STEP Safe Transportation for Every Pedestrian

EDC





Guidance for Improving Pedestrian Safety at Uncontrolled Crossings

U.S. Department of Transportation
Federal Highway Administration


"On average, a pedestrian was killed nearly every 1.5 hours in traffic crashes in 2016." NHTSA
Source: North Carolina Vision Zero, ncvisionzero.or

72% of pedestrian fatalities occur at non-intersection locations

16% of traffic fatalities are pedestrians

Pedestrian Networks

Interconnected pedestrian transportation facilities that allow people of all ages and abilities to safely and conveniently get where they want to go.

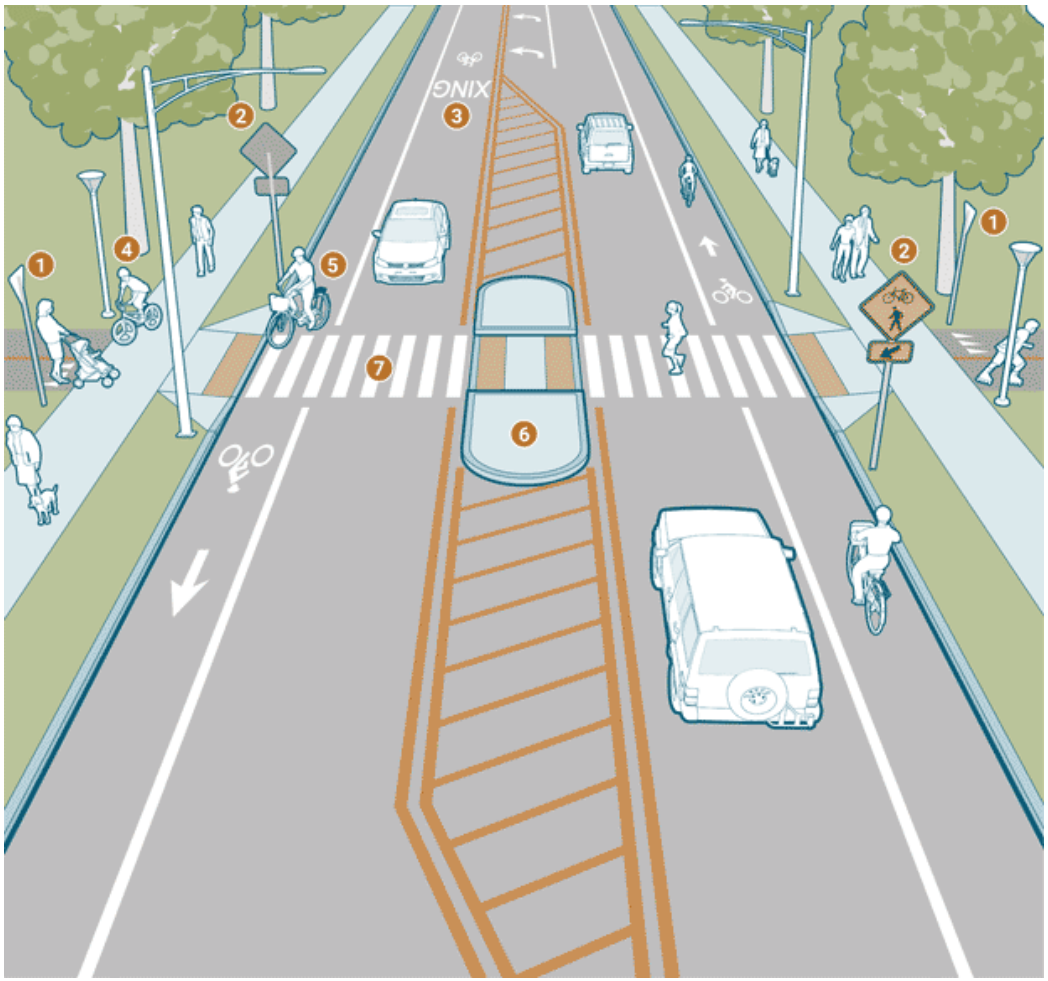


Image Source: FHWA *Achieving Multimodal Networks: Applying Design Flexibility and Reducing Conflicts*

Planning for Crosswalks

Common Crosswalk Myths

MYTH: There is an MUTCD pedestrian volume warrant for marked crosswalks.

REALITY: There is no pedestrian volume requirement to mark a crosswalk in the MUTCD.

MYTH: Research supports the removal of crosswalks.

REALITY: Marked crosswalks should not be removed without a plan for improving safety.

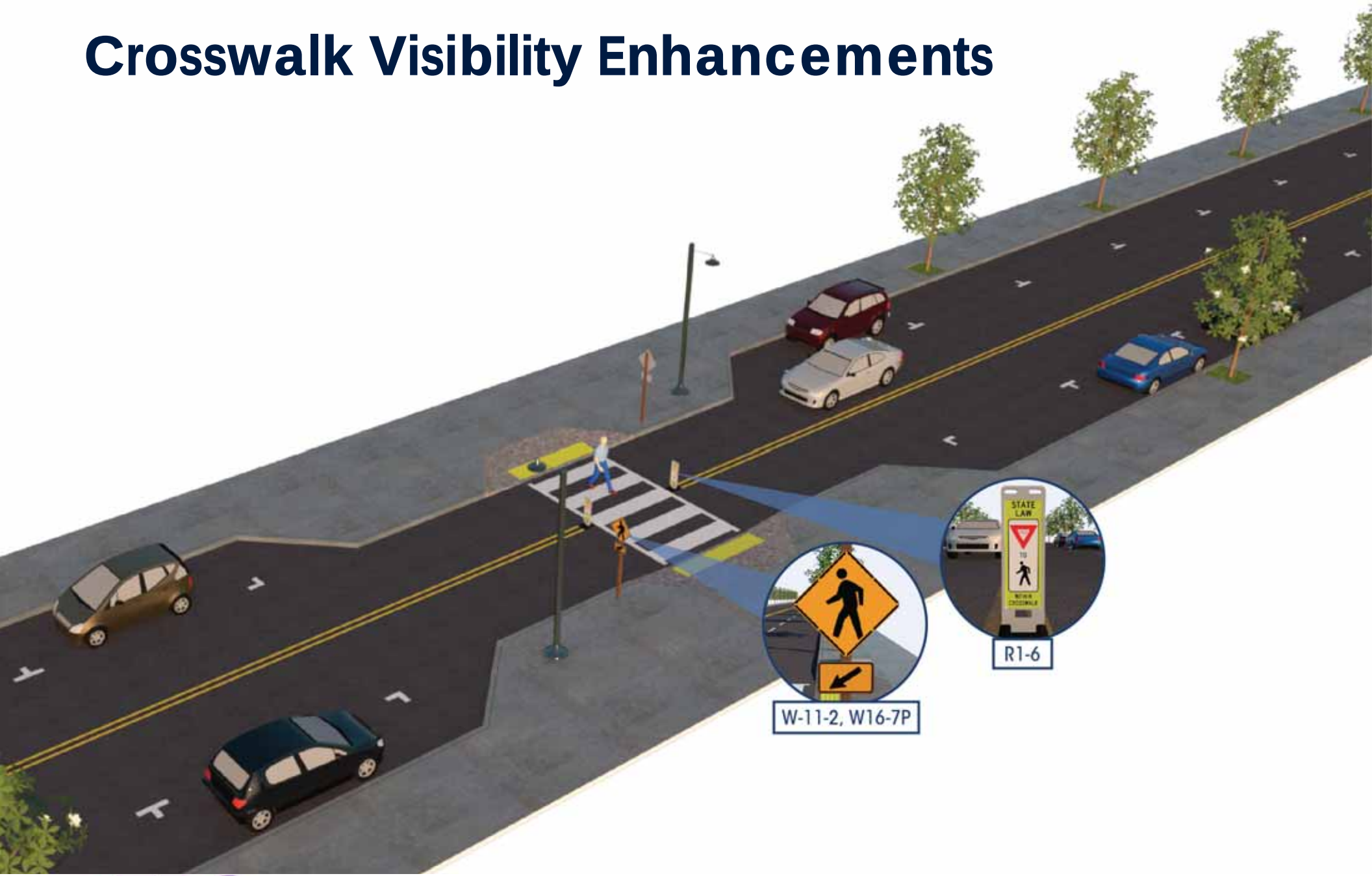
MYTH: Not marking a crosswalk is safer than marking a crosswalk.

