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Safe Transportation for Every Pedestrian (STEP)

Keith J. Harrison, PE

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FHWA Resource Center

Every Day Counts (EDC-5) >> “STEP”

Identify and rapidly deploy *proven, but underutilized* innovations

On-Ramp to Innovation
every day counts

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STEP's "Spectacular Seven"


Crosswalk Visibility Enhancements


Raised Crosswalks


Pedestrian Refuge Island


Rectangular Rapid Flashing Beacon (RRFB)


Pedestrian Hybrid Beacon (PHB)


Leading Pedestrian Interval (LPI)


Road Diets

STEP's "Spectacular Seven"

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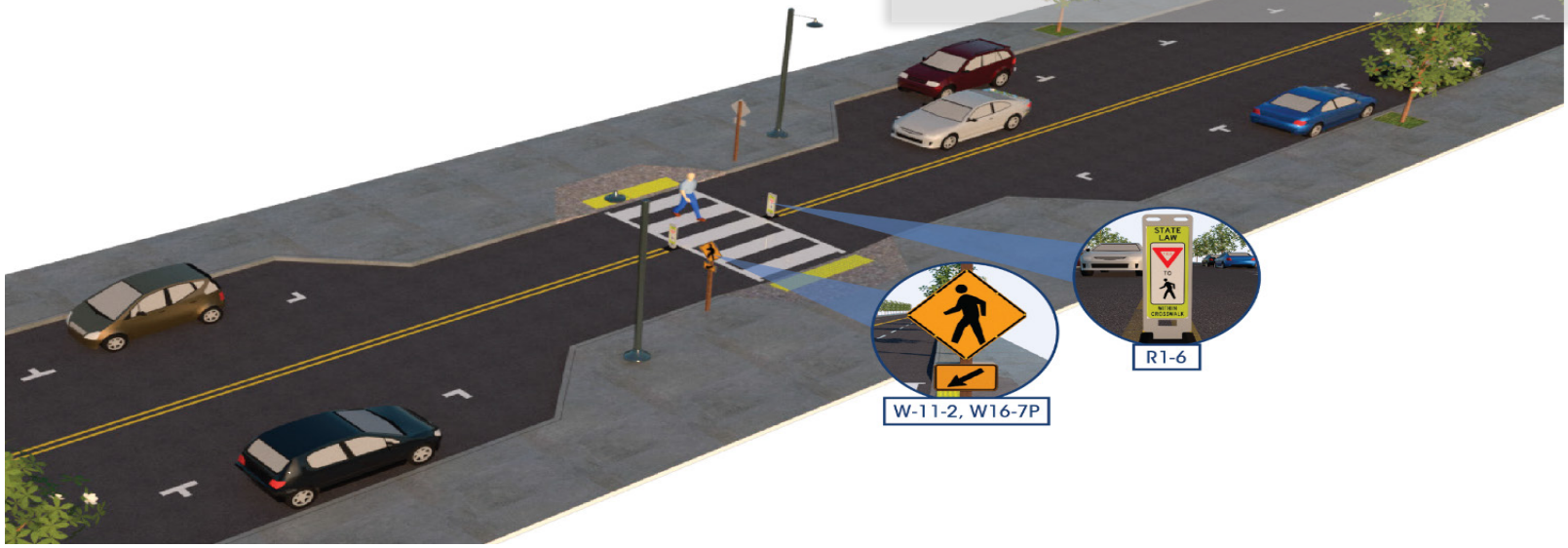
Road Diets

Crosswalk Visibility Enhancements

- Indicate preferred locations for people to cross
- Reinforce driver requirement to yield the right-of-way

23 - 48%

Reduction in Pedestrian Crashes



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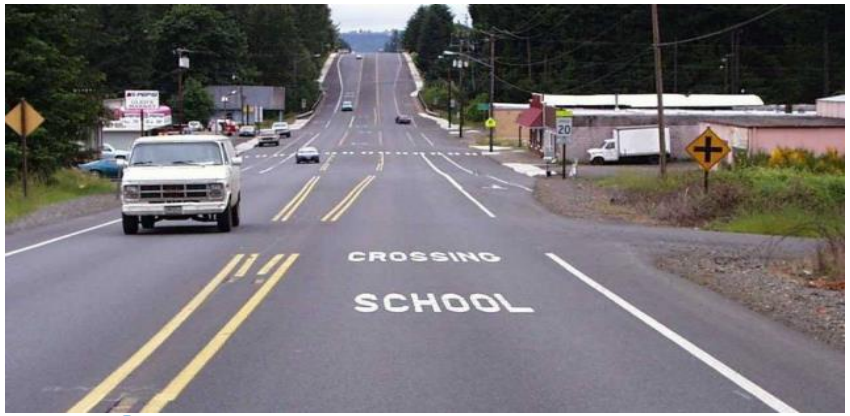
Crosswalk Visibility Enhancements

- High Visibility markings
- Parking restrictions on approaches
- Advance Yield/Stop signs and markings
- Curb extensions (bulb-outs)
- Improved placement of overhead lighting
- In-Street signs

