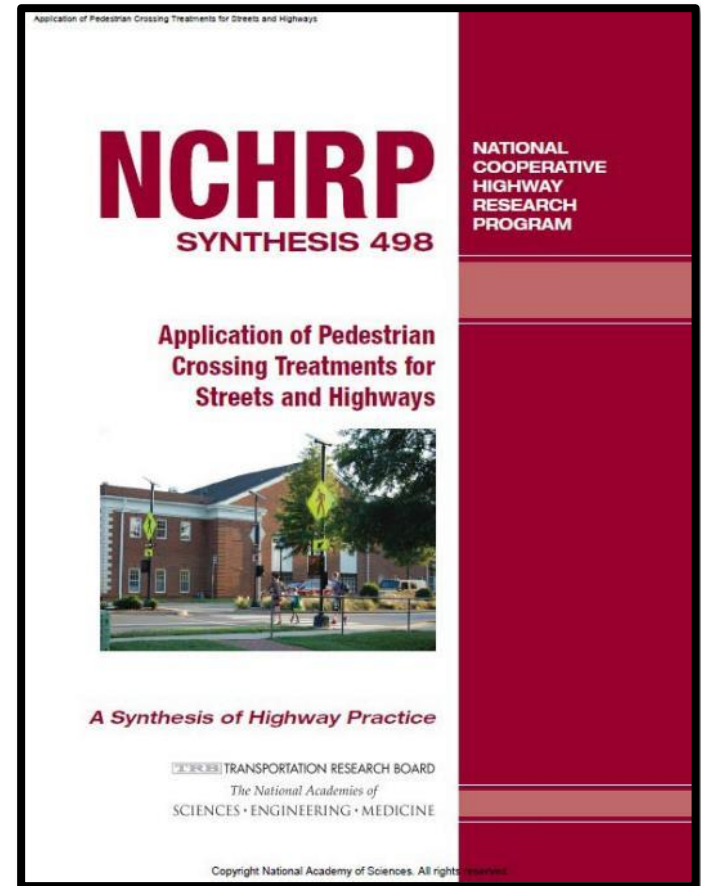
Photo Source: SRTS Guide

# Raised Crosswalks

## NCHRP Synthesis 498 (December 2016)

### Key Measured Effects

- Lower speeds
- Improved motorist yielding at some locations
- 30% CRF for all crashes
- 36% CRF for all fatal injury crashes



<http://www.trb.org/Publications/Blurbs/175419.aspx>

---

# Considerations

- May not be appropriate if street is a bus route or emergency route
  - Emergency services consulted
  - Snow plowing public works consulted
- ADA – Truncated domes for visually impaired
- Drainage
- May be inappropriate for crossings on curves or steep roadway grades
- Several raised crossings in succession may be disruptive

# Raised Crosswalk

## Traffic Calming ePrimer

- [https://safety.fhwa.dot.gov/speedmgt/traffic\\_calm.cfm](https://safety.fhwa.dot.gov/speedmgt/traffic_calm.cfm)



Figure 3.14.6. Raised Crosswalk with Bicycle Lane  
(Source: Scott Batson)



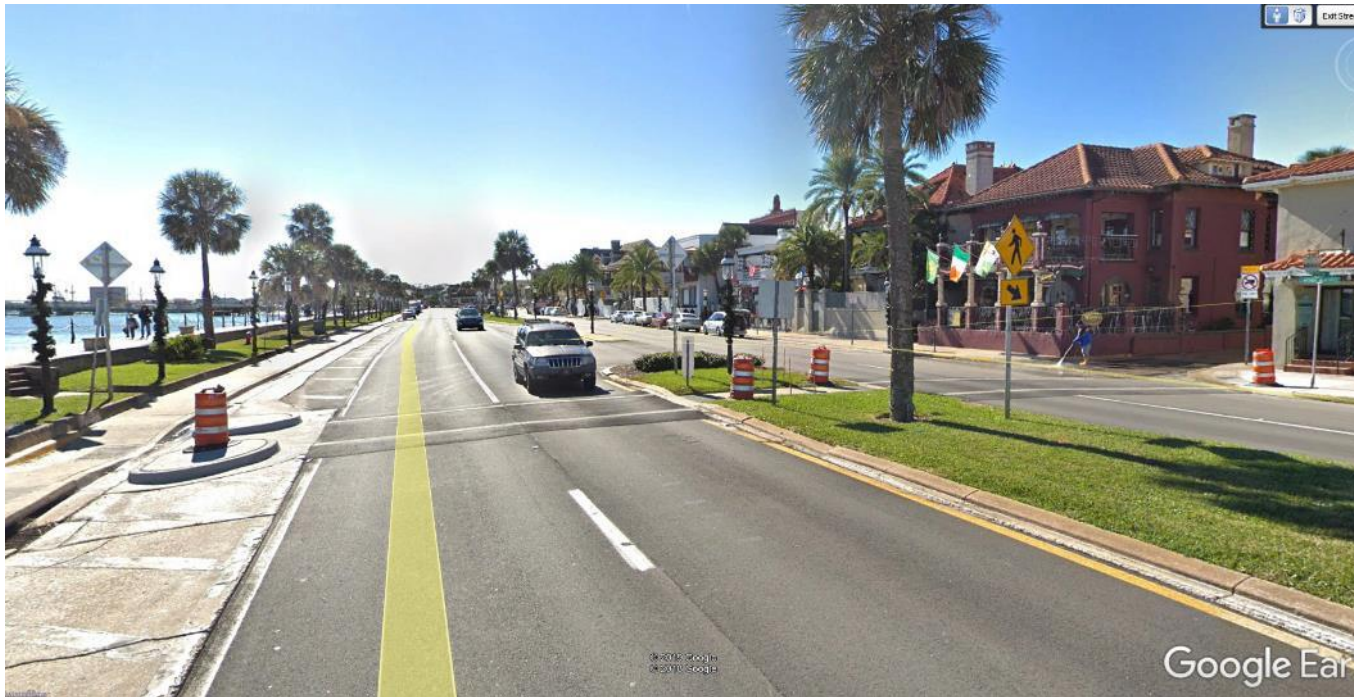
Figure 3.14.4. Raised Crosswalk at Intersection  
(Source: City of Cambridge, Massachusetts)



# FDM 202

## 202.3.8 Vertical Deflection

Like horizontal deflection, vertical deflection is a well-proven technique for speed management. Speed tables and raised intersections may be considered only for design speed 25 mph or less. High levels of engagement with local public works and emergency services is required when vertical deflection is proposed.



# FDM 202

## Table 2.3.1 25 mph Desired Operating Speed

Topic #625-000-002  
FDOT Design Manual

January 1, 2019

Table 202.3.1 Strategies to Achieve Desired Operating Speed

Context Classification	Design Speed (mph)	Strategies
C1	55-70	Project-specific; see <i>FDM 202.4</i> .
C2	55-70	Project-specific; see <i>FDM 202.4</i> .
C2T	40-45	Roundabout, Lane Narrowing, Horizontal Deflection, Speed Feedback Signs, RRFBs and PHBs
	35	Techniques for 40-45 mph, plus On-street Parking, Street Trees, Short Blocks, Median Islands at Crossings, Road Diet, Bulbouts, Terminated Vista
	30	Techniques for 35-45 mph, plus Chicanes, Median Islands in curved sections, Textured Surface
	≤ 25	Techniques for 30-45 mph, plus Vertical Deflection
C3R, C3C	55-70	Project-specific; see <i>FDM 202.4</i> .

		Textured Surface
C5	35	Roundabout, On-street Parking, Street Trees, Short Blocks, Speed Feedback Signs, Median Islands in Crossings, Road Diet, Bulbouts, RRFB and HAWK, Terminated Vista
	30	Techniques for 35 mph plus Chicanes, Median Island in Curve Sections, Textured Surface
	25	Techniques for 30-35 mph plus Vertical Deflection
C6	30	Roundabout, On-Street Parking, Horizontal Deflection, Street Trees, Median Islands in Curve Sections, Road Diet, Bulbouts, Terminated Vista, Textured Surface
	25	Techniques for 30 mph plus vertical deflection

# Spectacular Seven



Crosswalk Visibility Enhancements



Raised Crosswalks



**Pedestrian Refuge Islands**



Rectangular Rapid  
Flashing Beacon



Pedestrian Hybrid Beacon  
(PHB)



Road Diets

**Pedestrian Refuge Island**

SAFE TRANSPORTATION  
FOR EVERY PEDESTRIAN  
COUNTERMEASURE TECH SHEET

The combination of a long crossing distance and multiple lanes of oncoming traffic can create an unsafe pedestrian environment.

A pedestrian refuge island can improve safety and comfort by providing pedestrians with the option of waiting in the median area before beginning the next stage of the crossing.

Pedestrian refuge islands can reduce pedestrian crashes by **32%**

**FEATURES:**

- Median can enhance visibility of the crossing and reduce speed of approaching vehicles.
- Refuge area provides a place to rest and reduces the amount of time a pedestrian is in the roadway

**OFTEN USED WITH:**

- Crosswalk visibility enhancements
- Curb extensions (where road width allows)

A pedestrian refuge island is a median with a refuge area that is intended to help protect pedestrians who are crossing a multilane road. This countermeasure is sometimes referred to as a crossing island, refuge island, or pedestrian island. The presence of a pedestrian refuge island at a midblock location or intersection allows pedestrians to focus on one direction of traffic at a time as they cross, and gives them a place to wait for an adequate gap in oncoming traffic before finishing the second phase of a crossing.

Refuge islands are highly desirable for midblock pedestrian crossings on roads with four or more travel lanes, especially where speed limits are 35 mph or greater and/or where annual average daily traffic (AADT) is 9,000 or higher. They are also a candidate treatment option for uncontrolled pedestrian crossings on 3-lane or 2-lane roads that have high vehicle speeds or volumes. When installed at a midblock crossing, the island should be supplemented with a marked high-visibility crosswalk.

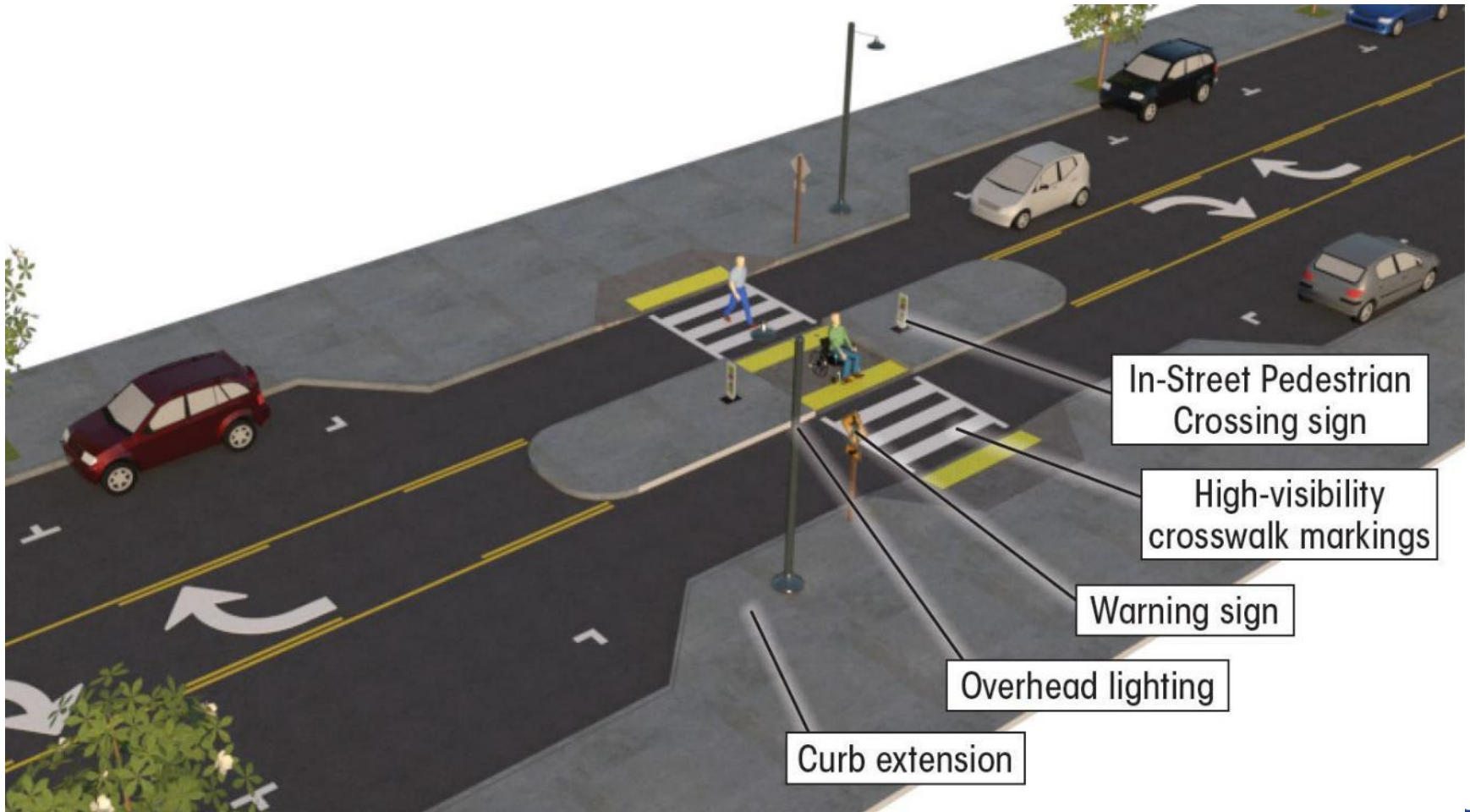
U.S. Department of Transportation  
Federal Highway Administration

Safe Road to a Safe Future

EDC



# Pedestrian Refuge Islands



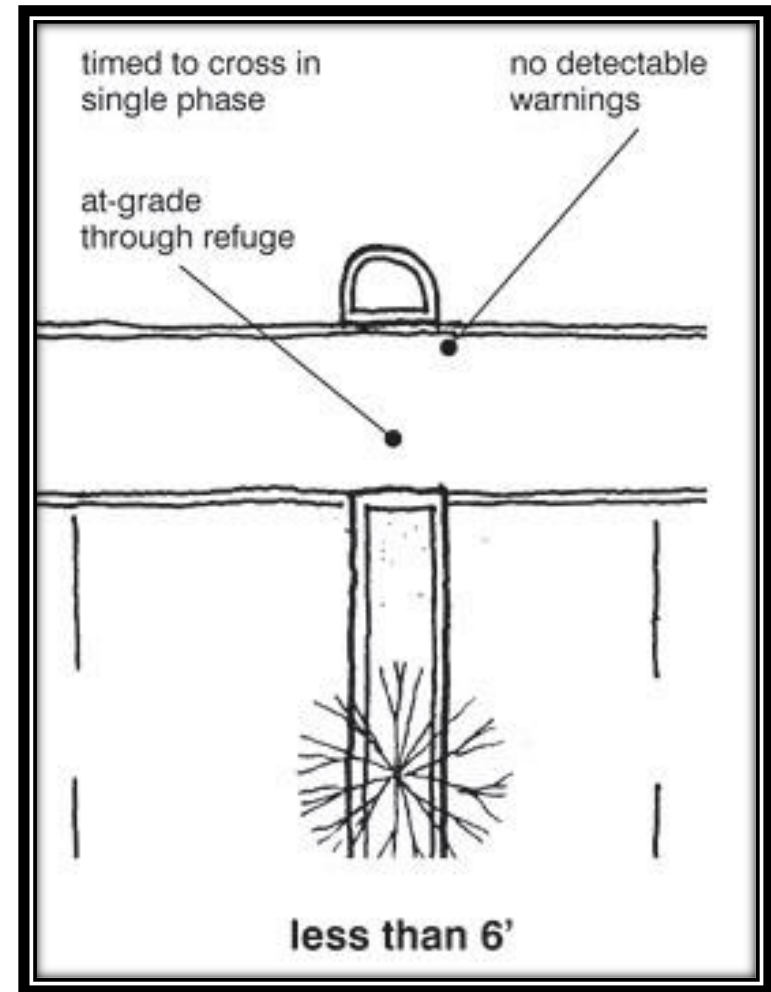
# Pedestrian Refuge Islands





# Medians less than 6 feet wide

- No detectable warning strips in median
- Need 2ft gap between truncated domes



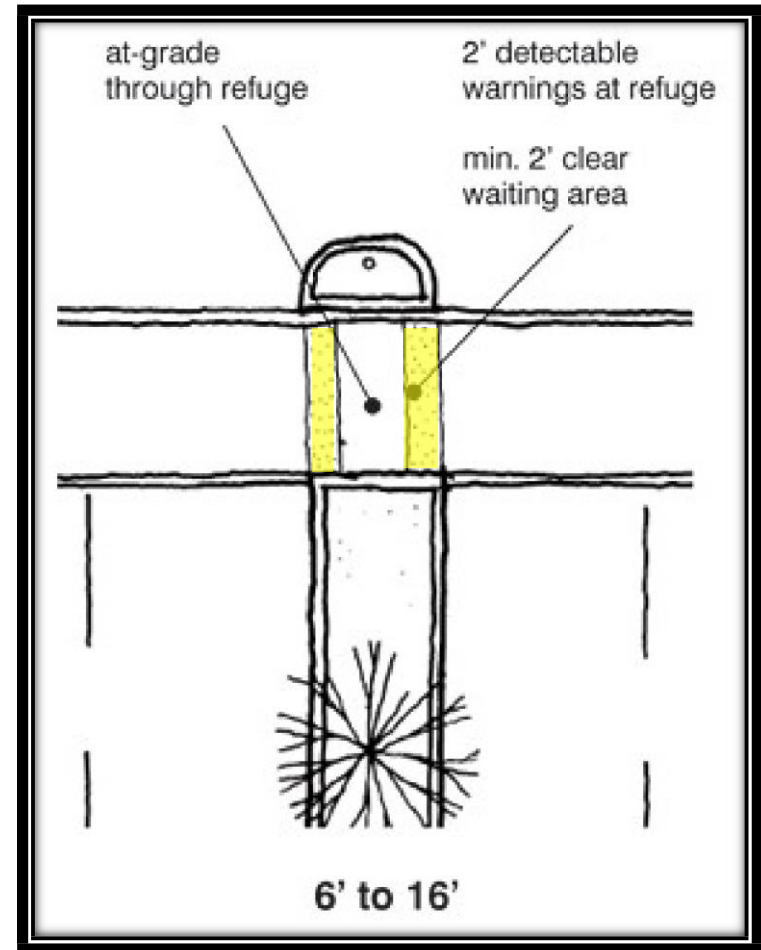
Graphic: San Francisco Better Streets Guide