REALITY: Pedestrians can be expected to cross most types of roadways, with or without marked crosswalks. Research demonstrates that marked crosswalks alone along high-volume or high-speed roadways are generally not sufficient to improve pedestrian safety.

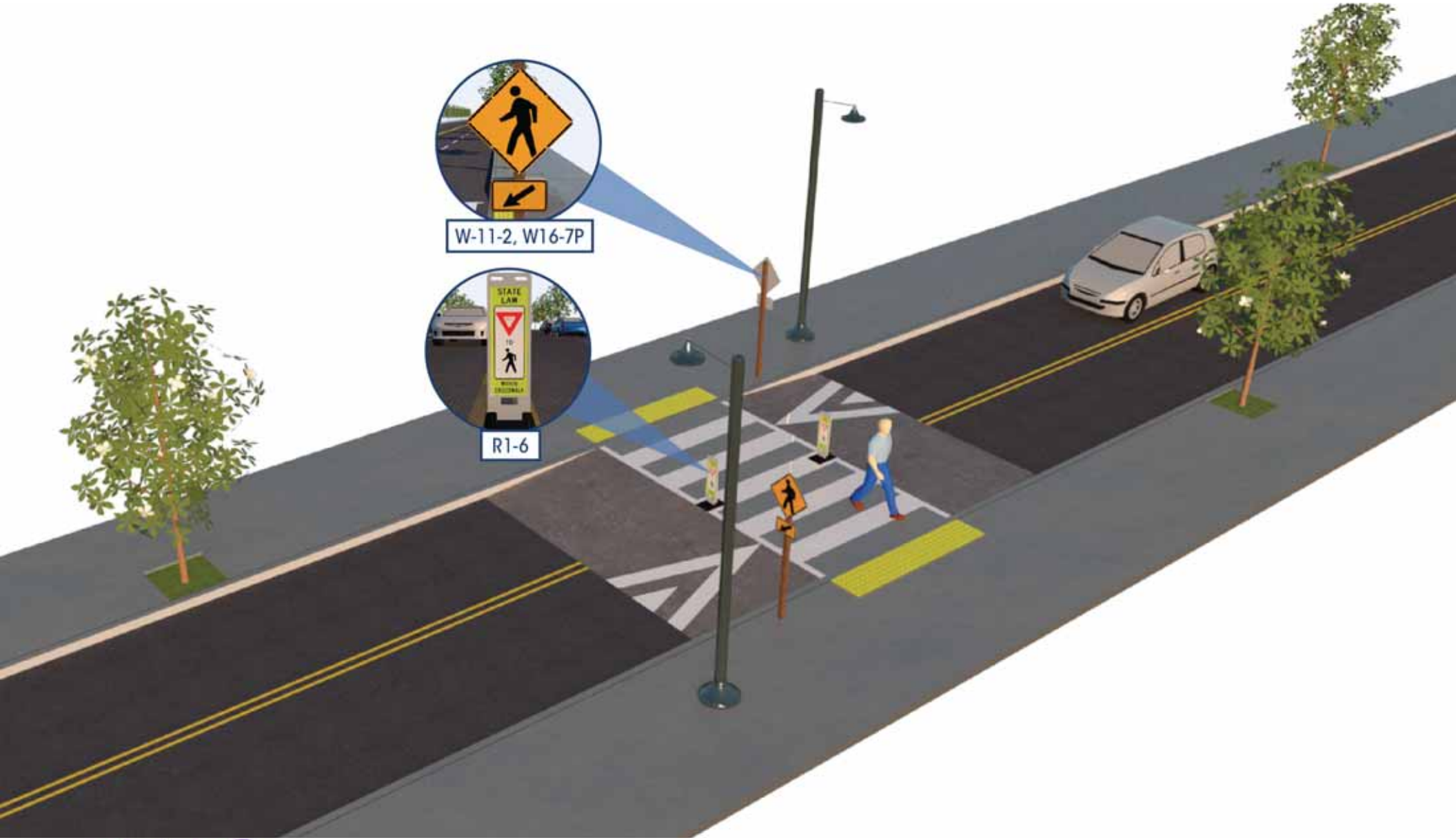
The Spectacular Six

- Crosswalk Visibility Enhancements
- Raised Crosswalks
- Pedestrian Refuge Island
- RRFB
- PHB
- Road Diets

Crosswalk Visibility Enhancements

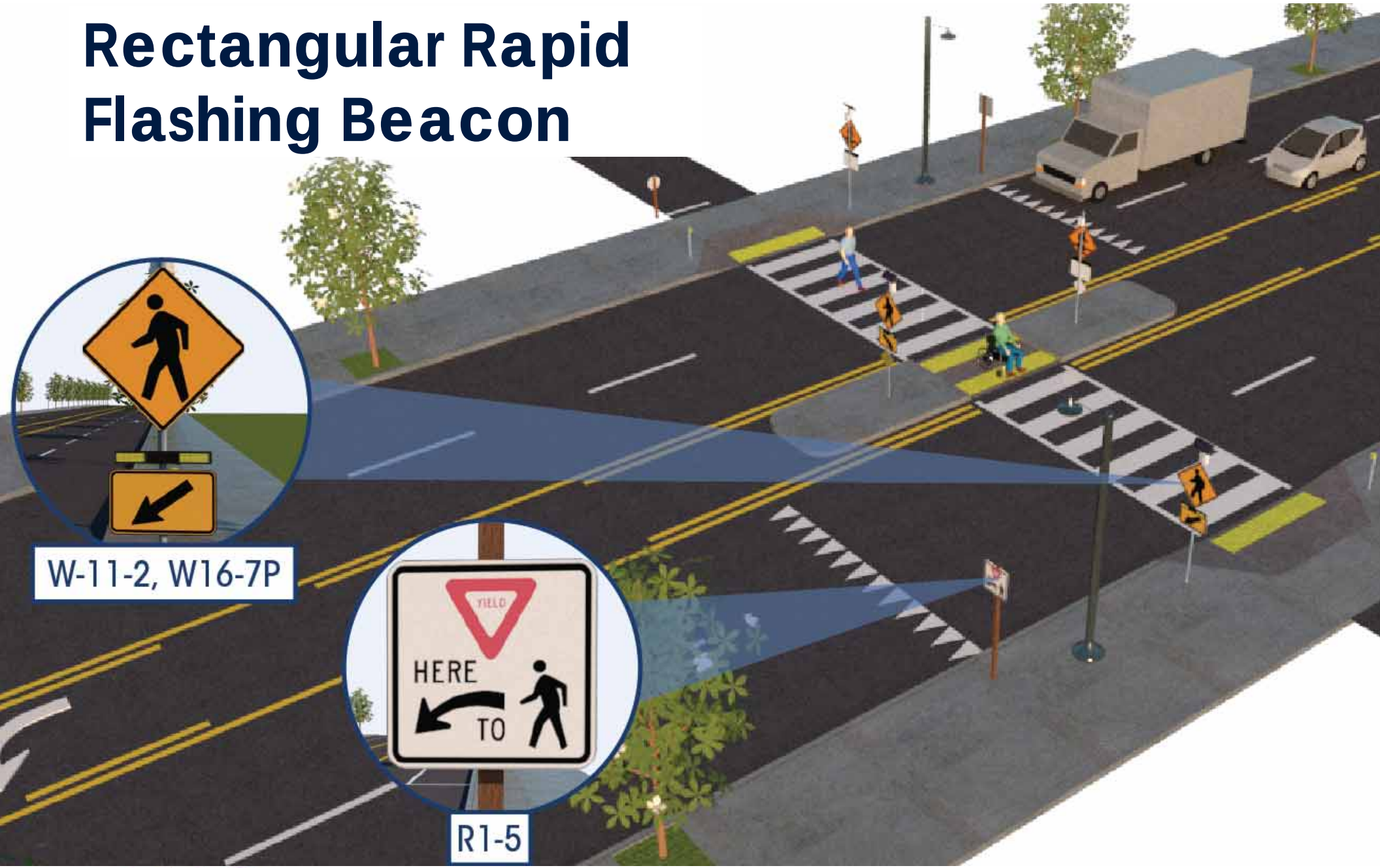


Raised Crosswalks

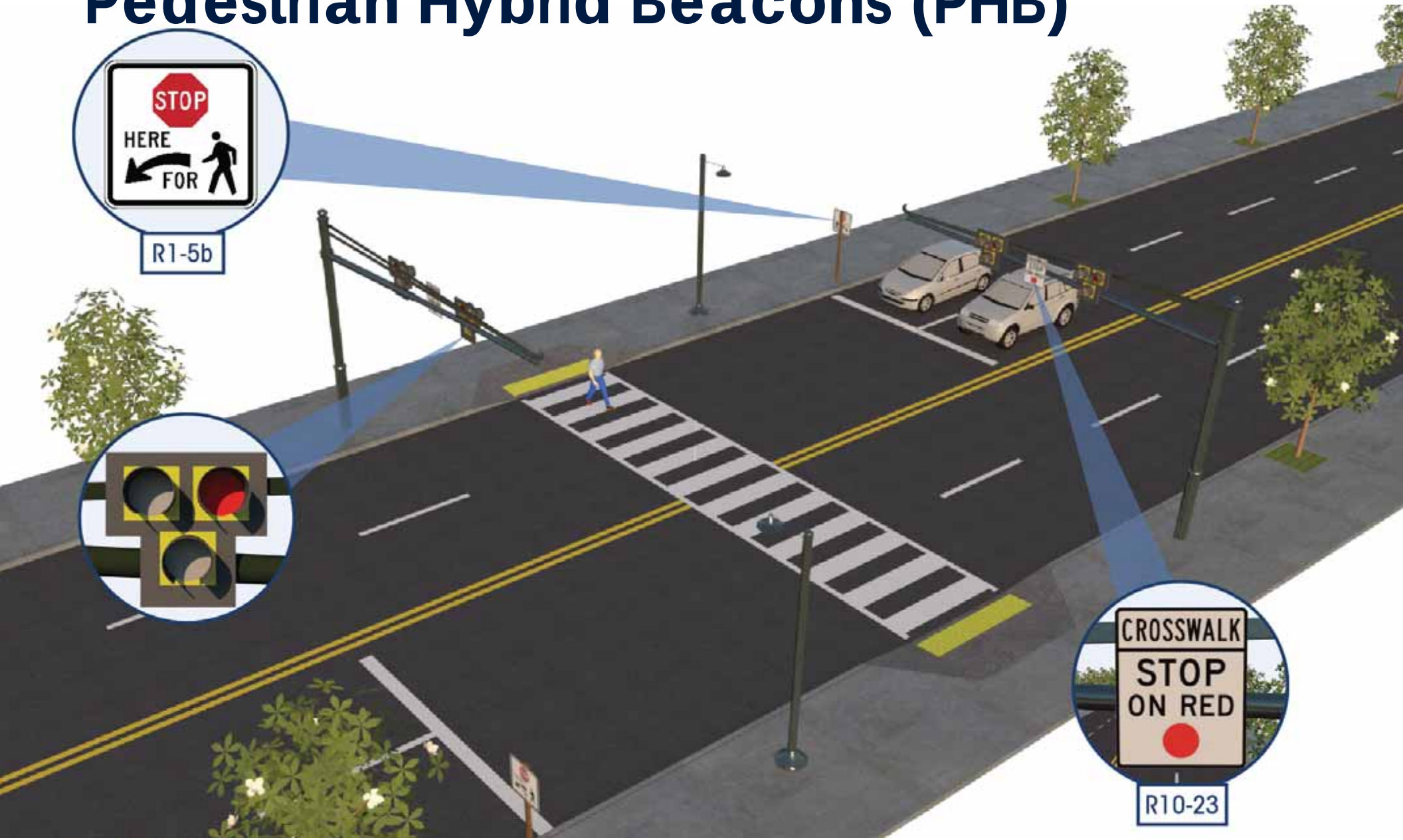


Pedestrian Refuge Islands

Rectangular Rapid Flashing Beacon



Pedestrian Hybrid Beacons (PHB)