# Less than 6 feet median: no truncated domes

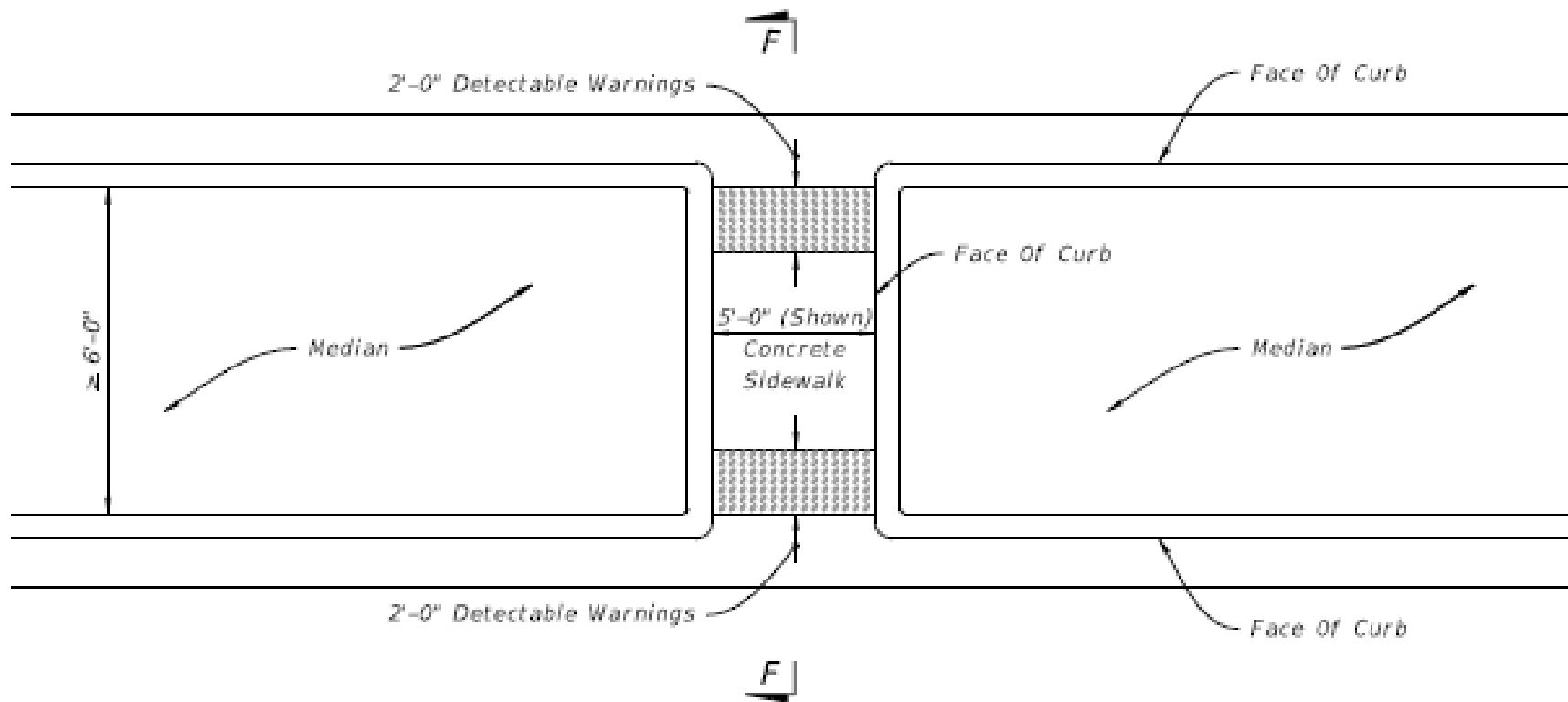


# Medians between 6 and 16 feet wide

- Pathway & waiting area should be at street grade
- 2 foot wide detectable warning strips on each end
- 2 foot wide clear zone (min.) in the center



Graphic: San Francisco Better Streets Guide



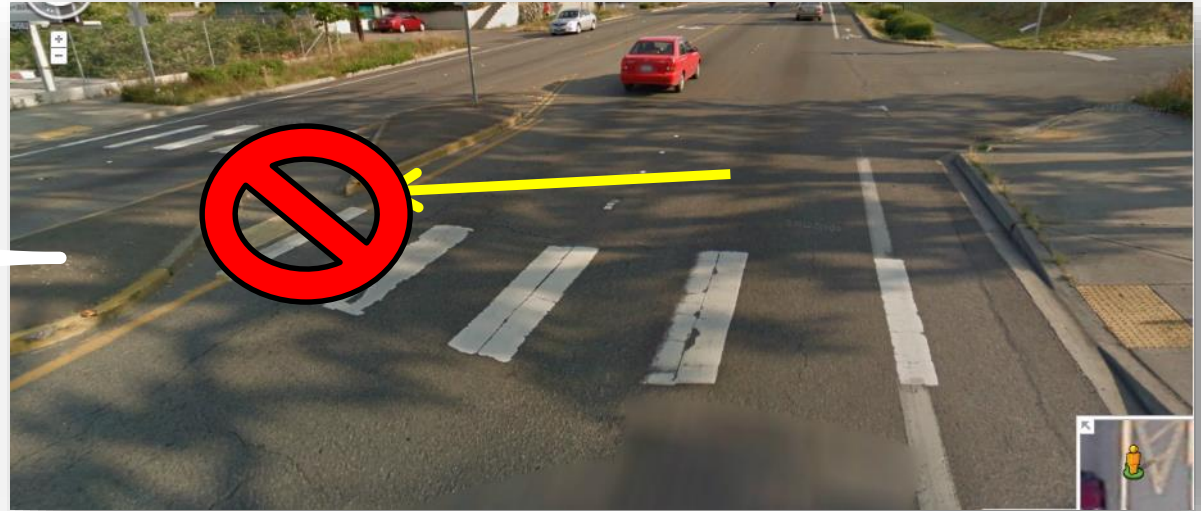
DEPRESSED SIDEWALK

MEDIAN CROSSING

LAST REVISION 11/01/17	DESCRIPTION:	FDOT	FY 2019-20 STANDARD PLANS	DETECTABLE WARNINGS AND SIDEWALK CURB RAMPS	INDEX 522-002	SHEET 7 of 8
------------------------------	--------------	------	------------------------------	---	------------------	-----------------



# Angled cut through right or wrong?





# Landscaping

- Landscaping can be a positive feature
- Must not block sight lines of pedestrians and motorists at the crossing area
- Use of ground covering, low shrubs, colorful native plants



# Landscaping

Hardscape treatments , patterned concrete or paver surface, may be used on splitter islands in lieu of landscaping



---

## **FDOT Resources for Pedestrian Refuge Islands:**

### **FDM 212: Intersections.**

#### **212.13 Islands**

Figure 212.13.1

Figure 212.13.2

### **FDM 213: Modern Roundabouts.**

#### **213.3.5 Splitter Islands**

Exhibit 213-3

Exhibit 213-4

Exhibit 213-5

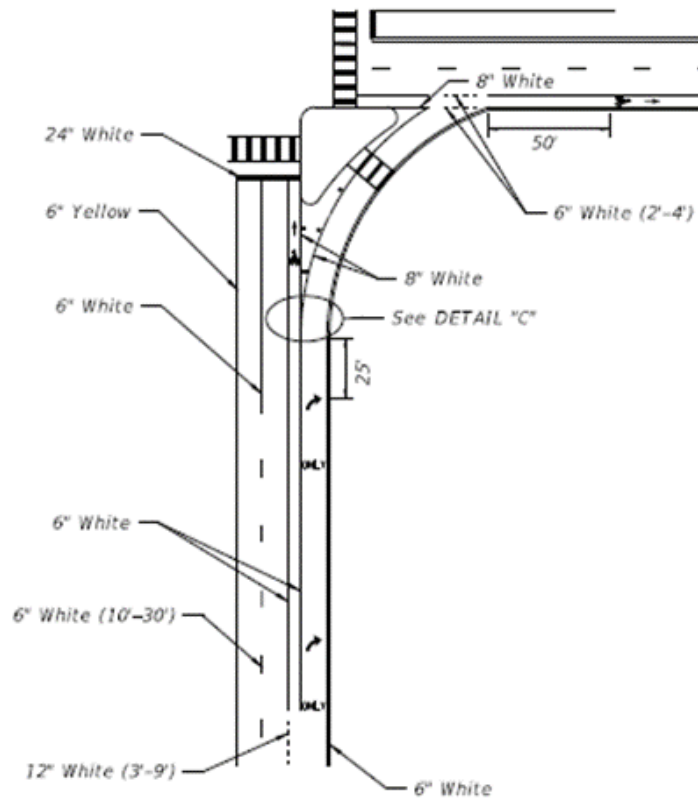
### **Standard Plans**

**Index 711-001** Pavement Markings. Sheet 8

**Index 522-002** Detectable Warnings and Sidewalk Curb Ramps. Sheet 7

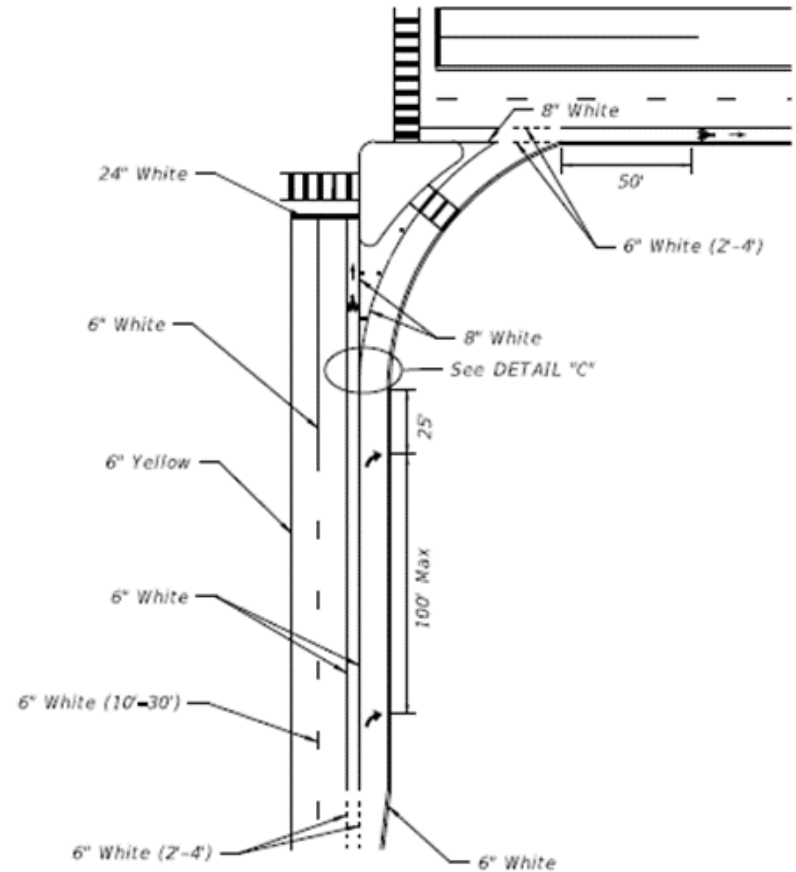
### **Developmental Standard Plans**

**Index D550-804** Pedestrian Channelization Barrier



==== RIGHT TURN LANE DROP AND ISLAND DETAILS ====

LEFT TURN LANE DROP IS MIRROR IMAGE

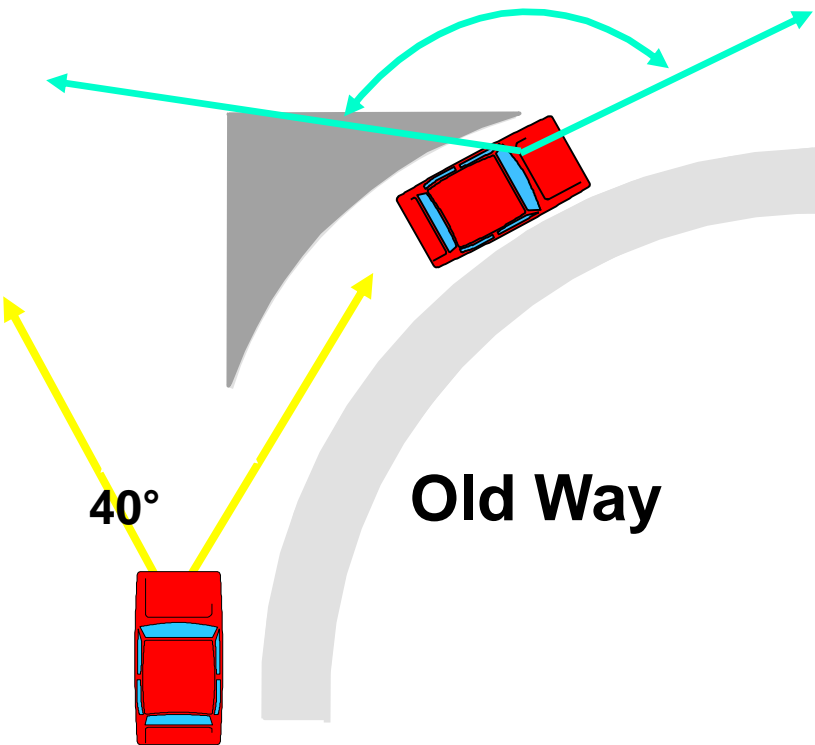


==== RIGHT TURN LANE AND ISLAND DETAILS ====

LAST REVISION	DESCRIPTION:	FDOT	FY 2019-20 STANDARD PLANS	PAVEMENT MARKINGS	INDEX	SHEET
11/01/18					711-001	8 of 13

# Right-Turn Slip Lane: Design for Pedestrians

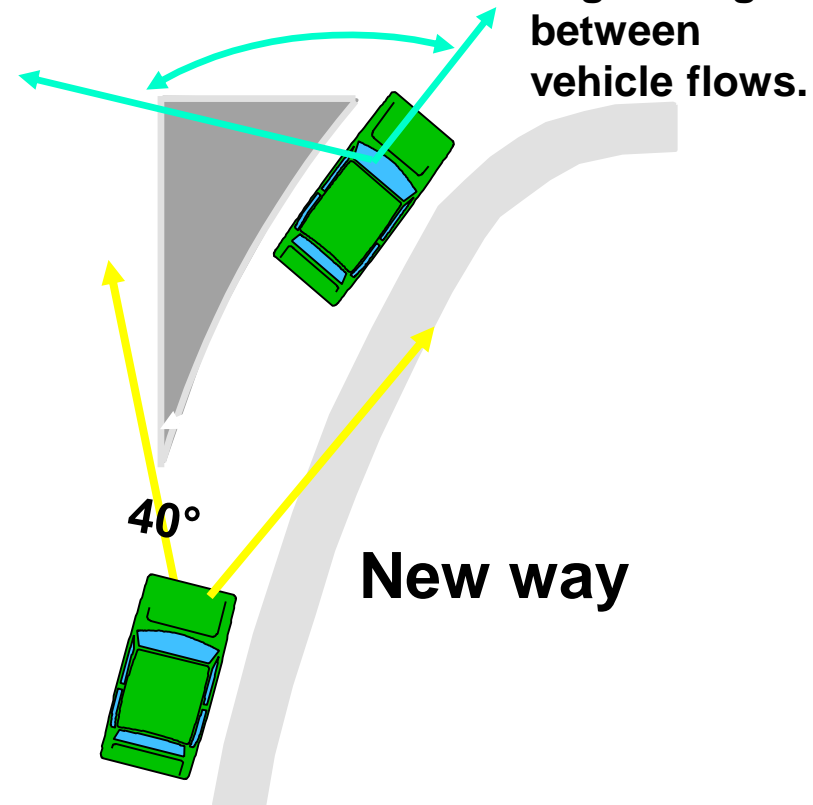
Wide Angle



Old Way

High speed, head turner =  
low visibility of pedestrians

Tighter angle



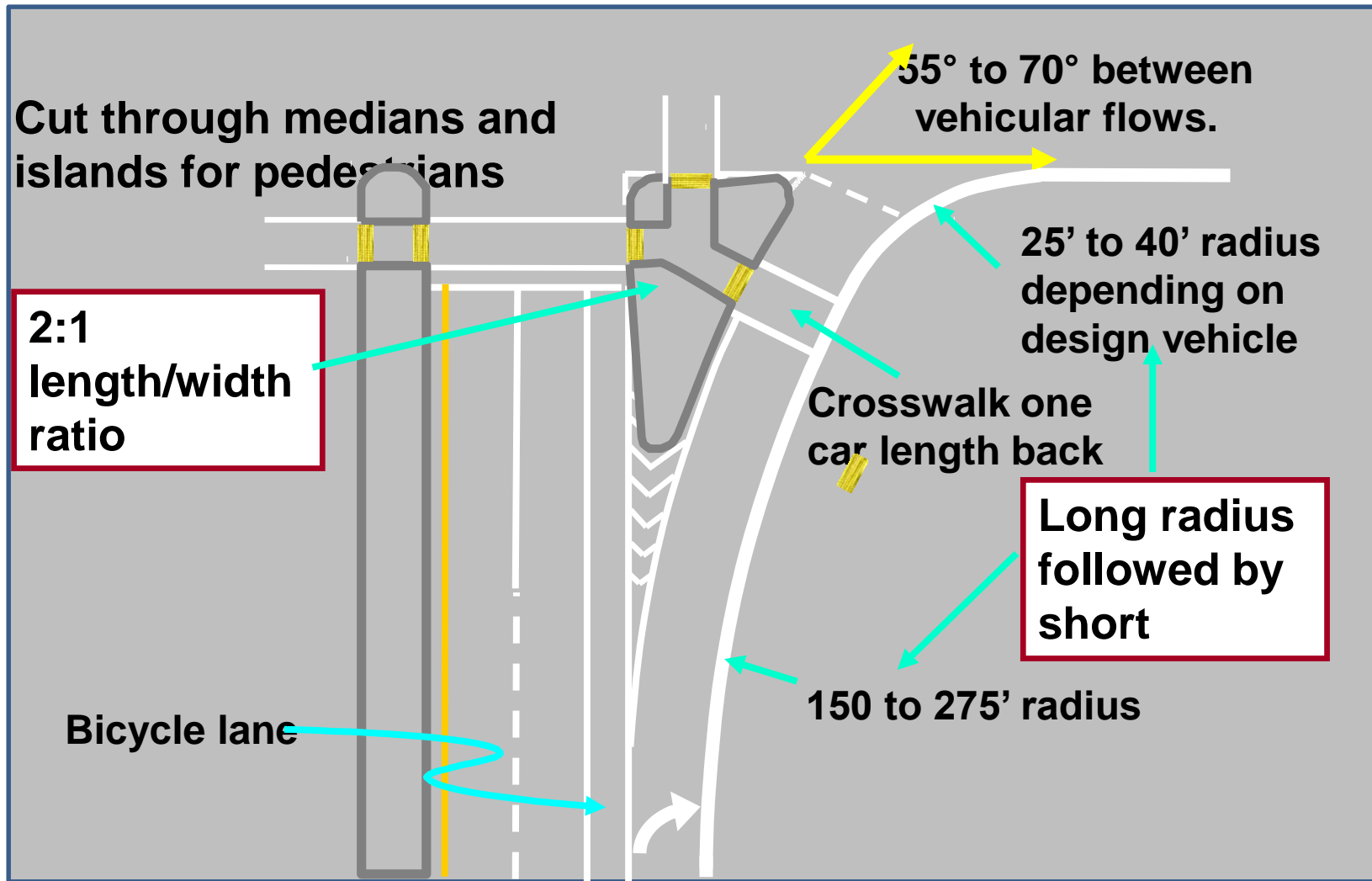
55 to 60  
degree angle  
between  
vehicle flows.

New way

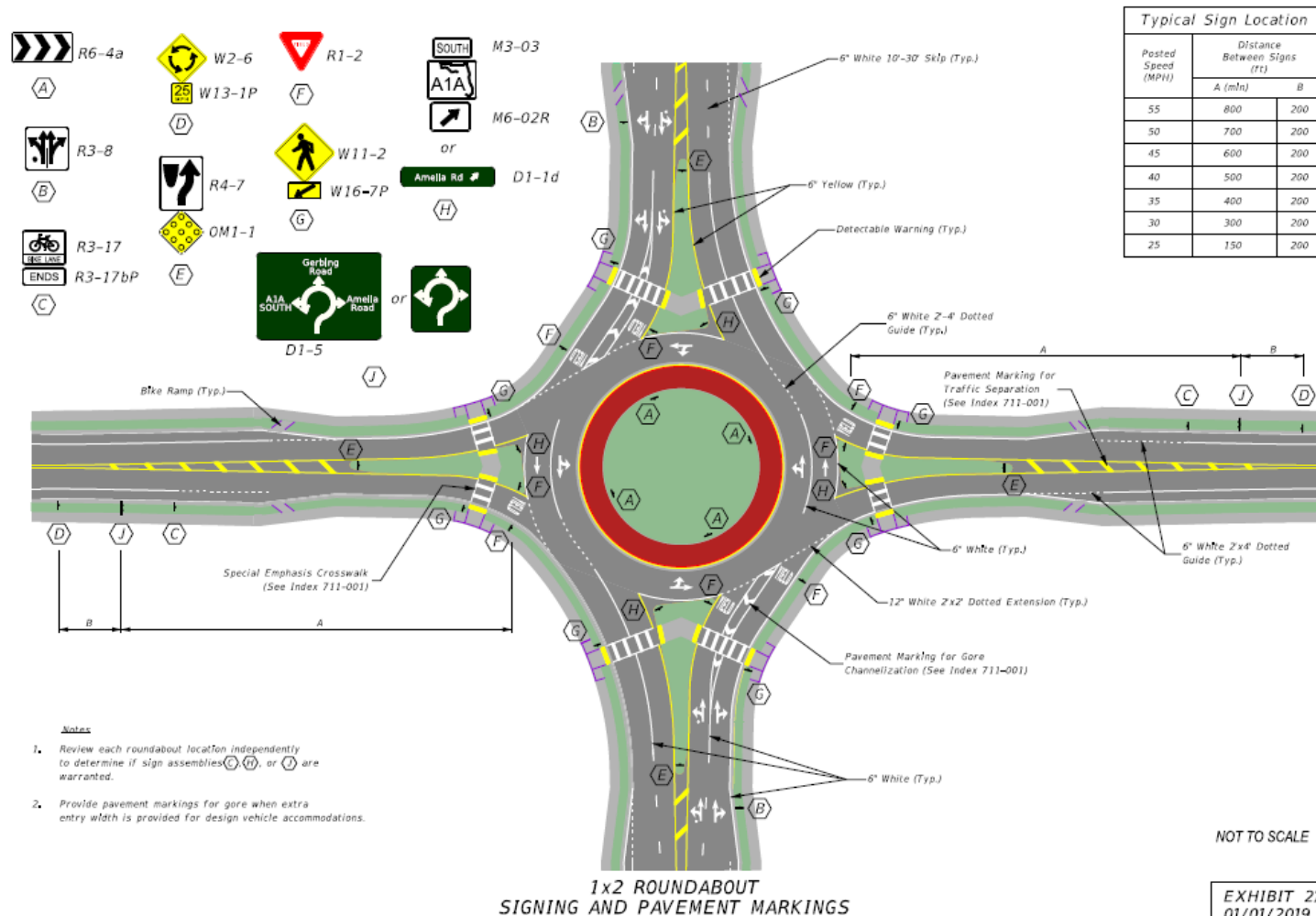
Slow speed, good angle =  
good visibility of pedestrians