Road Diet: Before

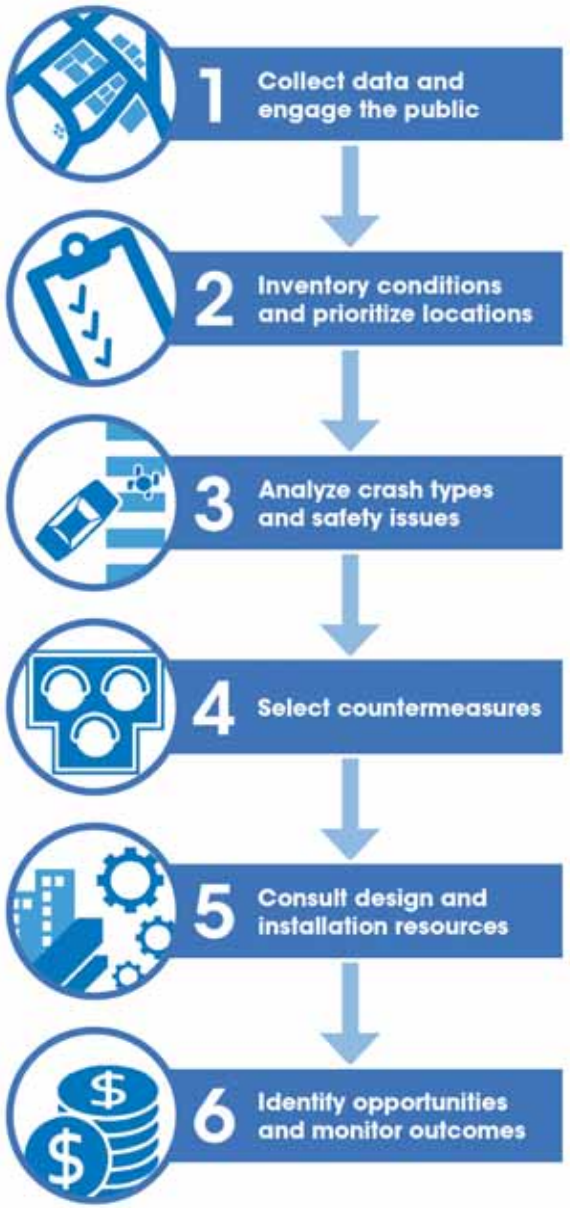
Road Diet: After

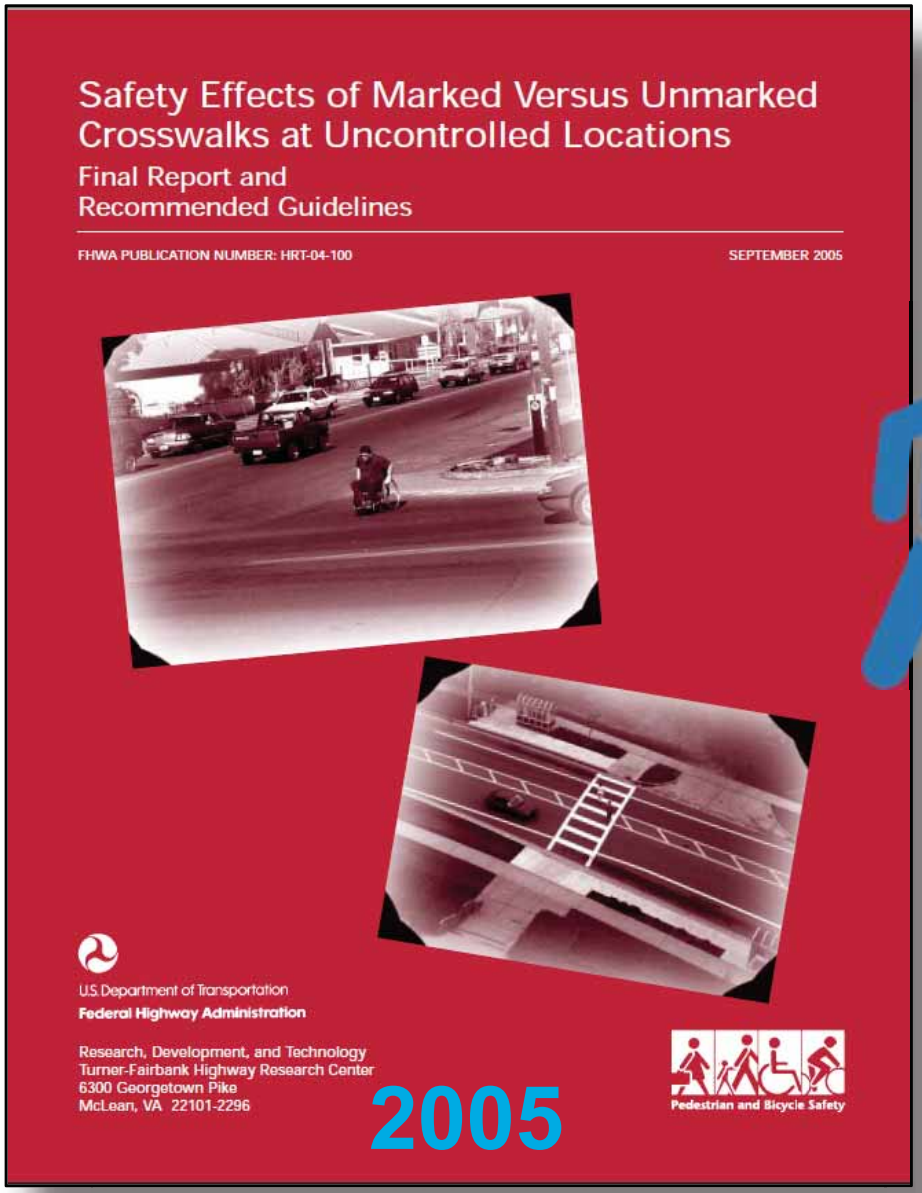
Guide for Improving Pedestrian Safety at Uncontrolled Crossing Locations