# Right-Turn Slip Lane - Details

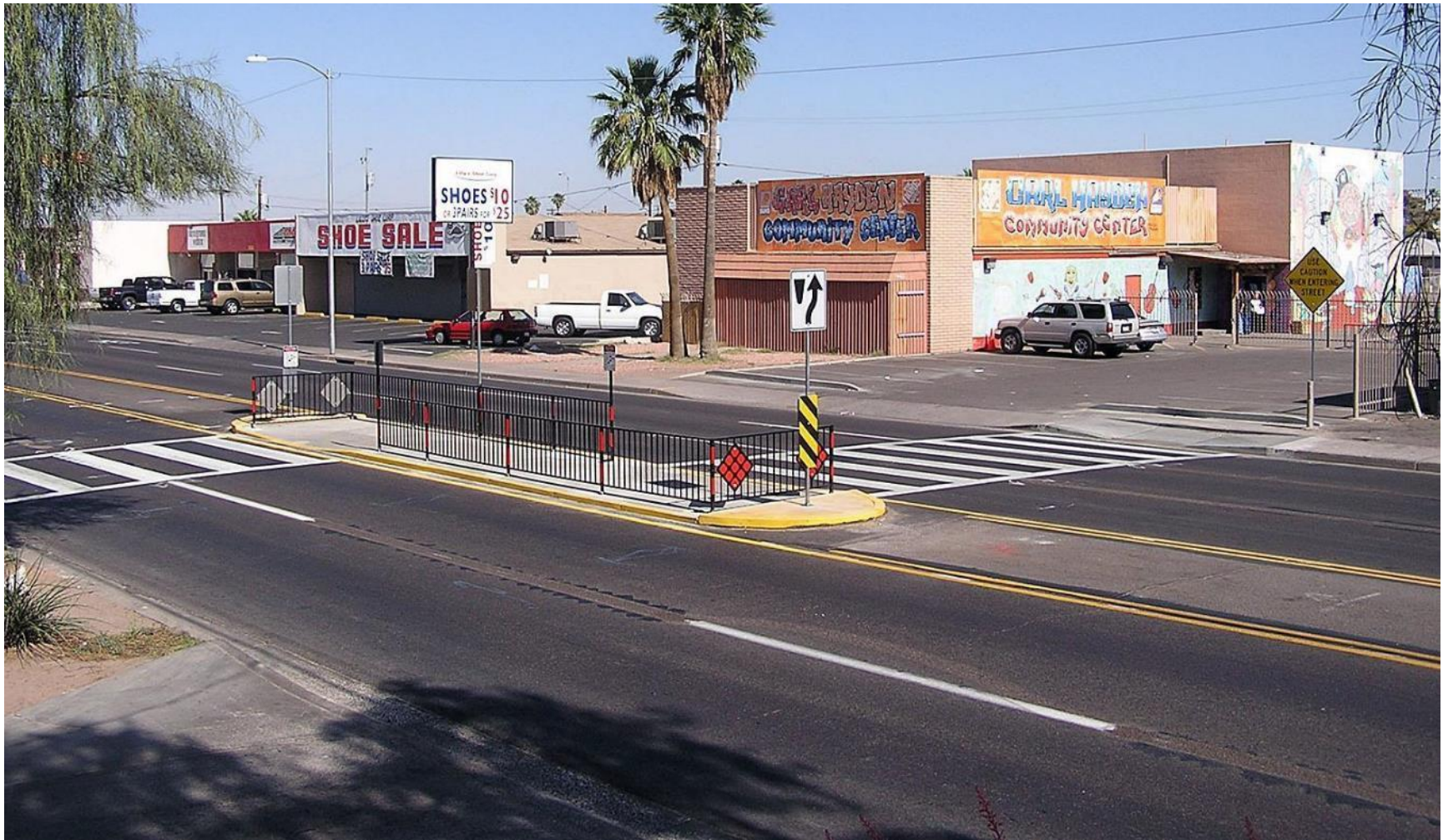


# FDM 213: Modern Roundabouts



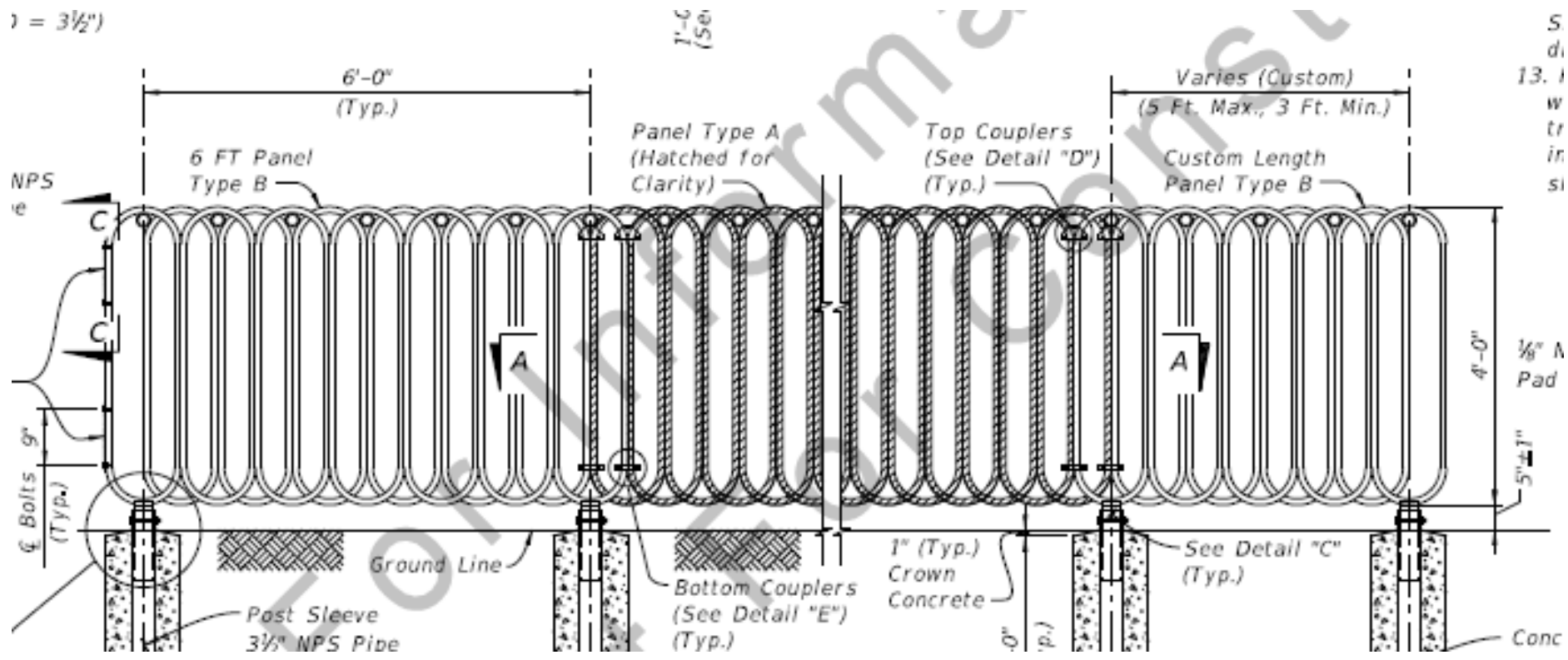
NOT TO SCALE


EXHIBIT 213-3  
01/01/2019



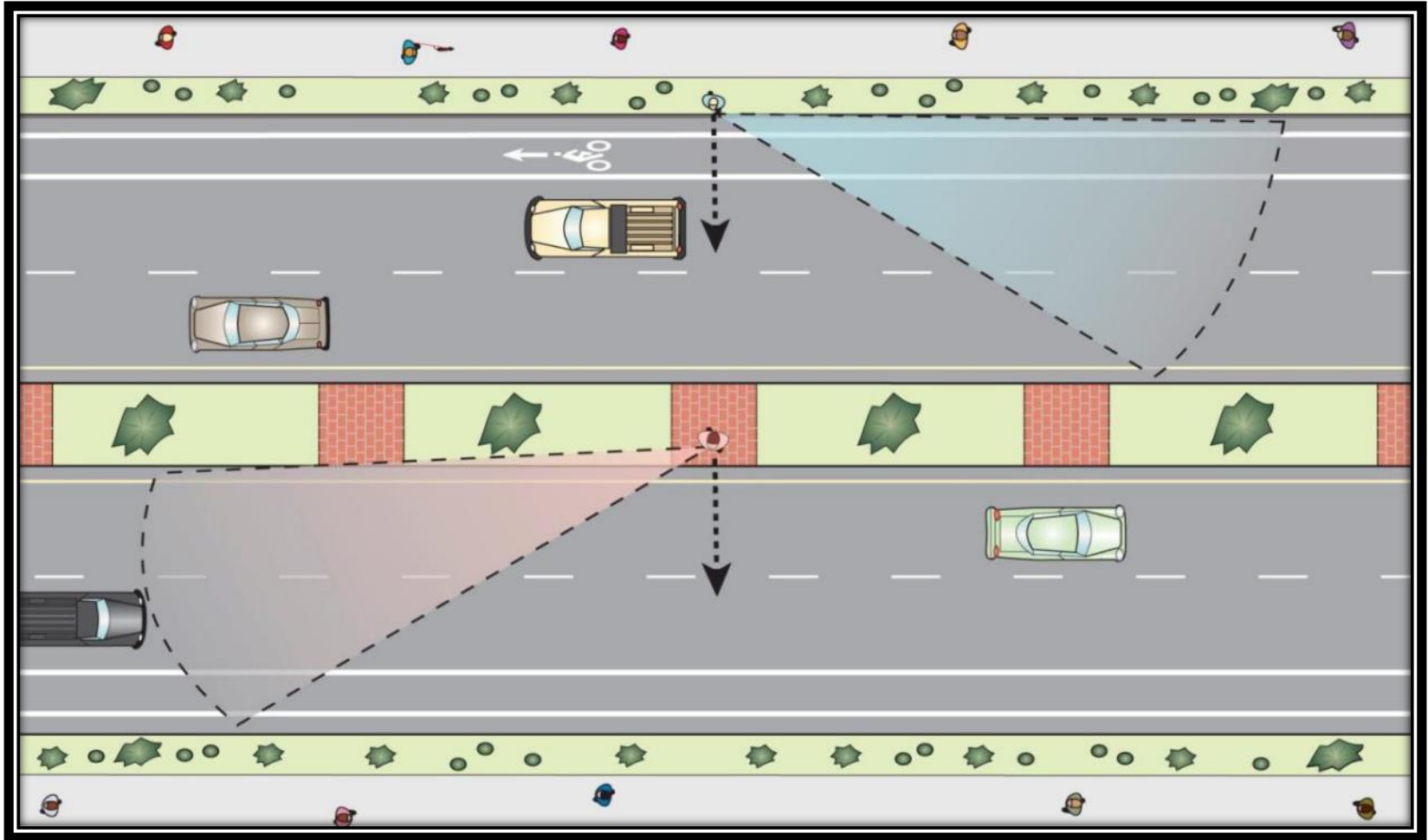
After: Raised median with stagger, Advance stop lines (not visible), Location near destination





LAST REVISION 10/10/14	DESCRIPTION:	 DEVELOPMENTAL STANDARD PLANS	PEDESTRIAN CHANNELIZATION BARRIER	INDEX D550-804	SHEET 1 of 4
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# Continuous Raised Median - Breaks complex crossing into two simpler crossings





# Spectacular Seven



Crosswalk Visibility Enhancements



Raised Crosswalks



Pedestrian Refuge Islands



**Rectangular Rapid Flashing Beacon**



PHB



Road Diets



LPI

**Rectangular Rapid-Flashing Beacon (RRFB)**

SAFE TRANSPORTATION FOR EVERY PEDESTRIAN  
COUNTERMEASURE TECH SHEET

High speeds and multiple lanes of traffic create challenges for pedestrians crossing at unsignalized locations.

RRFBs can make crosswalks and/or pedestrians more visible at a marked crosswalk.

RRFBs can reduce pedestrian crashes by **47%**

**FEATURES:**




- Enhanced warning
- Improves motorist yielding

**OFTEN USED WITH:**

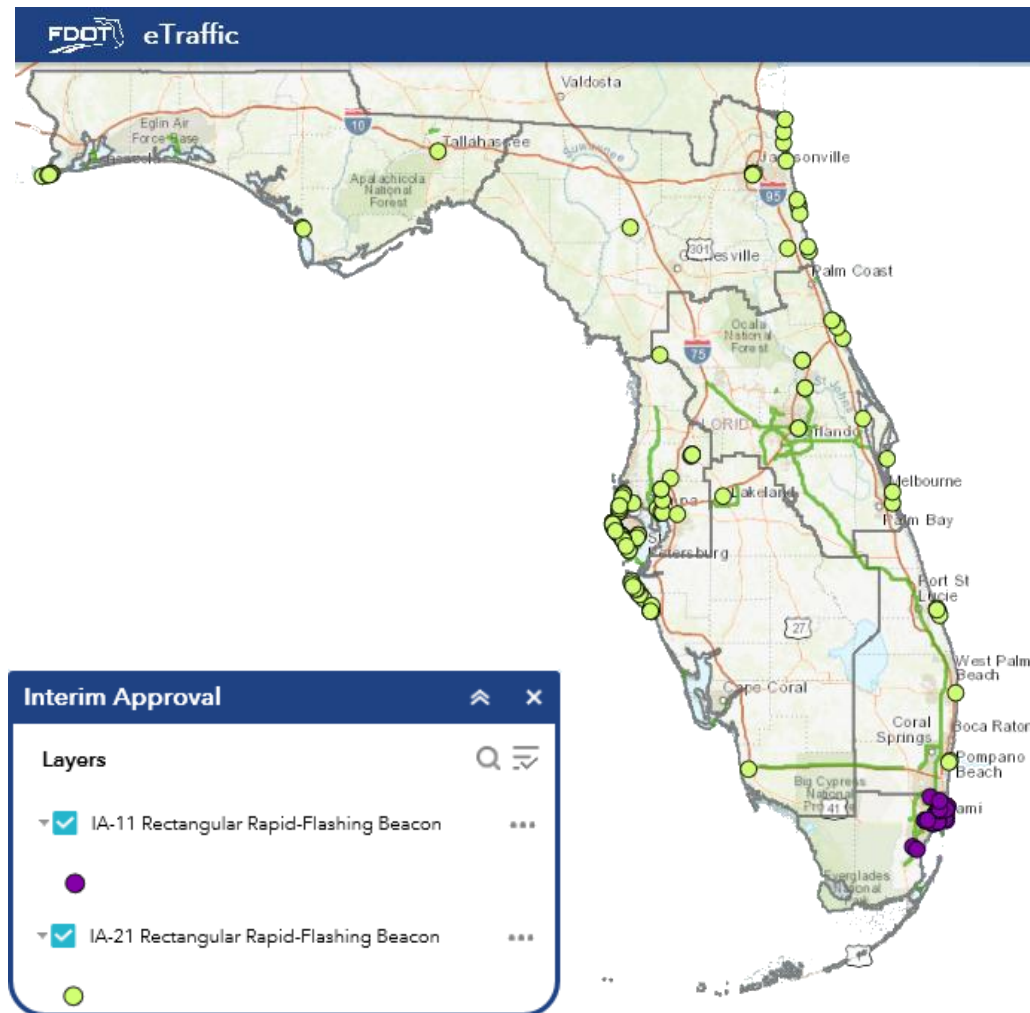
- Crosswalk visibility enhancements
- Pedestrian refuge island
- Advance STOP or YIELD markings and signs

An RRFB is a pedestrian-actuated conspicuity enhancement used in combination with a pedestrian crossing warning sign to improve safety at uncontrolled crossing locations. The device includes two rectangular-shaped yellow indications, each with an LED-array-based light source, that flash with high frequency when activated.

The RRFB is a treatment option at many types of established pedestrian crossings. For example, an RRFB may be a consideration for crossings of 2 or more lanes with speed limits of 35 mph or above and/or at crossings of 3 or more lanes with any speed limits. However, for high-speed roads (40 mph or greater) combined with high vehicle volumes (annual average daily traffic of 15,000 and above) and/or certain combinations of high-volume and high-speed, the RRFB may not be sufficient, and a Pedestrian Hybrid Beacon is likely a better option.

# (IA-21) and (IA-11)on eTraffic

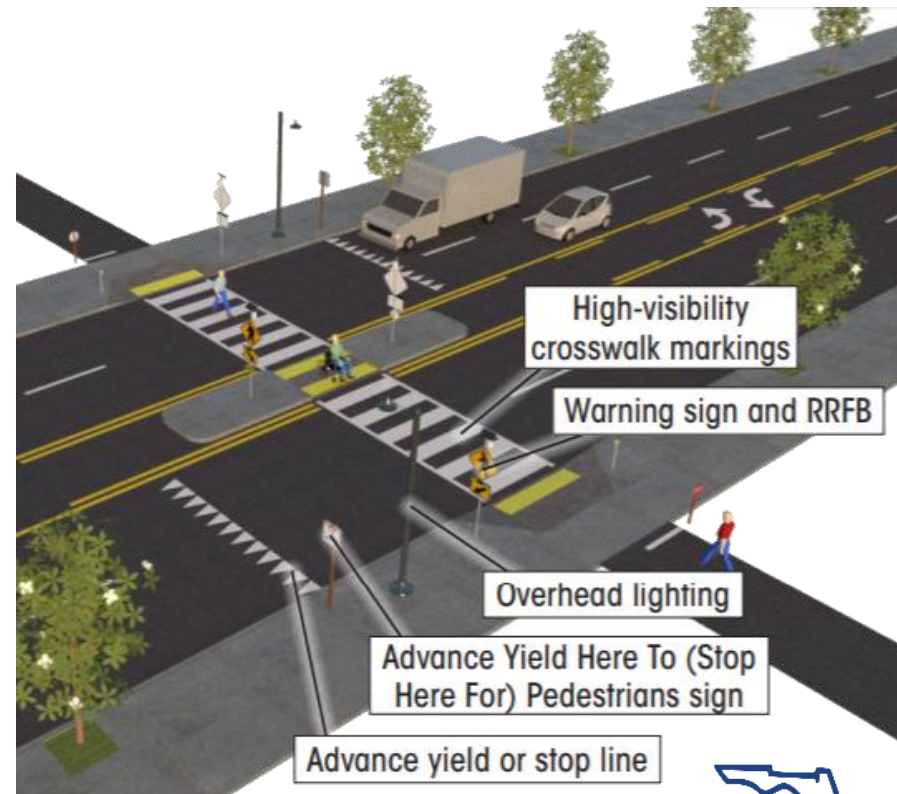
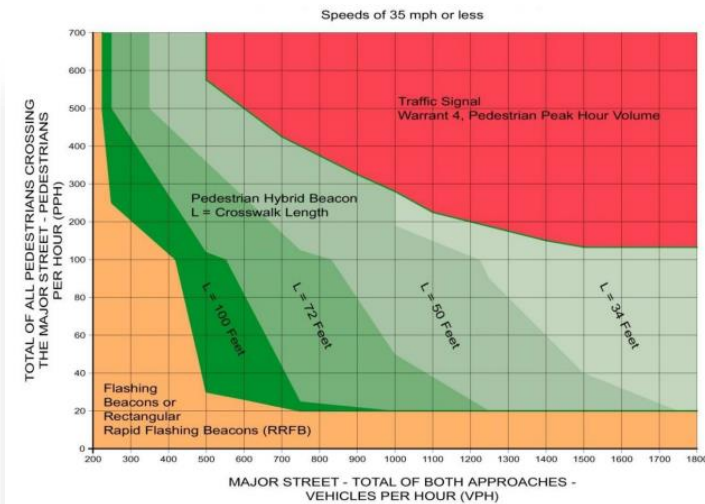


<https://www.arcgis.com/apps/webappviewer/index.html?id=ed2ff4aba7bd4345a089d821fbf667e4>



# RRFB Midblock Configuration and Guidelines

## FDOT Traffic Engineering Manual TEM 3.8 MID-BLOCK PEDESTRIAN CROSSWALKS

### TEM 3.8 Guideline for Installation of Pedestrian Treatment



# Rectangular Rapid Flashing Beacon New IA-21

		<b>Memorandum</b>	
Correction issued 3/21/2018			
Subject: <b>INFORMATION:</b> MUTCD – Interim Approval for Optional Use of Pedestrian-Actuated Rectangular Rapid-Flashing Beacons at Uncontrolled Marked Crosswalks (IA-21)		Date: MAR 20 2018	
From: Martin C. Knopp  Associate Administrator for Operations		In Reply Refer To: HOTO-1	
To: Federal Lands Highway Division Directors Division Administrators			



**Figure 1.** Example of an RRFB dark (left) and illuminated during the flash period (center and right) mounted with W11-2 sign and W16-7P plaque at an uncontrolled marked crosswalk.

[https://mutcd.fhwa.dot.gov/res-interim\\_approvals.htm#valid09](https://mutcd.fhwa.dot.gov/res-interim_approvals.htm#valid09)

Must request and receive permission to use this new Interim Approval (IA-21) even if prior approval had been given for Interim Approval (IA-11).



---

# Interim Approval – Allowable Uses

- Function as pedestrian-actuated conspicuity enhancement
- Shall only be used to supplement post-mounted Pedestrian, School, Trail Crossing warning sign with diagonal downward arrow, plaque, or overhead-mounted warning sign located at or immediately adjacent to an uncontrolled marked crosswalk
- If deemed necessary by the engineer, in event of sight distance, additional RRFB may be installed in advance of crosswalk. Shall supplement not replace.



# IA-21 Beacon Operation

6. e. Flash period shall be **immediately initiated each and every time** a pedestrian is detected through passive detection or pushbutton activated, including when pedestrians are detected while RRFB's are already flashing and when pedestrians are detected immediately after the RRFB's have ceased flashing.

6. f. Small pilot light may be installed



Figure 2. View of pilot light to pedestrian at shared-use path crossing with median refuge. Enlargement of pilot light at right.



IA-21 3.a For any approach two RRFB required, One on right-hand and one on left-hand of roadway. If divided highway left-hand should be installed on median if practical rather than far left-hand.

# Rectangular Rapid Flash LED Beacon

- Studies indicate motorist yield rates increased from about 20% to 80%
- Higher yielding rates sustained even after two years of operation and no identifiable negative effects
  - St. Petersburg FL research report 2008





# FDOT/FHP Rectangular Rapid Flashing Beacons PSA



[https://www.youtube.com/watch?v=RInnUoJoT48&feature=emb\\_logo](https://www.youtube.com/watch?v=RInnUoJoT48&feature=emb_logo)

# Spectacular Seven



Crosswalk Visibility Enhancements



Raised Crosswalks



Pedestrian Refuge Islands



RRFB



**Pedestrian Hybrid Beacon (PHB)**



Road Diets

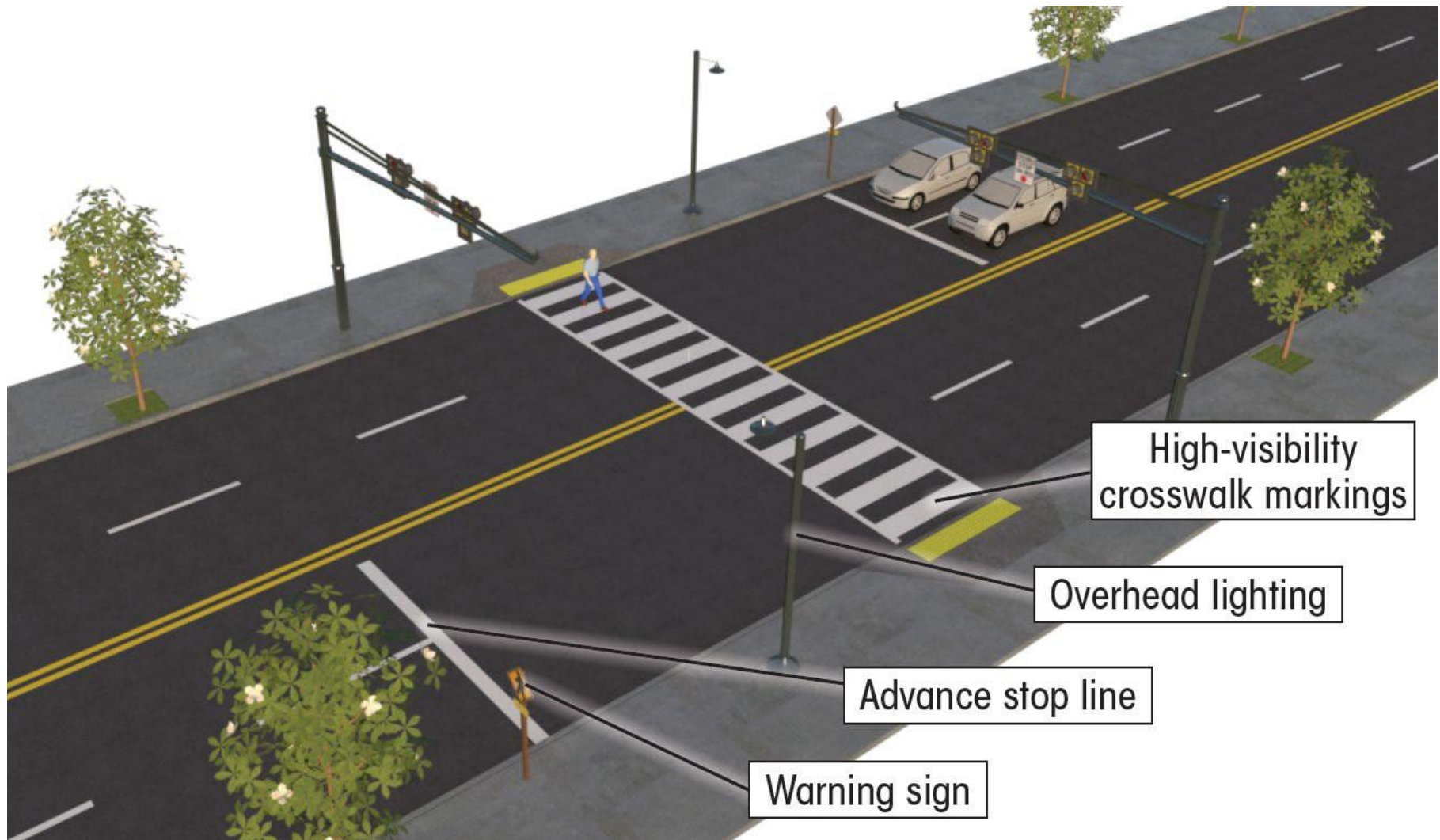


LPI





# Pedestrian Hybrid Beacon



# When to consider a PHB

- Pedestrians want or need to cross the high speed multilane roadways
- Crossing location doesn't meet signal warrants
- Crosswalk markings and signs just won't do if there are any at all
- Pedestrians complain or crash data shows a problem



# Pedestrian Hybrid Beacons (PHB)



CRF: Vehicle/Pedestrian 69%



1  
Blank for  
drivers



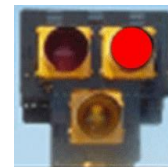
2  
Flashing  
yellow



3  
Steady yellow



4  
Steady red



5  
Wig-Wag

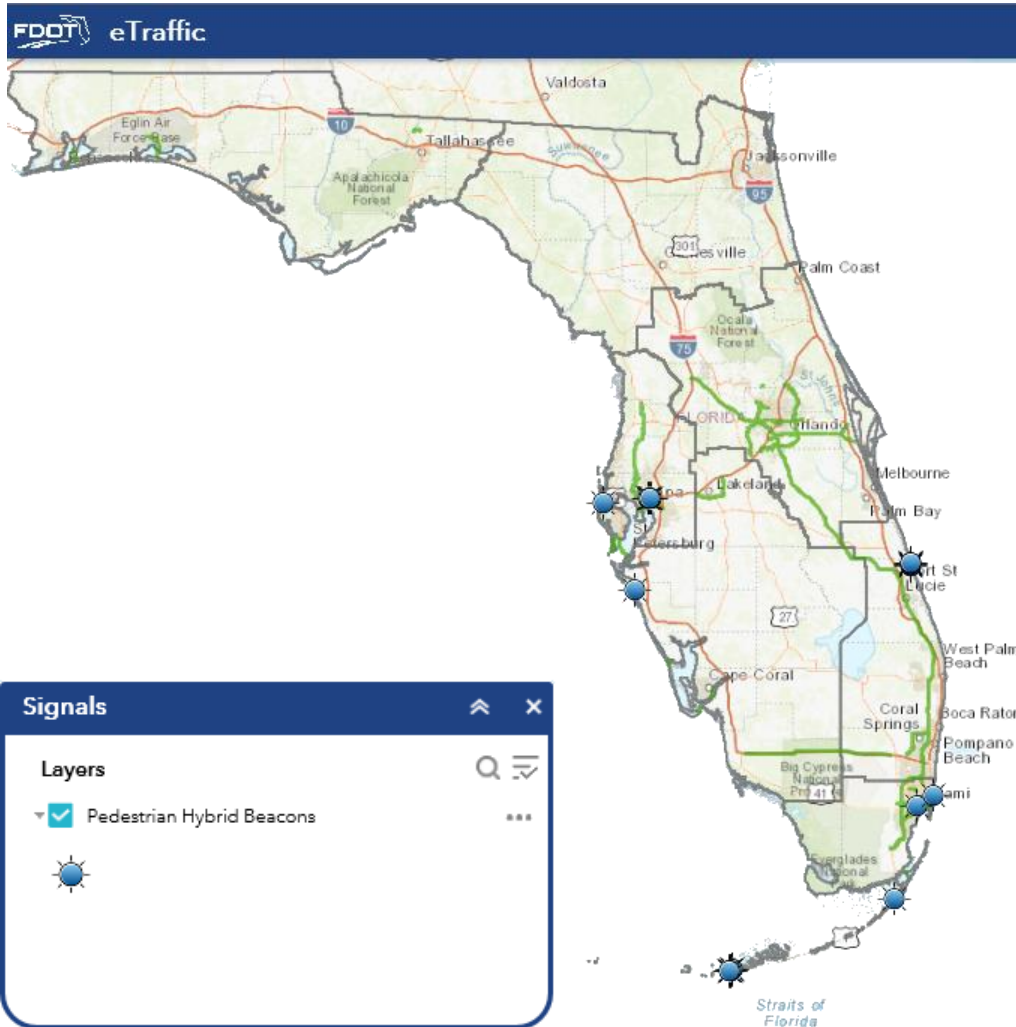


Return  
to 1





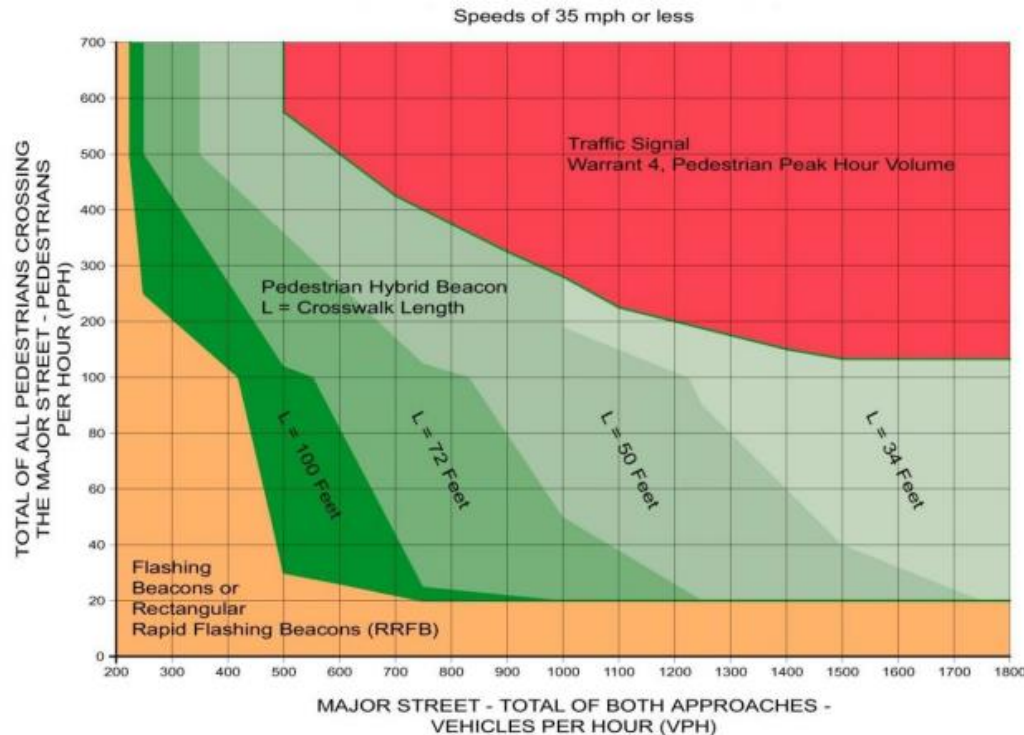
# PHB on eTraffic



<https://www.arcgis.com/apps/webappviewer/index.html?id=ed2ff4aba7bd4345a089d821fbf667e4>

# PHB TEM 3.8 Guidelines and Criteria

- FDOT 20 PPH minimum threshold requirement
- Low speed and high speed volume criteria.
- If Pedestrian Signal warrants are met FDOT preferred treatment is a signal.

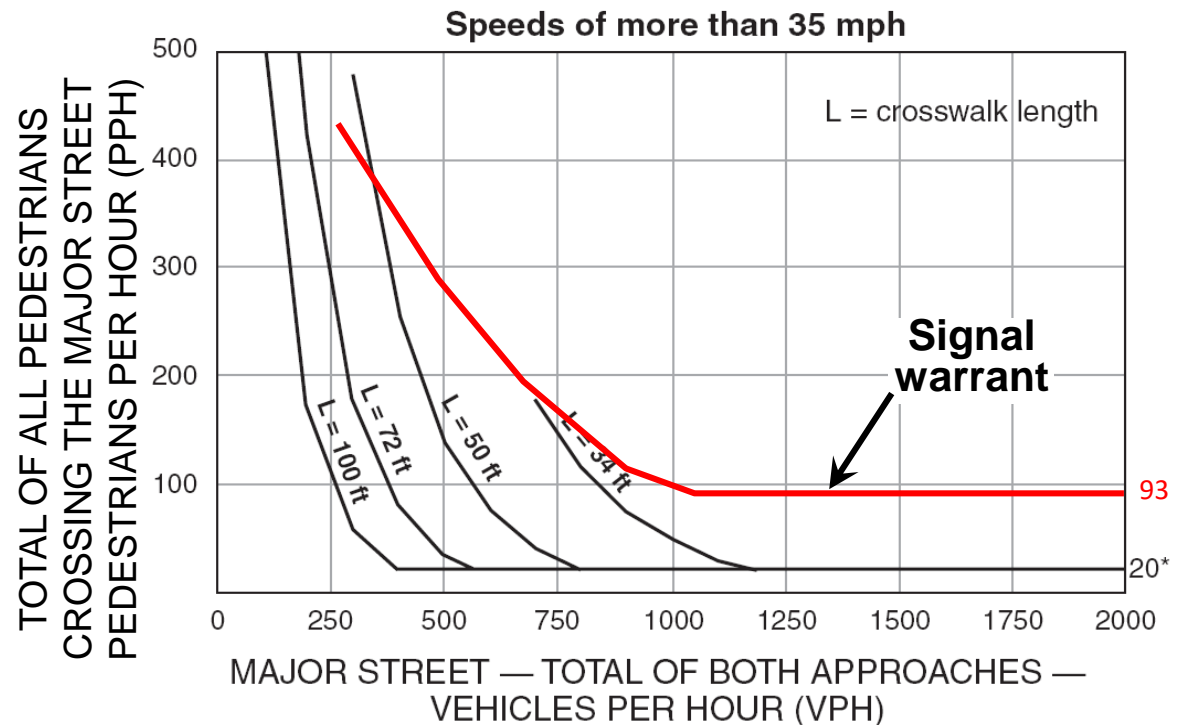




# Excerpts from 2009 MUTCD Chapter 4F For Pedestrian Hybrid Beacons

Guidelines for Pedestrian Hybrid Beacons – variables include:

- Pedestrian volume
- Traffic speeds
- Traffic volumes
- Crosswalk length



MUTCD Sections 4F.1 and 4F.2

# 2009 MUTCD mandated sign

Standard:

A CROSSWALK STOP ON RED (symbolic circular red) (R10-23) sign shall be mounted adjacent to a PHB face on each major street approach.

Option:

State MUTCD's may allow other appropriate MUTCD approved ped, bike or school crossing signs



# Optional Signing

Courtesy: City of Columbus



# Cost Savings with Post Mounted PHB

Las Cruces New Mexico





# PHB Florida Success Story

FDOT D7 installed three PHBs along Hillsborough Ave in the Fall of 2015.





# Hillsborough Ave Preliminary Crash Data

Hillsborough Ave Bicycle and Pedestrian Crashes	
Year	Crashes
2010	17
2011	20
2012	27
2013	24
2014	14
2015	19
2016	7

PHB Installed Fall of 2015

Six year average 20 crashes per year

# Education Campaign

**HOW TO USE THE PEDESTRIAN HYBRID BEACON**

SEE THIS	DO THIS
	<b>GO!</b>
<b>FLASHING</b> 	<b>SLOW DOWN</b> (Pedestrian has activated the push button)
	Prepare to <b>STOP</b>
	<b>STOP!</b> For Pedestrian
<b>FLASHING</b> 	<b>STOP!</b> Proceed with Caution if Clear



# Spectacular Seven



Crosswalk Visibility Enhancements



Raised Crosswalks



Pedestrian Refuge Islands



RRFB



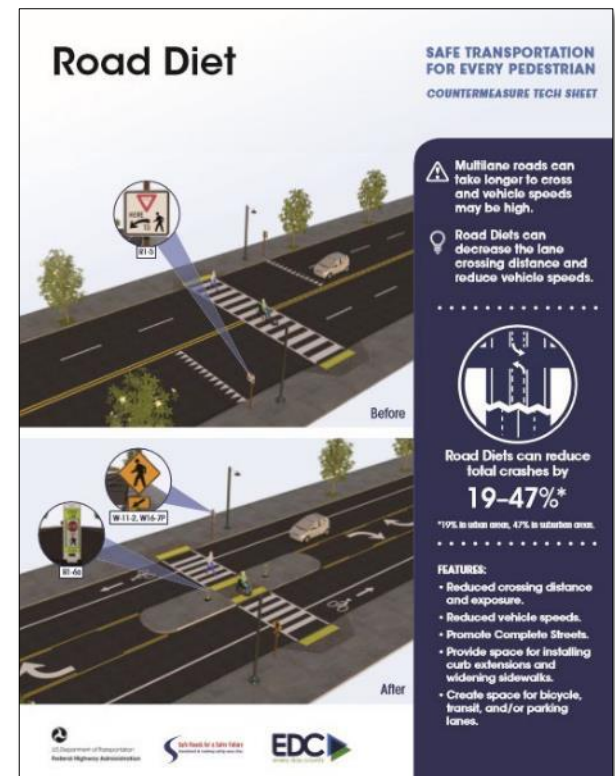
PHB



Road Diets



LPI



# Road Diet CMF = 0.47 & 0.71

## CRF = 53% & 29%

▼ Countermeasure: Converting four-lane roadways to three-lane roadways with center turn lane (road diet)

CMF	CRF (%)	Quality	Crash Type	Crash Severity	Area Type	Reference	Comments
0.47	53	★★★★★	All	All	Suburban	Persaud et. al, 2010	

▼ Countermeasure: Road diet (Convert 4-lane undivided road to 2-lanes plus turning lane)

CMF	CRF (%)	Quality	Crash Type	Crash Severity	Area Type	Reference	Comments
0.71 <sup>[B]</sup>	29	★★★★★	All	All	Urban	Harkey et al., 2008	

Source: CMF Clearinghouse [www.cmfclearinghouse.org](http://www.cmfclearinghouse.org)