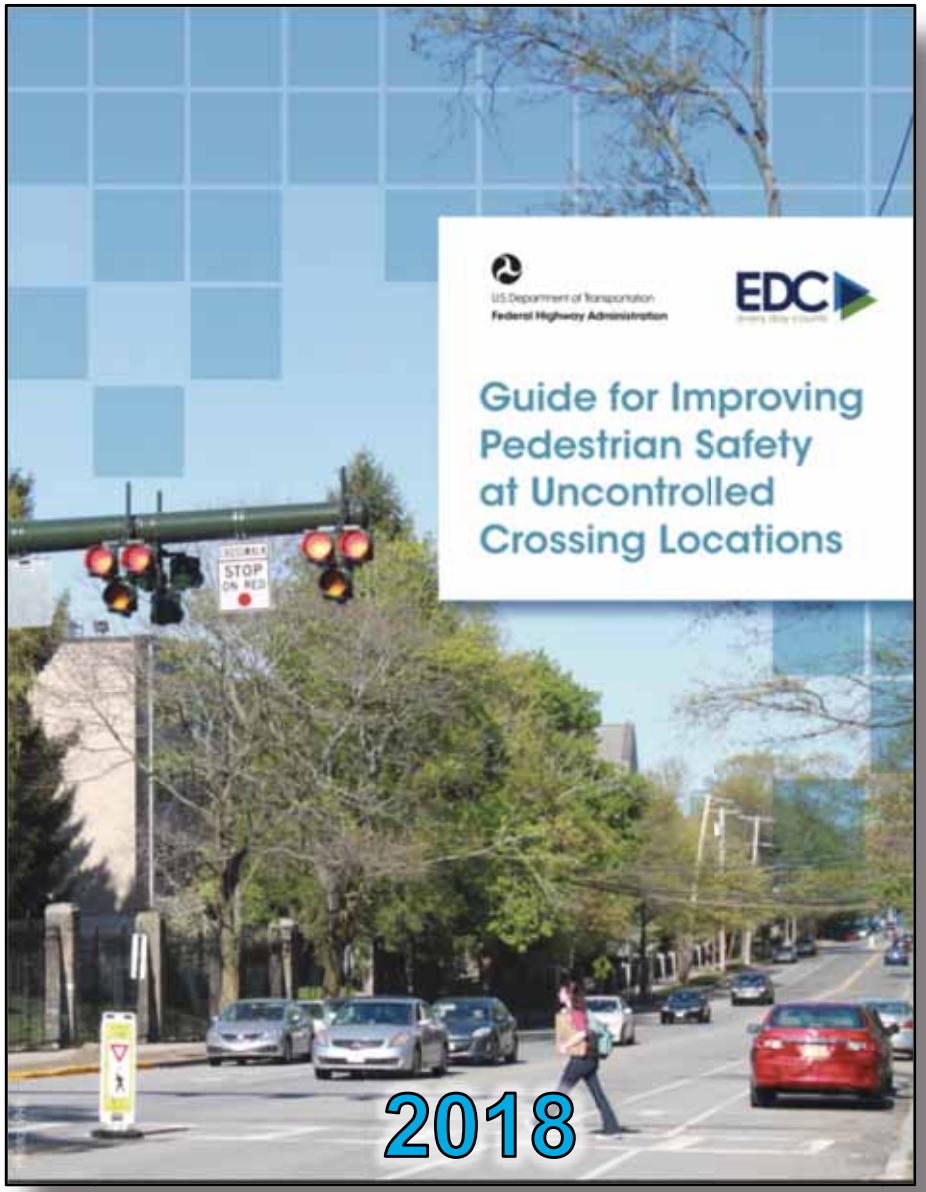
Follows a 6-step process

Guides the selection of countermeasures to improve pedestrian safety

Supported by a “Field Guide for Selecting Countermeasures at Uncontrolled Pedestrian Crossing Locations”




Safety Effects of Marked Versus Unmarked Crosswalks at Uncontrolled Locations
Final Report and Recommended Guidelines
FHWA PUBLICATION NUMBER: HRT-04-100
SEPTEMBER 2005
U.S. Department of Transportation
Federal Highway Administration
Research, Development, and Technology
Turner-Fairbank Highway Research Center
6300 Georgetown Pike
McLean, VA 22101-2296
Pedestrian and Bicycle Safety
2005


U.S. Department of Transportation
Federal Highway Administration
EDC
Guide for Improving Pedestrian Safety at Uncontrolled Crossing Locations
2018

- Collect pedestrian crash and safety data
- Evaluate pedestrian accommodation policies
- Initiate a Pedestrian Safety Action Plan
- Review pedestrian and traffic safety plans
- Conduct a walkability audit

- Inventory pedestrian crossings and observed traffic behavior
- Classify pedestrian crossings: controlled vs uncontrolled
- Inventory roadway characteristics
- Screen the network for high-crash or high-risk locations

2005 Zegeer Study

Safety Effects of Marked Versus Unmarked Crosswalks at Uncontrolled Locations: Final Report and Recommended Guidelines

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

Marked crosswalks alone (i.e., without signals or other substantial crossing improvements) are insufficient and should not be installed under the following conditions:

- Where the speed limit exceeds 40 mph
- On a roadway with 4+ lanes without a raised median; ADT of 12,000 or greater
- On a roadway with 4+ lanes with a raised median; ADT of 15,000 or greater

3 Analyze crash types and safety issues

- Diagram crash reports
- Identify crash factors
- Lead an informal site visit
- Conduct an Road Safety Audit