# Road Diet / Roadway Reconfiguration



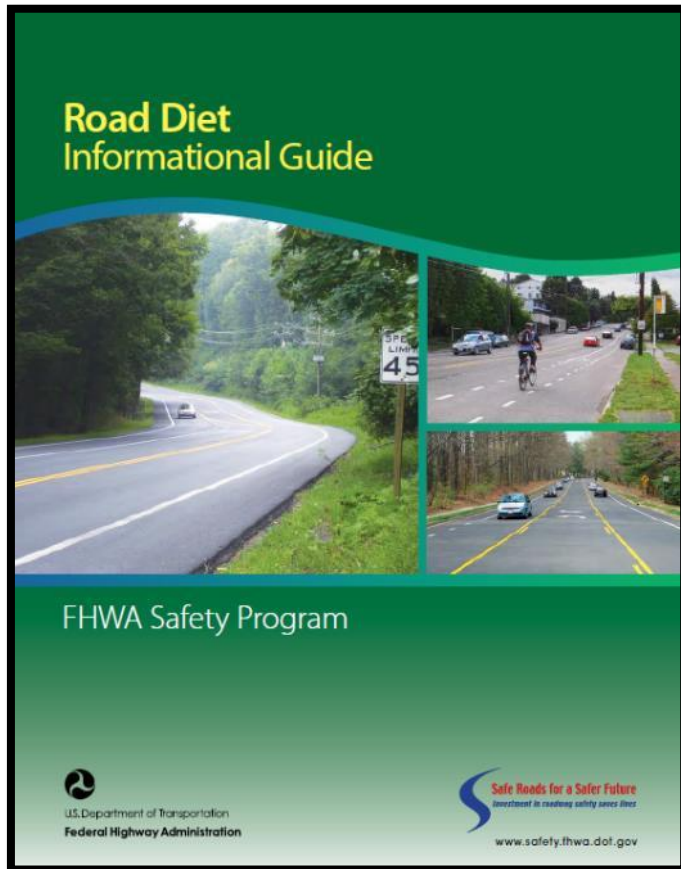
- Reduce crossing distance
- Eliminate /reduce “multiple threat” crash types
- Install crossing island to cross in 2 simple steps

# Road Diet / Roadway Reconfiguration

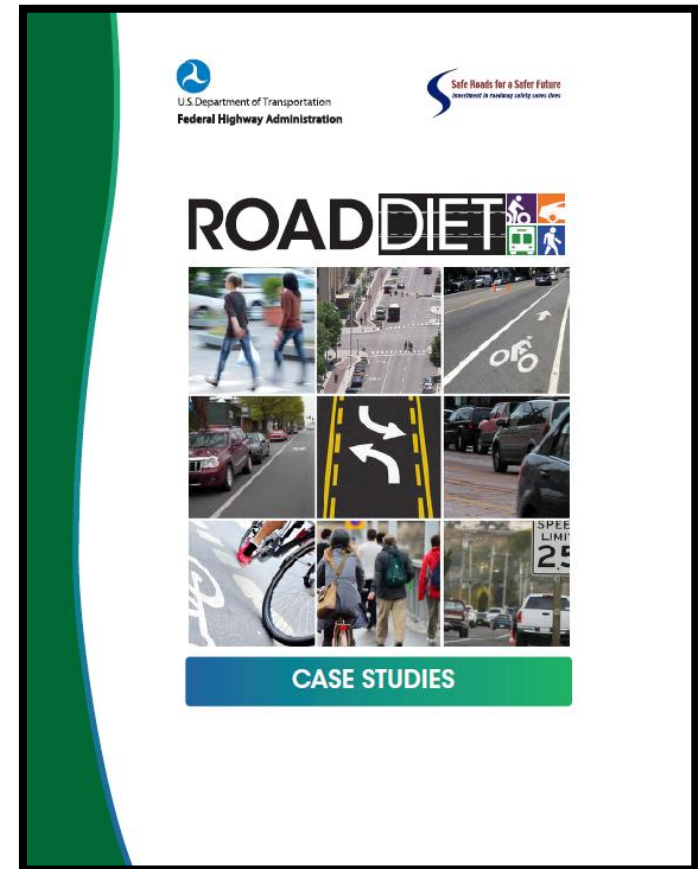


- Reduce top end travel speeds
- Buffer sidewalk from travel lanes (parking or bike lane)
- Reclaim street space for “higher and better use” than moving peak hour traffic

# Road Diet Informational Guide & Road Diet Case Studies

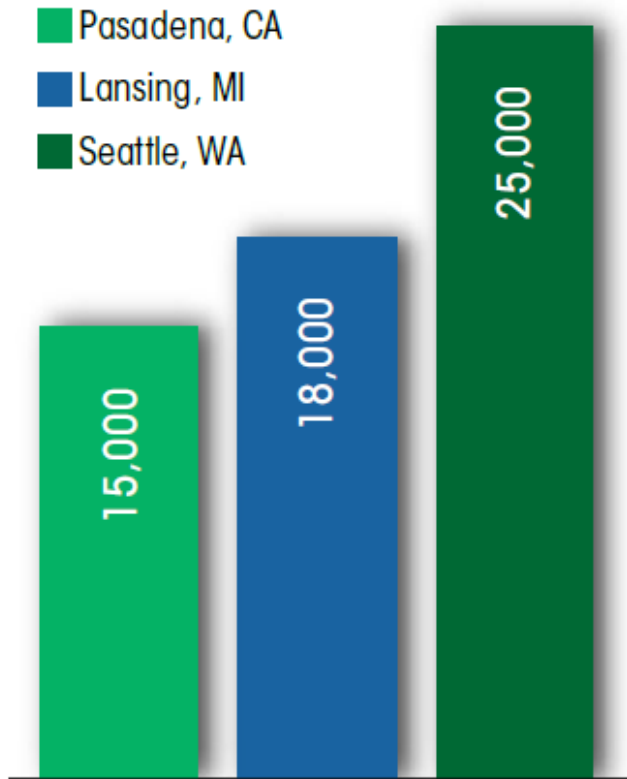


[https://safety.fhwa.dot.gov/road\\_diets/guidance/info\\_guide/](https://safety.fhwa.dot.gov/road_diets/guidance/info_guide/)



[https://safety.fhwa.dot.gov/road\\_diets/case\\_studies/](https://safety.fhwa.dot.gov/road_diets/case_studies/)

# Road Diets



Maximum Volume for Road Diet (ADT)

**Figure 12.** Road Diet Implementation Maximum Volume Thresholds by Agency

## Considerations

- Safety
- Operations  
Peak Hour
- Design  
Signalized Intersection  
Adjustments
- Resurfacing
- Context Sensitive  
Solutions/Complete  
Streets



# General Guidelines for Traffic Volumes

**LESS THAN  
10,000 ADT**

**Great  
candidate  
for Road  
Diet**

In most instances traffic will likely not be negatively affected.

**10,000 –  
15,000 ADT**

**Very good  
candidate  
for Road  
Diet**

Agencies should conduct intersection analysis to study potential traffic operational effects and consider signal retiming as needed.

**15,000 –  
20,000 ADT**

**Good  
candidate  
for Road  
Diet**

Agencies should conduct a corridor analysis since traffic operations may be affected at this volume depending on the “before” condition.

**GREATER THAN  
20,000 ADT**

**Potential  
candidate  
for Road  
Diet**

Agencies should complete a feasibility study to determine whether this is a good location for a Road Diet. Operations may be affected at this volume.

There are examples across the country where Road Diets have been successful with ADTs as high as 26,000

# Intersections

- Signal timing or phasing changes at intersections to optimize operations and safety benefits
- Roundabouts Single Lane  
~ 20,000 ADT



# LaJolla Blvd – Bird Rock Community (San Diego, CA)

Prior to 2003, La Jolla Boulevard was a four-lane boulevard moving 20,000 cars per day with average speeds of 38-42 mph.

The roadway configuration and speed of traffic created a setting uninviting for pedestrians and unable to stimulate growth among local businesses.

In response to numerous community members demanding a safer walking environment, the City of San Diego, in partnership with the community, embarked upon a project to improve safety along the boulevard.

Source: Arnold, M., Chui, G., and Lupo, D., P.E. "Roundabout Product Demonstration Showcase" Presentation on December 10, 2008, City of San Diego Engineering & Capital Projects Department



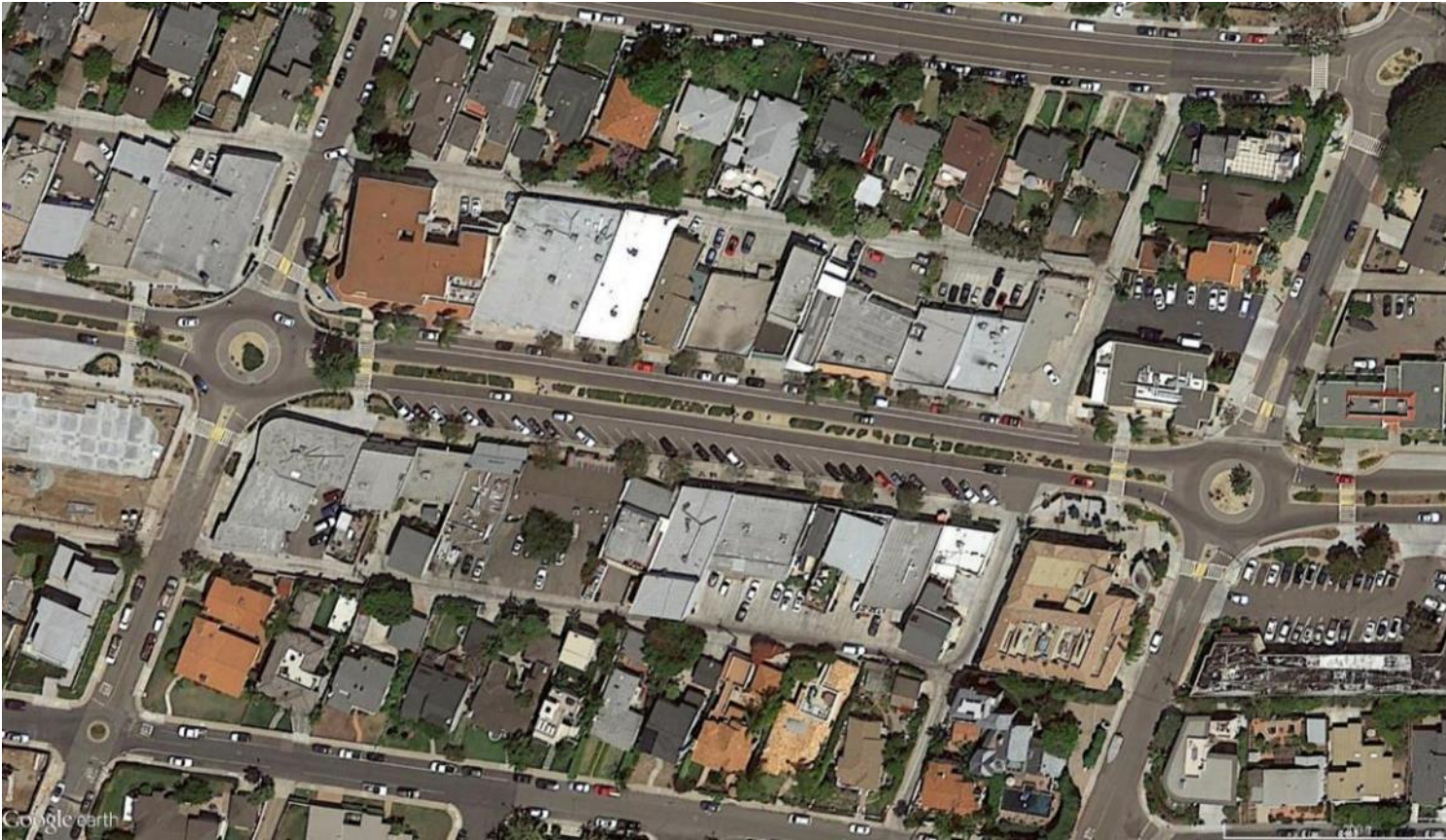
# LaJolla Blvd – San Diego, CA





# LaJolla Blvd - San Diego, CA

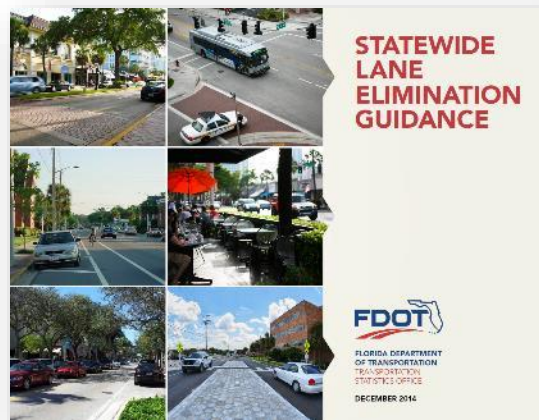
Narrower travel lanes, five roundabouts, landscaped medians and angled parking have slowed traffic speeds, improved pedestrian safety, and also revitalized the businesses!!!



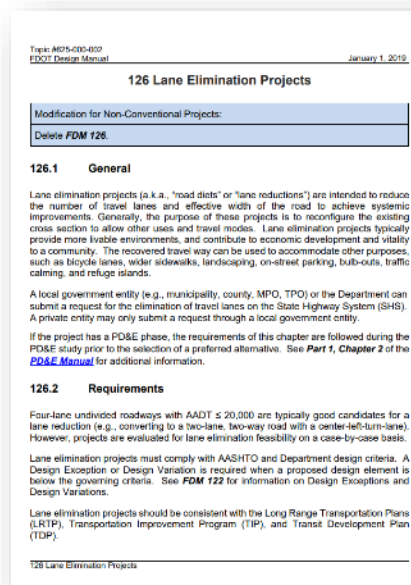
# Resources



Phase 1: FDOT's compilation of lane elimination examples and sample analysis processes



Phase 2: FDOT's internal guidance for implementing lane elimination projects on the State System



FDOT Design Manual Chapter 126: Lane Elimination Chapter 103 Standard Forms

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# Applicant

- A local government entity (e.g., municipality, county, MPO, TPO) or the Department.
- Private entity may only submit a request through a local government entity.

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# Requirements

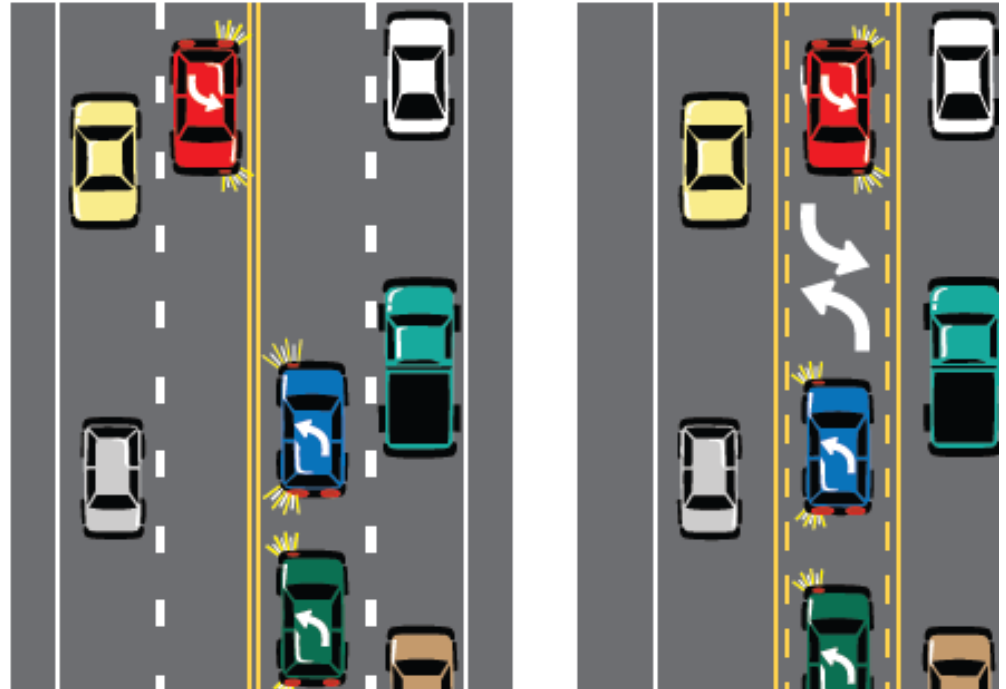
- Comply with AASHTO and FDOT design criteria
- Follow the National Environmental Policy Act (NEPA) when using federal funding
- If project has a PD&E phase, the requirements of this chapter are followed during the PD&E study prior to the selection of a preferred alternative
- Design Exception or Design Variation



## Requirements (FDM 126)

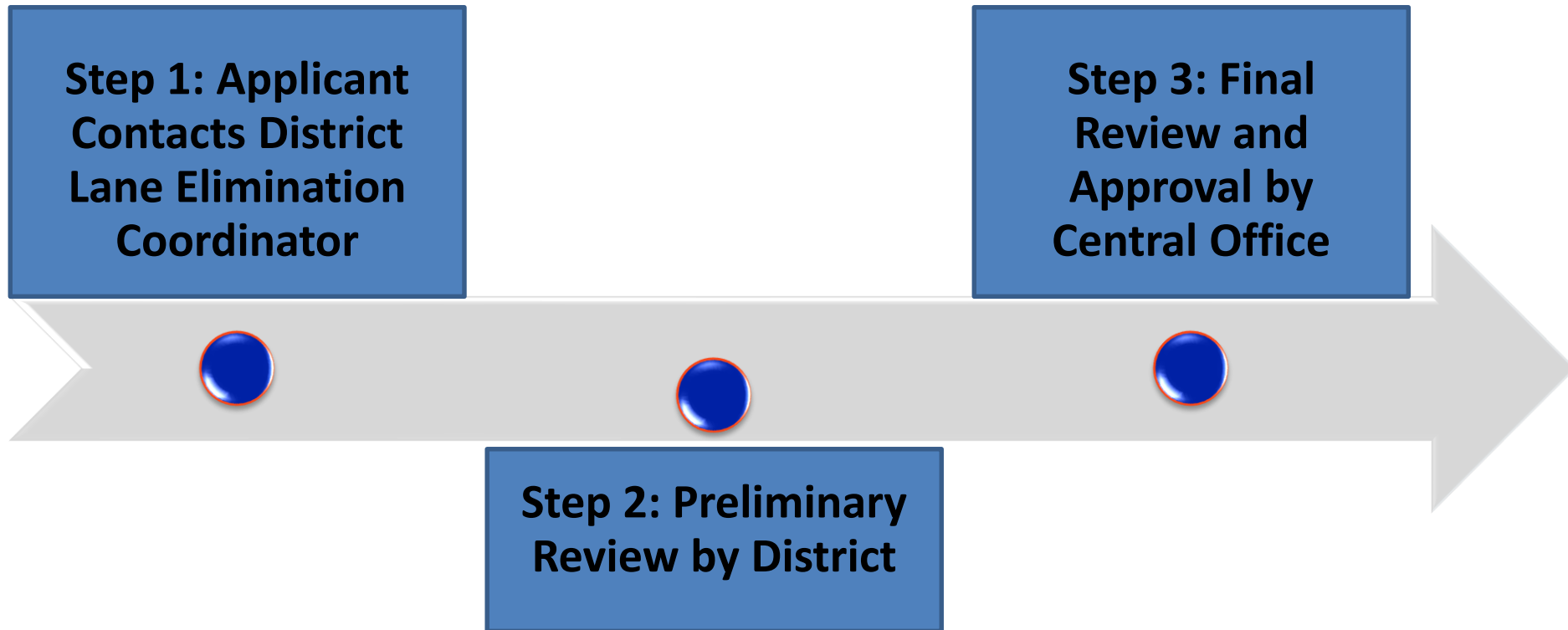
- Four-lane undivided roadways with AADT  $\leq$  20,000
- Consistent with the LRTP, TIP, and TDP
- Impacts in different areas
- Conduct public involvement activities in accordance with FDOT's *Public Involvement Handbook*.

A 4-lane roadway may already operate like a 3-lane road



# Application Process

## FDM 126.3



[https://fdotwww.blob.core.windows.net/sitefinity/docs/default-source/roadway/fdm/2020/2020fdm126laneelim.pdf?sfvrsn=3d2605b5\\_2](https://fdotwww.blob.core.windows.net/sitefinity/docs/default-source/roadway/fdm/2020/2020fdm126laneelim.pdf?sfvrsn=3d2605b5_2)

---

# Required Forms

- FDM Chapter 103: Standard Forms
- Documents to support the Lane Elimination Review Process and the initial meetings.
- Forms:
  - ✓ Form 126-A Initial Meeting Checklist
  - ✓ Form 126-B Methodology Checklist
  - ✓ Form 126 C- Lane Elimination Initial Notice to Central Office
  - ✓ Form 126-D Lane Elimination Final Approval Notice to Central Office

# Spectacular Seven



Crosswalk Visibility Enhancements



Raised Crosswalks



Pedestrian Refuge Islands



RRFB



PHB



Road Diets



**Leading Pedestrian Interval**





MUTCD Sec. 4E.06,  
paragraphs 19-23



LPI : WALK comes on at least 3 seconds prior to the green vehicular signal; pedestrians enter crosswalk before turning vehicles start moving into their path.

# Benefits

- Ease of implementation
- Immediate results
- Minimal impact to vehicular timing plans
- Up to 60% reduction in conflicts
- High B/C ratio
- May be systemically applied

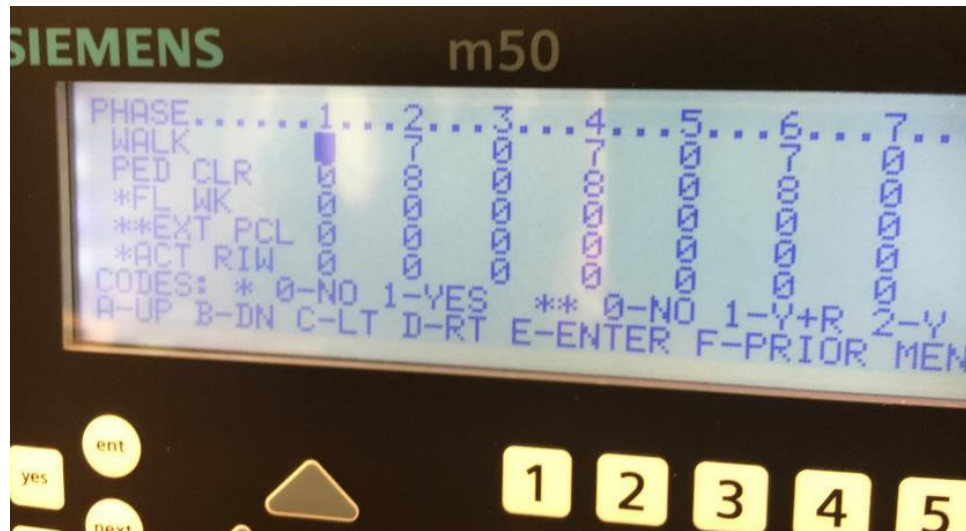


# LPI Huntsville



# Hardware and Controller Requirements

- NEMA TS2 Type 1 or 2
- 2070 or 270





# Accessible Pedestrian Signal

MUTCD Sec. 4E.06, paragraphs 20-21

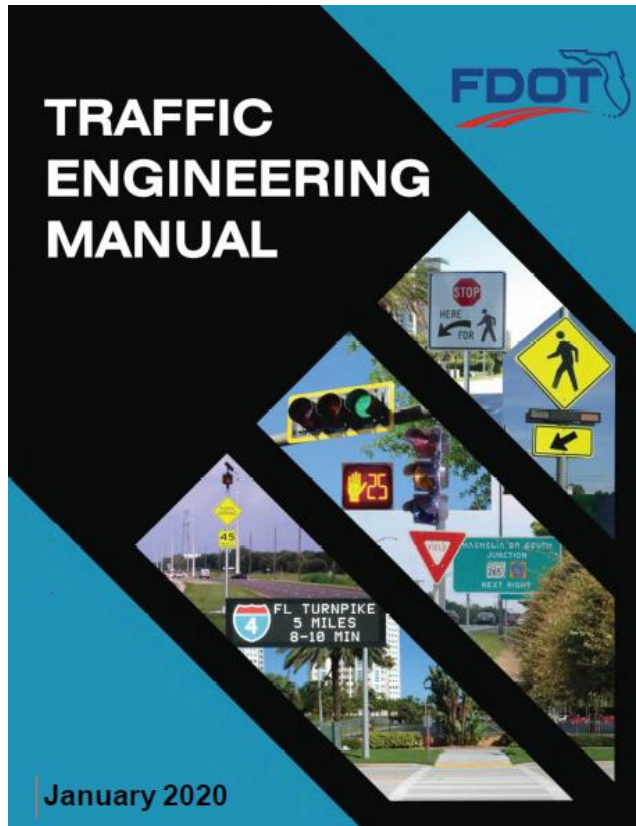
Guidance:

*If a leading pedestrian interval is used, the use of accessible pedestrian signals (see [Sections 4E.09](#) through [4E.13](#)) should be considered.*

Support:

*If a leading pedestrian interval is used without accessible features, pedestrians who are visually impaired can be expected to begin crossing at the onset of the vehicular movement when drivers are not expecting them to begin crossing.*





## Section 3.11 LEADING PEDESTRIAN INTERVAL SIGNAL APPLICATION

### 3.11.1 PURPOSE

To establish criteria for implementing leading pedestrian interval (LPI) signal applications at new and existing signalized intersections.

# City of Austin LPI

**austintexas.gov**  
the official website of the City of Austin

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3-1-1



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Department » Transportation » Austin Transportation gives pedestrians head start at 110 downtown intersections for improved safety

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CITY OF AUSTIN

FOR IMMEDIATE RELEASE

Release Date: Jan. 07, 2020

Contact: Jacob Barrett 5129748000 [Email](#)

## AUSTIN TRANSPORTATION GIVES PEDESTRIANS HEAD START AT 110 DOWNTOWN INTERSECTIONS FOR IMPROVED SAFETY

The Austin Transportation Department continues to improve safety for pedestrians by installing leading pedestrian intervals (LPIs) in downtown Austin. LPIs provide pedestrians five to seven seconds of dedicated time to begin crossing an intersection before drivers receive a green light. Every intersection within the area bordered by 15th Street, North Lamar Boulevard, West Cesar Chavez Street and Interstate 35 features a LPI for at least one pedestrian crossing.

<https://austintexas.gov/news/austin-transportation-gives-pedestrians-head-start-110-downtown-intersections-improved-safety>





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# Questions







# Resources

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# Resources

- EDC4 STEP Website

- [https://www.fhwa.dot.gov/innovation/everydaycounts/edc\\_4/step.cfm](https://www.fhwa.dot.gov/innovation/everydaycounts/edc_4/step.cfm)

- EDC5 STEP website

- [https://www.fhwa.dot.gov/innovation/everydaycounts/edc\\_5/step2.cfm](https://www.fhwa.dot.gov/innovation/everydaycounts/edc_5/step2.cfm)

- FHWA Pedestrian Safety Website

- [https://safety.fhwa.dot.gov/ped\\_bike/](https://safety.fhwa.dot.gov/ped_bike/)

- PBIC Website

- [www.pedbikeinfo.org](http://www.pedbikeinfo.org)

- CMF Clearinghouse

- <http://www.cmfclearinghouse.org/>

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# Resources

## Design

- AASHTO Green Book
  - AASHTO Store
- Florida Design Manual (FDM) – Florida
  - <https://www.fdot.gov/roadway/fdm/default.shtm>
- Manual of Uniform Minimum Standards for Design, Construction and Maintenance (Florida Greenbook)
  - <https://www.fdot.gov/roadway/floridagreenbook/fgb.shtm>

## Operations

- Manual Uniform Traffic Control Devices (MUTCD)
  - <https://mutcd.fhwa.dot.gov/>
- Manual Uniform Traffic Studies (MUTS) – Florida
  - <https://www.fdot.gov/traffic/trafficservices/studies/muts/muts.shtm>
- Speed Zone Manual – Florida
  - <https://www.fdot.gov/traffic/speedzone/speed-zone-manual.shtm>
- Traffic Engineering Manual (TEM) – Florida
  - <https://www.fdot.gov/traffic/trafficservices/Studies/TEM/TEM.shtm>

# Resources

PEDSAFE <http://www.pedbikesafe.org/PEDSAFE/index.cfm>

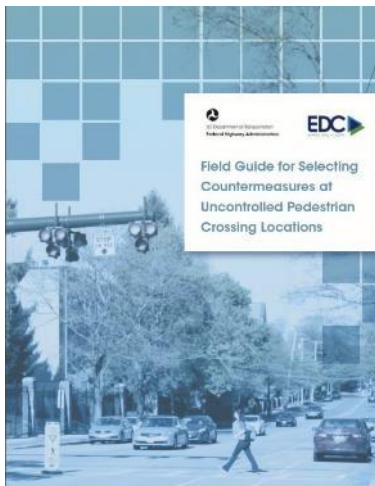
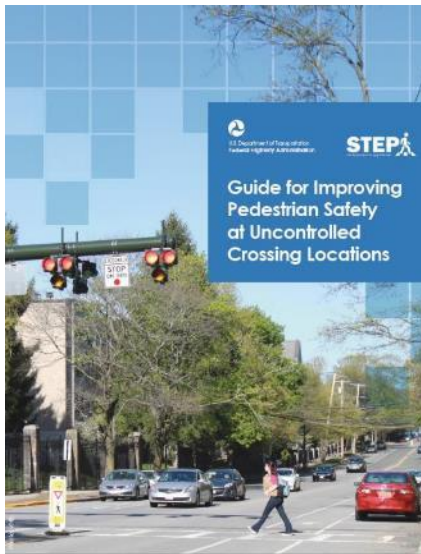
Links in PEDSAFE to specific countermeasures

- Marked Crosswalks and Enhancements
  - [http://www.pedbikesafe.org/PEDSAFE/countermeasures\\_detail.cfm?CM\\_NUM=4](http://www.pedbikesafe.org/PEDSAFE/countermeasures_detail.cfm?CM_NUM=4)
- Lighting and Illumination
  - [http://www.pedbikesafe.org/PEDSAFE/countermeasures\\_detail.cfm?CM\\_NUM=8](http://www.pedbikesafe.org/PEDSAFE/countermeasures_detail.cfm?CM_NUM=8)
- Crossing Islands
  - [http://www.pedbikesafe.org/PEDSAFE/countermeasures\\_detail.cfm?CM\\_NUM=6](http://www.pedbikesafe.org/PEDSAFE/countermeasures_detail.cfm?CM_NUM=6)
- Raised Pedestrian Crossings/ Raised Crosswalks
  - [http://www.pedbikesafe.org/PEDSAFE/countermeasures\\_detail.cfm?CM\\_NUM=7](http://www.pedbikesafe.org/PEDSAFE/countermeasures_detail.cfm?CM_NUM=7)
- Raised Medians
  - [http://www.pedbikesafe.org/PEDSAFE/countermeasures\\_detail.cfm?CM\\_NUM=22](http://www.pedbikesafe.org/PEDSAFE/countermeasures_detail.cfm?CM_NUM=22)
- RRFB
  - [http://www.pedbikesafe.org/PEDSAFE/countermeasures\\_detail.cfm?CM\\_NUM=54](http://www.pedbikesafe.org/PEDSAFE/countermeasures_detail.cfm?CM_NUM=54)
- Pedestrian Hybrid Beacon
  - [http://www.pedbikesafe.org/PEDSAFE/countermeasures\\_detail.cfm?CM\\_NUM=53](http://www.pedbikesafe.org/PEDSAFE/countermeasures_detail.cfm?CM_NUM=53)
- Road Diets (Lane Reduction)
  - [http://www.pedbikesafe.org/PEDSAFE/countermeasures\\_detail.cfm?CM\\_NUM=19](http://www.pedbikesafe.org/PEDSAFE/countermeasures_detail.cfm?CM_NUM=19)
- Leading Pedestrian Interval (LPI)
  - [http://www.pedbikesafe.org/PEDSAFE/countermeasures\\_detail.cfm?CM\\_NUM=12](http://www.pedbikesafe.org/PEDSAFE/countermeasures_detail.cfm?CM_NUM=12)

Costs of Treatments [http://www.pedbikeinfo.org/cms/downloads/Countermeasure%20Costs\\_Report\\_Nov2013.pdf](http://www.pedbikeinfo.org/cms/downloads/Countermeasure%20Costs_Report_Nov2013.pdf)



# STEP Guides and Tech Sheets



[https://www.fhwa.dot.gov/innovation/everydaycounts/edc\\_4/step\\_tech\\_sheet.pdf](https://www.fhwa.dot.gov/innovation/everydaycounts/edc_4/step_tech_sheet.pdf)

## Table 1: Application of Pedestrian Crash Countermeasures by Roadway Feature

Table 1 identifies suggested countermeasures for uncontrolled crossing locations according to roadway and traffic features. Review the corresponding worksheets for countermeasures considered for the site. The worksheets describe additional design and installation considerations for the countermeasures.