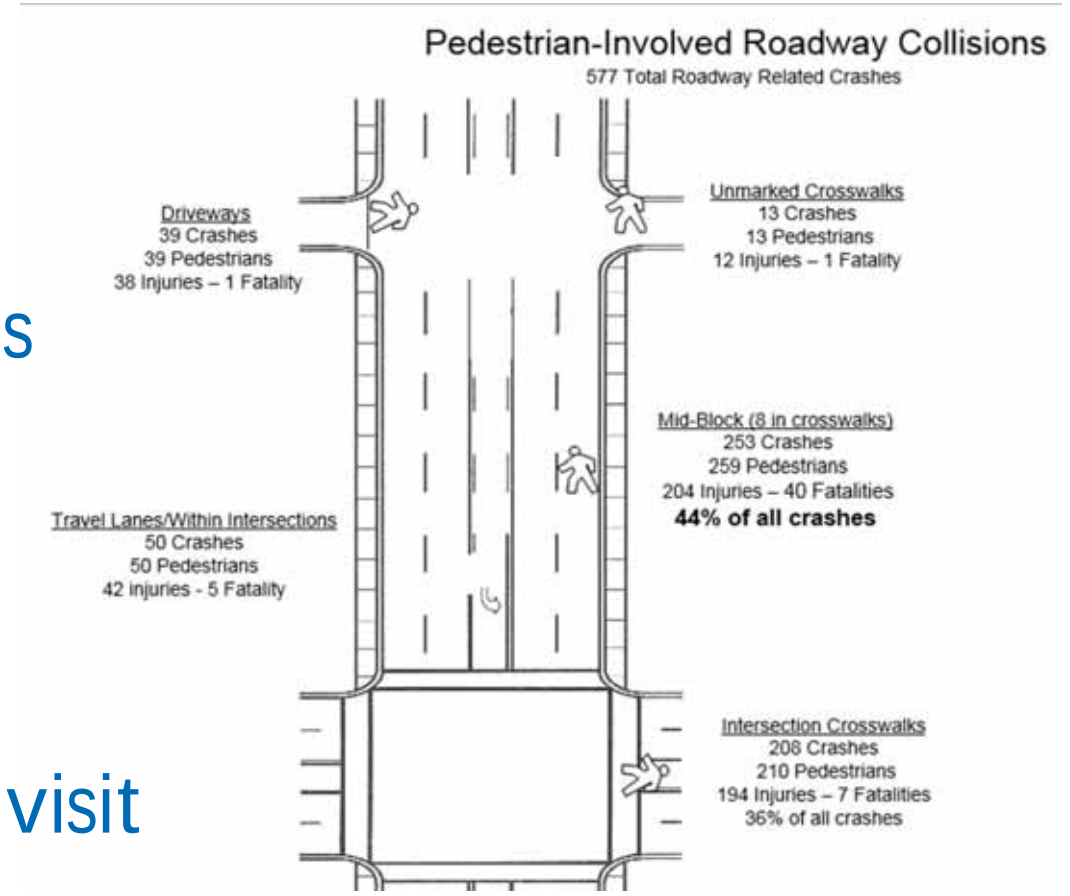


Image Source: City of Phoenix, Arizona

4 Select countermeasures

July 2018 version includes RRFB

Highlights situations where a marked crosswalk *alone* is not sufficient

Presents *options* for countermeasure selection

Does not substitute MUTCD requirements or guidance

Table 1. Application 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
2 lanes (1 lane in each direction)	● 2 4 5 6	● 5 6 7 9	○ 5 6 ● ●	● 4 5 6	● 5 6 7 9	○ 5 6 ● ●	● 4 5 6 7 9	○ 5 6 7 9	○ 5 6 ●
3 lanes with raised median (1 lane in each direction)	● 2 3 4 5 ● 5 7 9	● ● 5 7 9	○ ● 5 ● ●	○ 3 4 5 7 9	○ ● 5 ● ●	○ ● 5 ● ●	○ ● 4 5 7 9	○ ● 5 ● ●	○ ● 5 ●
3 lanes w/o raised median (1 lane in each direction with a two-way left-turn lane)	● 2 3 4 5 6 7 9	● ● 5 6 7 9	○ ● 5 6 ●	○ 3 4 5 6 7 9	○ ● 5 6 ● ●	○ ● 5 6 ●	○ ● 4 5 6 7 9	○ ● 5 6 ●	○ ● 5 6
4+ lanes with raised median (2 or more lanes in each direction)	● ● 5 7 8 9	● ● 5 7 8 9	○ ● 5 8 ●	○ ● 5 7 8 9	○ ● 5 ● 8 ●	○ ● 5 8 ●	○ ● 5 ● 8 ●	○ ● 5 8 ●	○ ●
4+ lanes w/o raised median (2 or more lanes in each direction)	● ● 5 6 7 8 9	○ ● 5 ● 7 8 9	○ ● 5 ● 8 ●	○ ● 5 ● 7 8 9	○ ● 5 ● ● 8 ●	○ ● 5 ● 8 ●	○ ● 5 ● 7 8 ●	○ ● 5 ● 8 ●	

Given the set of conditions in a cell,

- # Signifies that the countermeasure is a candidate treatment at a marked uncontrolled crossing location.
- ● Signifies that the countermeasure should always be considered, but not mandated or required, based upon engineering judgment at a marked uncontrolled crossing location.
- ○ Signifies that crosswalk visibility enhancements should always occur in conjunction with other identified countermeasures.*

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, park… crosswalk approach, adequate nighttime lighting levels, and crossing warning sign
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 Rectangular Rapid-Flashing Beacon (RRFB)**
8 Road Diet
9 Pedestrian Hybrid Beacon (PHB)**

*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.

Considers additional observed behaviors or crash trends

Further focuses options for countermeasure selection

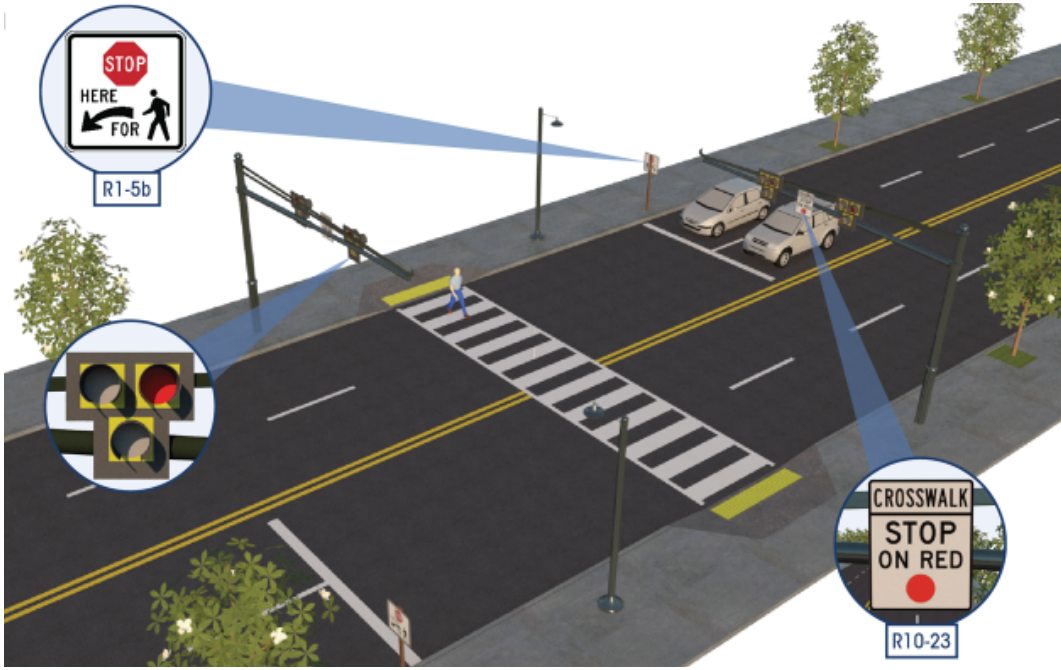
Consult crash types and field data

Table 2. Safety issues addressed per countermeasure.