Roadway Configuration	Speed Limit								
	≤30 mph			35 mph			≥40 mph		
	Vehicle AADT <9,000			Vehicle AADT 9,000–15,000			Vehicle AADT >15,000		
2 lanes*	1 2 3 4 5 6	1 3 5 6 7	1 3 5 6 7	1 3 4 5 6	1 3 5 6 7	1 3 5 6 7	1 3 4 5 6 7	1 3 5 6 7	1 3 5 6 7
3 lanes with raised median*	1 2 3 4 5	1 3 5 7	1 3 5 7	1 3 4 5 7	1 3 5 7	1 3 5 7	1 3 4 5 7	1 3 5 7	1 3 5 7
3 lanes w/o raised median†	1 2 3 4 5 6 7	1 3 5 6 7	1 3 5 6 7	1 3 4 5 6 7	1 3 5 6 7	1 3 5 6 7	1 3 4 5 6 7	1 3 5 6 7	1 3 5 6 7
4+ lanes with raised median‡	1 3 5	1 3 5 7	1 3 5 7	1 3 5 7	1 3 5 7	1 3 5 7	1 3 5 7	1 3 5 7	1 3 5 7
4+ lanes w/o raised median‡	1 3 5 6 7 8	1 3 5 6 7 8	1 3 5 6 7 8	1 3 5 6 7 8	1 3 5 6 7 8	1 3 5 6 7 8	1 3 5 6 7 8	1 3 5 6 7 8	1 3 5 6 7 8
*One lane in each direction    †One lane in each direction with two-way left-turn lane    ‡Two or more lanes in each direction									
Given the set of conditions in a cell, <b>1</b> Signifies that the countermeasure should always be considered, but not mandated or required, based upon engineering judgment at a marked uncontrolled crossing location. <b>#</b> Signifies that the countermeasure is a candidate treatment at a marked uncontrolled crossing location. The absence of a number signifies that the countermeasure is generally not an appropriate treatment, but exceptions may be considered following engineering judgment.									
1 High-visibility crosswalk markings, parking restriction on crosswalk approach, adequate nighttime lighting levels 2 Raised crosswalk 3 Advance Yield Here To (Stop Here For) Pedestrians sign and yield (stop) line 4 In-Street Pedestrian Crossing sign 5 Curb extension 6 Pedestrian refuge island 7 Pedestrian Hybrid Beacon 8 Road Diet									
This table was developed using information from: Zegeer, C. V., Stewart, J. R., Huang, H. H., Lagenwey, P. A., Feaganes, J., & Campbell, B. J. (2005). Safety effects of marked versus unmarked crosswalks at uncontrolled locations: Final report and recommended guidelines (No. FHWA-HRT-04-100); Manual on Uniform Traffic Control Devices, 2009 Edition, Chapter 4F, Pedestrian Hybrid Beacons; the Crash Modification Factors (CMF) Clearinghouse website ( <a href="http://www.cmfclearinghouse.org/">http://www.cmfclearinghouse.org/</a> ); and the Pedestrian Safety Guide and Countermeasure Selection System (PEDSAFE) website ( <a href="http://www.pedbikesafe.org/PEDSAFE/">http://www.pedbikesafe.org/PEDSAFE/</a> ).									

## Table 2: Safety Issues Addressed per Countermeasure

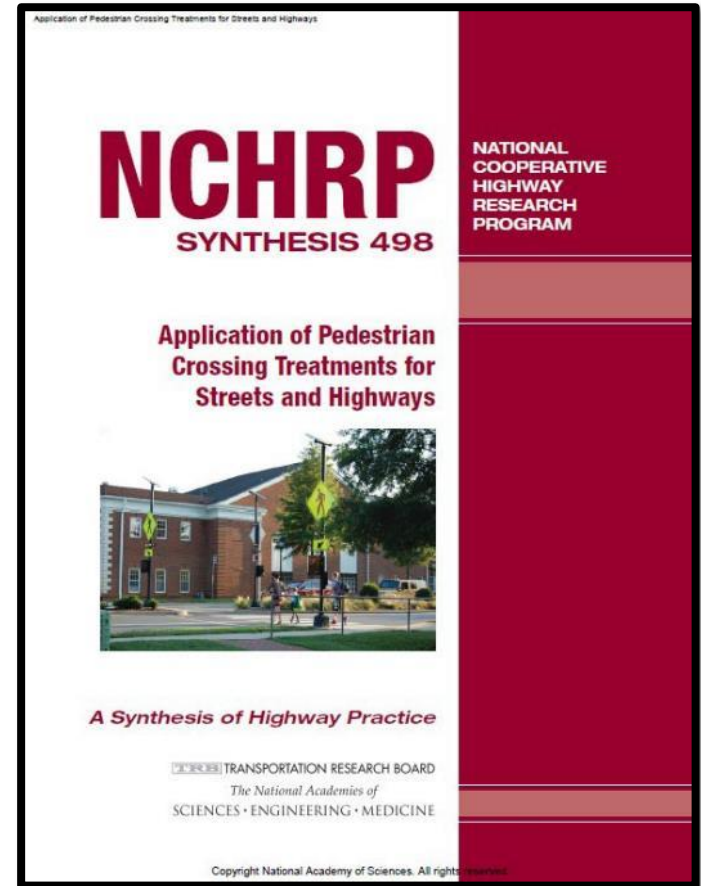
Table 2 identifies the safety issues that may be addressed by suggested countermeasures for uncontrolled crossing locations. Review the corresponding worksheets for countermeasures considered for the site. The worksheets describe additional design and installation considerations for the countermeasures.

Pedestrian Crash Countermeasure for Uncontrolled Crossings	Safety Issue Addressed				
	Conflicts at crossing locations	Excessive vehicle speed	Inadequate conspicuity/visibility	Drivers not yielding to pedestrians in crosswalks	Insufficient separation from traffic
Crosswalk visibility enhancement	1	1	1	1	1
High-visibility crosswalk markings*	1		1	1	
Parking restriction on crosswalk approach*	1		1	1	
Improved nighttime lighting*	1		1		
Advance Yield Here To (Stop Here For) Pedestrians sign and yield (stop) line*	1		1	1	1
In-Street Pedestrian Crossing sign*	1	1	1	1	
Curb extension*	1	1	1		1
Raised crosswalk	1	1	1	1	
Pedestrian refuge island	1	1	1		1
Pedestrian Hybrid Beacon	1			1	
Road Diet	1	1	1		1
*These countermeasures make up the STEP countermeasure "crosswalk visibility enhancements." Multiple countermeasures may be implemented at a location as part of crosswalk visibility enhancements.					

# NCHRP Synthesis 498 (December 2016)

Developed by

1. Surveying State DOT's, Local Transportation Agencies
2. Identifying & synthesizing effective practices and policies
3. Comprehensive literature review of safety evidence for more than 25 pedestrian crossing treatments



<http://www.trb.org/Publications/Blurbs/175419.aspx>



# NCHRP 841 Development of CMF for Uncontrolled Pedestrian Crossing Treatments

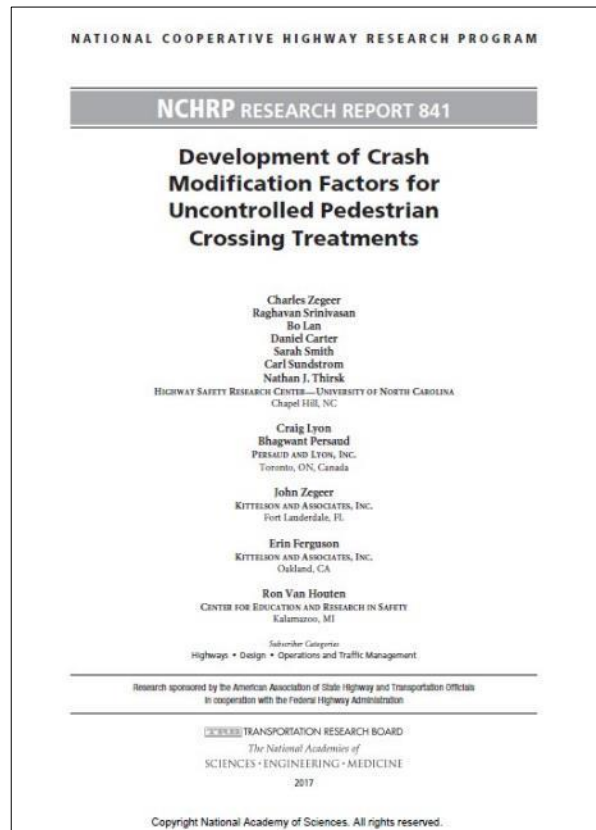


Table S-1. Recommended CMFs.

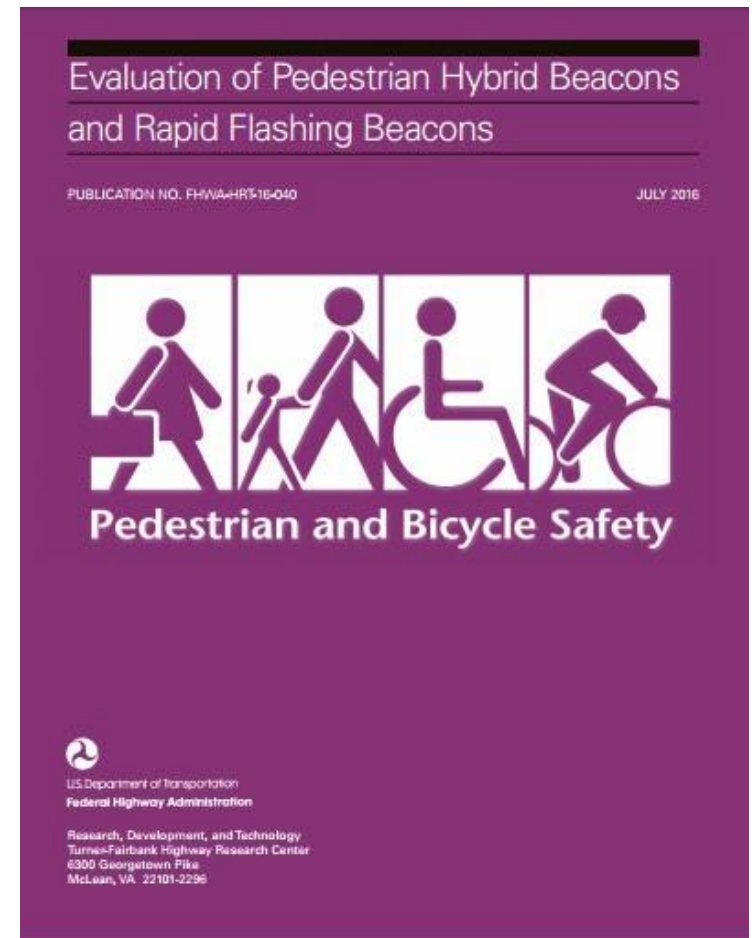
Treatment	Crash Type	Recommended CMF		Study Basis
		Estimate	Standard Error	
Refuge Island	Pedestrian	0.685	0.183	Median from two studies
	Total	0.742	0.071	Cross-section
	All Injury	0.714	0.082	Cross-section
	Rear-End/Sideswipe Total	0.741	0.093	Cross-section
	Rear-End/Sideswipe Injury	0.722	0.106	Cross-section
Advanced YIELD or STOP Markings and Signs	Pedestrian	0.750	0.230	Median from two studies
	Total	0.886	0.065	Before-after
	Rear-End/Sideswipe Total	0.800	0.076	Before-after
PHB	Pedestrian	0.453	0.167	Median from two studies
PHB + Advanced YIELD or STOP Markings and Signs	Pedestrian	0.432	0.134	Median from two studies
	Total	0.820	0.078	Before-after
	Rear-End/Sideswipe Total	0.876	0.111	Before-after
RRFB	Pedestrian	0.526	0.377	Cross-section

<http://www.trb.org/Main/Blurbs/175381.aspx>



# Research of PHB

- 20 PHB sites open-road study
- Driver yielding to pedestrians avg. 96%
- Overall, 91% pedestrians pushed pushbutton to activate the PHB in the crosswalk
- A greater percentage of pedestrians activated the device when on 45 mph posted speed limit roads as compared to roads with posted speed limits of 40 mph or less



<https://www.fhwa.dot.gov/publications/research/safety/16040/16040.pdf>



# LPI Additional Resources

- FHWA

## Proven Safety Countermeasures

[https://safety.fhwa.dot.gov/provencountermeasures/lead\\_ped\\_int/](https://safety.fhwa.dot.gov/provencountermeasures/lead_ped_int/)

- Safety Evaluation of Protected Left-Turn Phasing and Leading Pedestrian Intervals on Pedestrian Safety

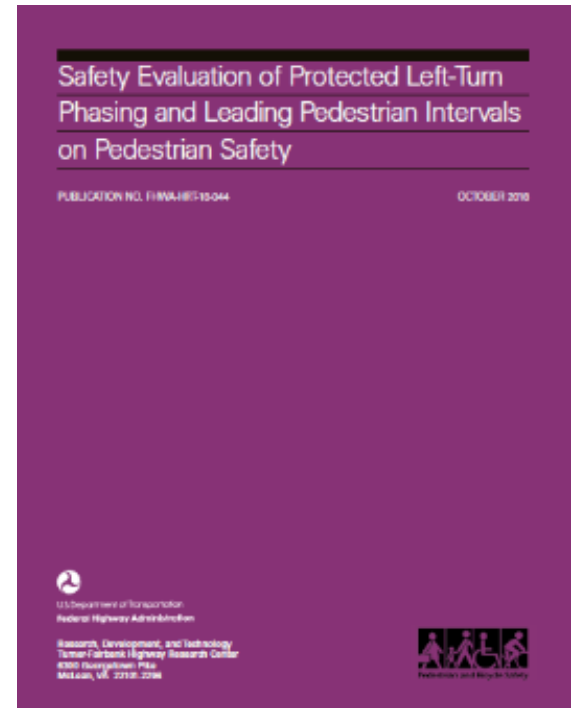
Publication No. FHWA-HRT-18-044

October 2018

<https://www.fhwa.dot.gov/publications/research/safety/18044/18044.pdf>

- NACTO Urban Street Design Guide

<https://nacto.org/publication/urban-street-design-guide/intersection-design-elements/traffic-signals/leading-pedestrian-interval/>





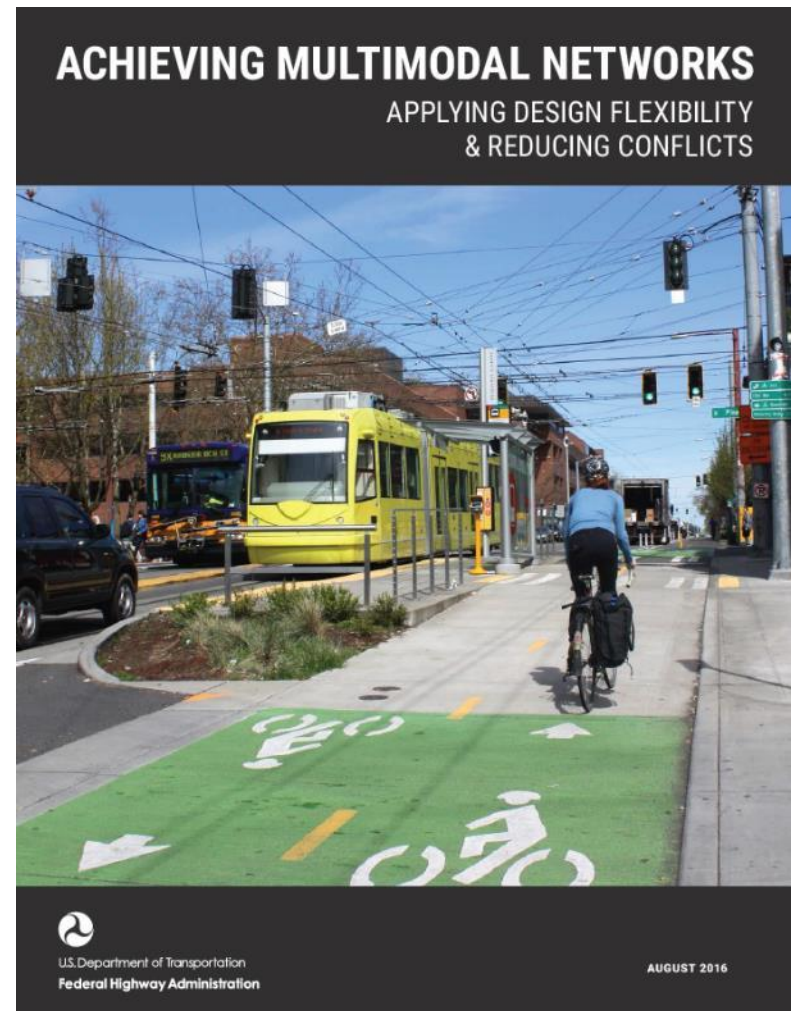
## Case Examples

1. Seattle Department of Transportation
2. Oregon Department of Transportation
3. Arizona Department of Transportation
4. California Department of Transportation

<http://www.trb.org/NCHRP/Blurbs/178087.aspx>

# Achieving Multimodal Networks

- 24 design topics: 2 Parts
1. 12 design topics on design flexibility
  2. 12 topics on measures to reduce conflicts between modes



[https://www.fhwa.dot.gov/environment/bicycle\\_pedestrian/publications/multimodal\\_networks/](https://www.fhwa.dot.gov/environment/bicycle_pedestrian/publications/multimodal_networks/)



**Thank You**  
**Walk Safely and Cross Safer**



# Course Details

- Survey through GoToWebinar
- FBPE Provider Number: 0003533
- FBPE Course Number: 0003151
- APA Course Web Page <https://www.planning.org/events/eventsingle/9195321/>
- APA Course Number: 9195321
- AICP/PDH Credits Provided: 1.50

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