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	✓	✓	✓	✓	✓
High-visibility crosswalk markings*	✓		✓	✓	
Parking restriction on crosswalk approach*	✓		✓	✓	
Improved nighttime lighting*	✓		✓		
Advance Yield Here To (Stop Here For) Pedestrians sign and yield (stop) line*	✓		✓	✓	✓
In-Street Pedestrian Crossing sign*	✓	✓	✓	✓	
Curb extension*	✓	✓	✓		✓
Raised crosswalk	✓	✓	✓	✓	
Pedestrian refuge island	✓	✓	✓		✓
Pedestrian Hybrid Beacon	✓	✓	✓	✓	
Road Diet	✓	✓	✓		✓
Rectangular Rapid-Flashing Beacon	✓		✓	✓	✓

5 Consult design and installation resources

- Manual on Uniform Traffic Control Devices (MUTCD)
- AASHTO Guide for the Design of Pedestrian Facilities
- Local design guidance and selection criteria



Pedestrian Hybrid Beacon

6 Identify opportunities and monitor outcomes

- Construct improvements
- Monitor results of implementation
- Consider funding options
- Identify implementation opportunities

Raised Crosswalk

CRF and CMF Summary Table

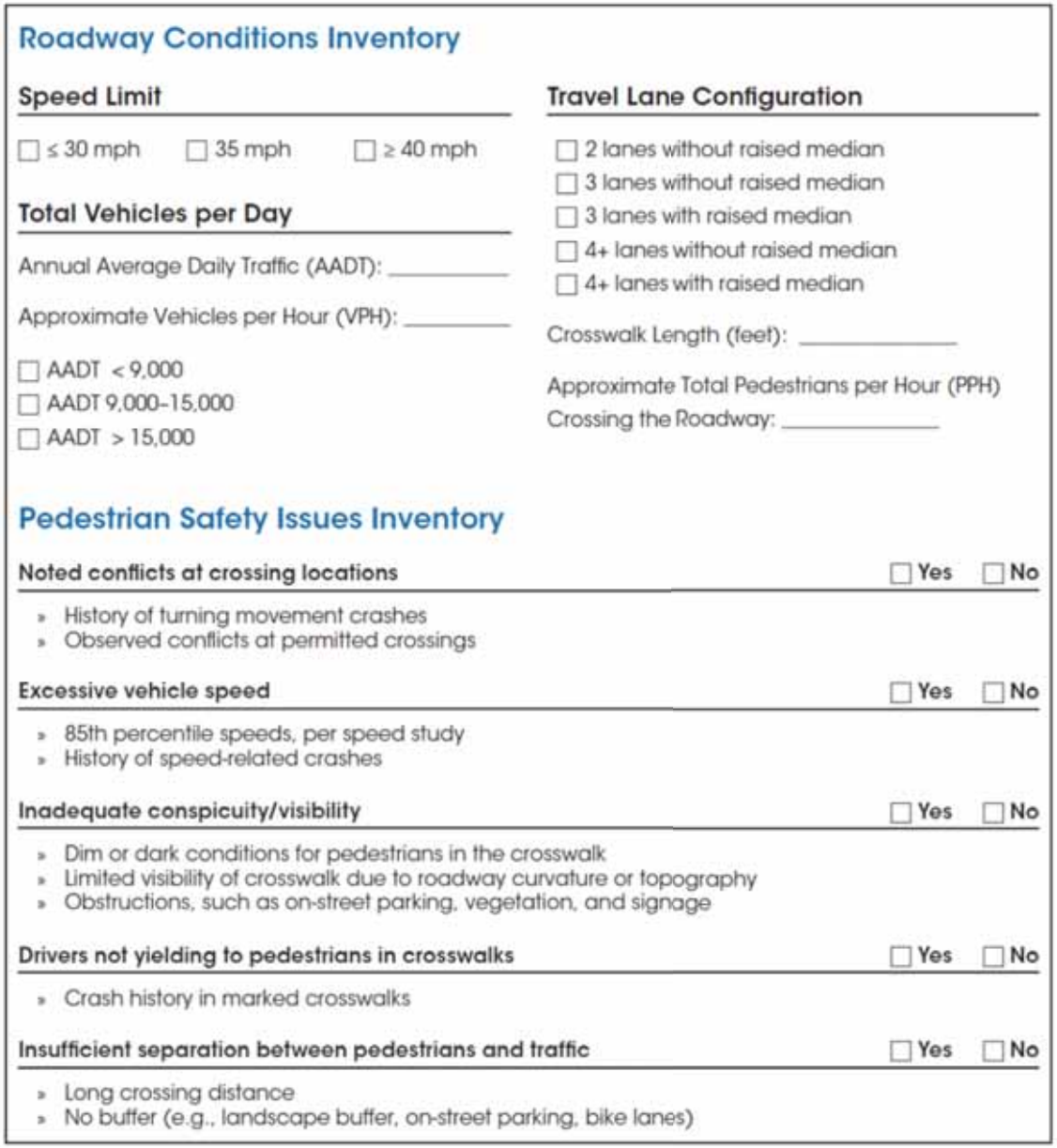
Countermeasure	CRF	CMF	Basis	Reference
Crosswalk visibility enhancement[1]	—	—	—	—
Advance STOP/YIELD signs and markings	25%	0.75	Pedestrian crashes[2]	Zegeer, et. al. 2017
Add overhead lighting	23%	0.77	Total injury crashes	Harkey, et. al. 2008
High-visibility marking[3]	48%	0.52	Pedestrian crashes	Chen, et. al., 2012
High-visibility markings (school zone)[3]	37%	0.63	Pedestrian crashes	Feldman, et. al. 2010
Parking restriction on crosswalk approach	30%	0.70	Pedestrian crashes	Gan, et. al., 2005
In-street Pedestrian Crossing sign	UNK	UNK	N/A	N/A
Curb extension	UNK	UNK	N/A	N/A
Raised crosswalk (speed tables)	45%	0.55	Pedestrian crashes	Elvik, et. al., 2004
	30%	0.70	Vehicle crashes	
Pedestrian refuge island	32%	0.68	Pedestrian crashes	Zegeer, et. al., 2017
PHB	55%	0.45	Pedestrian crashes	Zegeer, et. al., 2017
Road Diet – Urban area	19%	0.81	Total crashes	Pawlovich, et. al., 2006
Road Diet – Suburban area	47%	0.53	Total crashes	Persaud, et. al., 2010
RRFB	47%	0.53	Pedestrian crashes	Zegeer, et. al. 2017

Field Guide

Sample Inventory Form

Worksheets for each countermeasure:

- Definition
- Roadway conditions checklist
- Safety issues checklist
- Installation guidelines and MUTCD references



Roadway Conditions Inventory

Speed Limit

☐ ≤ 30 mph ☐ 35 mph ☐ ≥ 40 mph

Total Vehicles per Day

Annual Average Daily Traffic (AADT): _____

Approximate Vehicles per Hour (VPH): _____

☐ AADT < 9,000
☐ AADT 9,000–15,000
☐ AADT > 15,000

Travel Lane Configuration

☐ 2 lanes without raised median
☐ 3 lanes without raised median
☐ 3 lanes with raised median
☐ 4+ lanes without raised median
☐ 4+ lanes with raised median

Crosswalk Length (feet): _____

Approximate Total Pedestrians per Hour (PPH) Crossing the Roadway: _____

Pedestrian Safety Issues Inventory

Noted conflicts at crossing locations ☐ Yes ☐ No

- History of turning movement crashes
- Observed conflicts at permitted crossings

Excessive vehicle speed ☐ Yes ☐ No

- 85th percentile speeds, per speed study
- History of speed-related crashes

Inadequate conspicuity/visibility ☐ Yes ☐ No

- Dim or dark conditions for pedestrians in the crosswalk
- Limited visibility of crosswalk due to roadway curvature or topography
- Obstructions, such as on-street parking, vegetation, and signage

Drivers not yielding to pedestrians in crosswalks ☐ Yes ☐ No

- Crash history in marked crosswalks

Insufficient separation between pedestrians and traffic ☐ Yes ☐ No

- Long crossing distance
- No buffer (e.g., landscape buffer, on-street parking, bike lanes)

Local Success Story: Austin, TX PHBs

The city has installed 55 PHBs since 2009, and evaluates up to 10 locations a year.

The public can submit requests on the **Signal Request Dashboard**, City staff then evaluate and prioritize each request.

Evaluation criteria include:

- Speed limit
- Number of lanes
- Distance to nearest crossing
- Ped crash history

Source: City of Austin, Texas

Local Success Story: Austin, TX PHBs

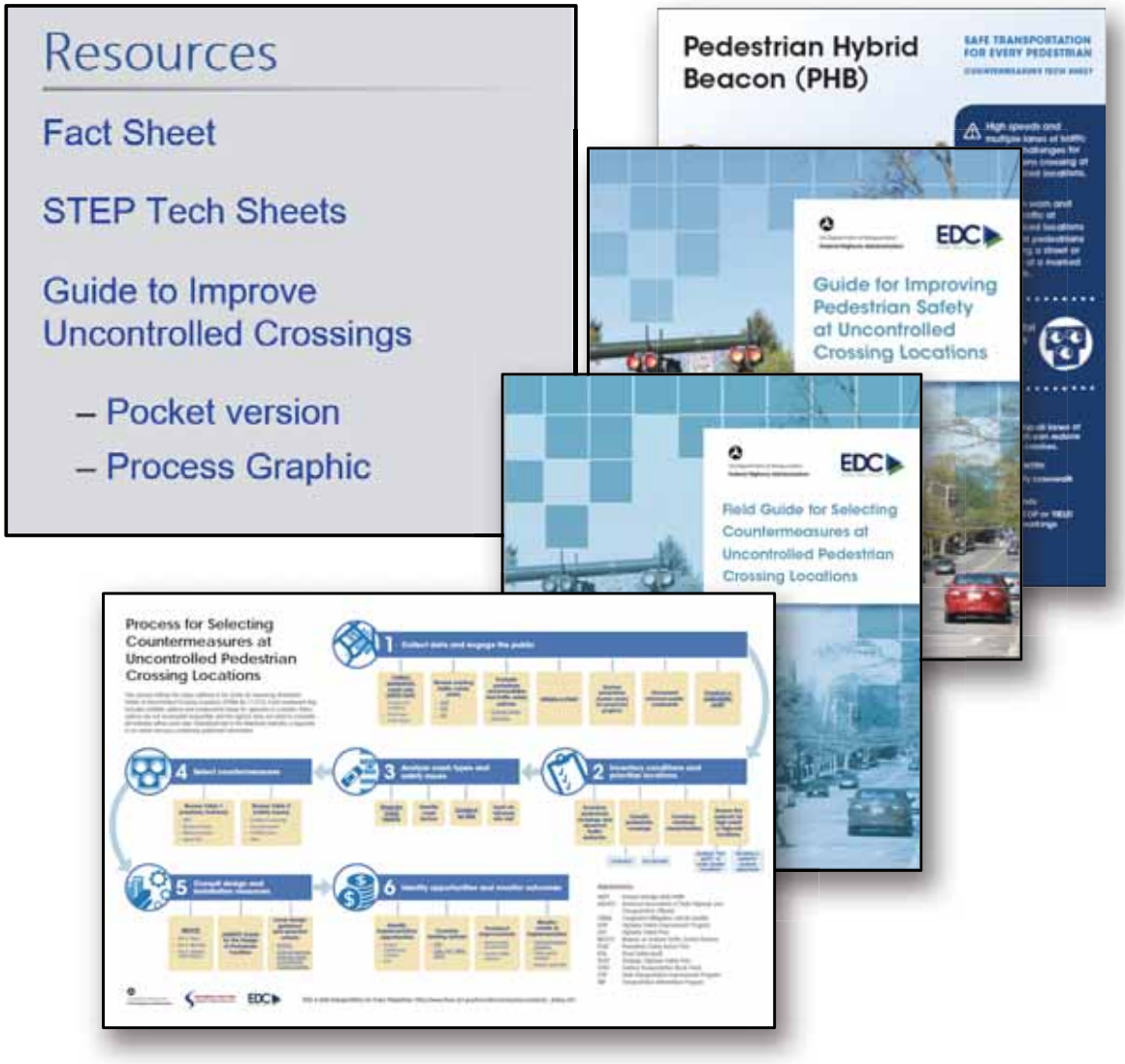
2014 Research by Texas A&M Transportation Institute evaluated 8 PHB sites in Austin.

Sites were on four-lane roads with ADT of 14,000-28,000.

Drivers on average **yielded 96% of the time** for all 20 PHB locations.

Source: City of Austin, Texas

www.fhwa.dot.gov/innovation/everydaycounts/edc_4/step.cfm



U.S. Department of Transportation
Federal Highway Administration

FHWA EVERY DAY COUNTS / STEP

For Additional Information Contact:

https://www.fhwa.dot.gov/innovation/everydaycounts/edc_4/step.cfm

STEP is continuing through 2021 as part of EDC-5 !

Becky Crowe
FHWA Office of Safety
(804) 775-3381
Rebecca.Crowe@dot.gov

Peter Eun
FHWA Resource Center
(360) 753-9551
Peter.Eun@dot.gov

Stephen Ratke
FHWA TX Division
Stephen.Ratke@dot.gov