Crosswalk Visibility Enhancements

✓High visibility markings to enhance conspicuity/awareness



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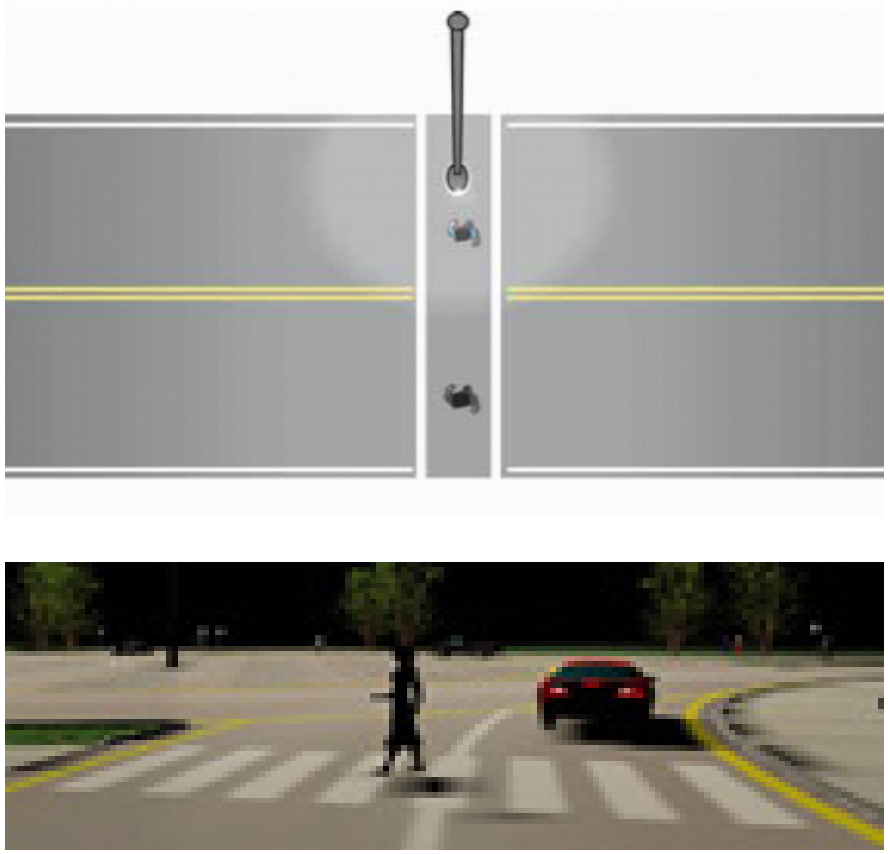
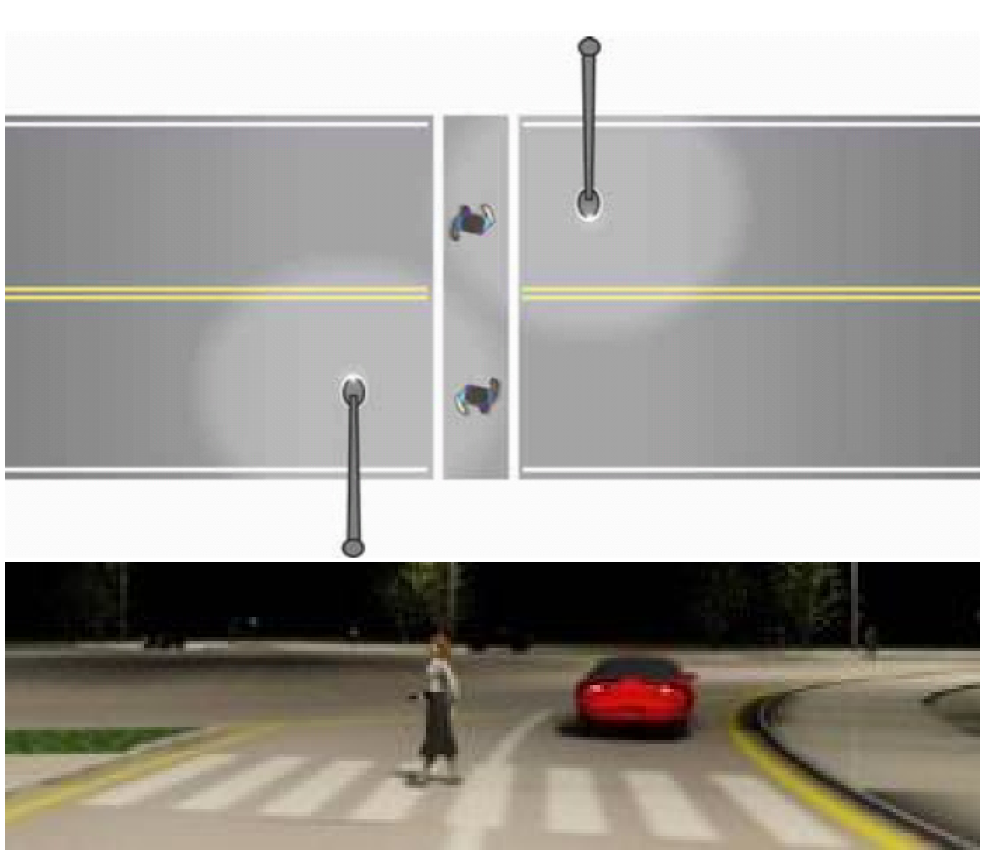
Crosswalk Visibility Enhancements

✓Position luminaires upstream of crosswalk, not overhead





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Crosswalk Visibility Enhancements

✓In-street signs to reinforce pedestrian right-of-way

Gateway Treatment, Three–Lane Configuration Without Refuge Island	
Travel Lanes Passing/Turn Lanes	2 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.

Figure 6a

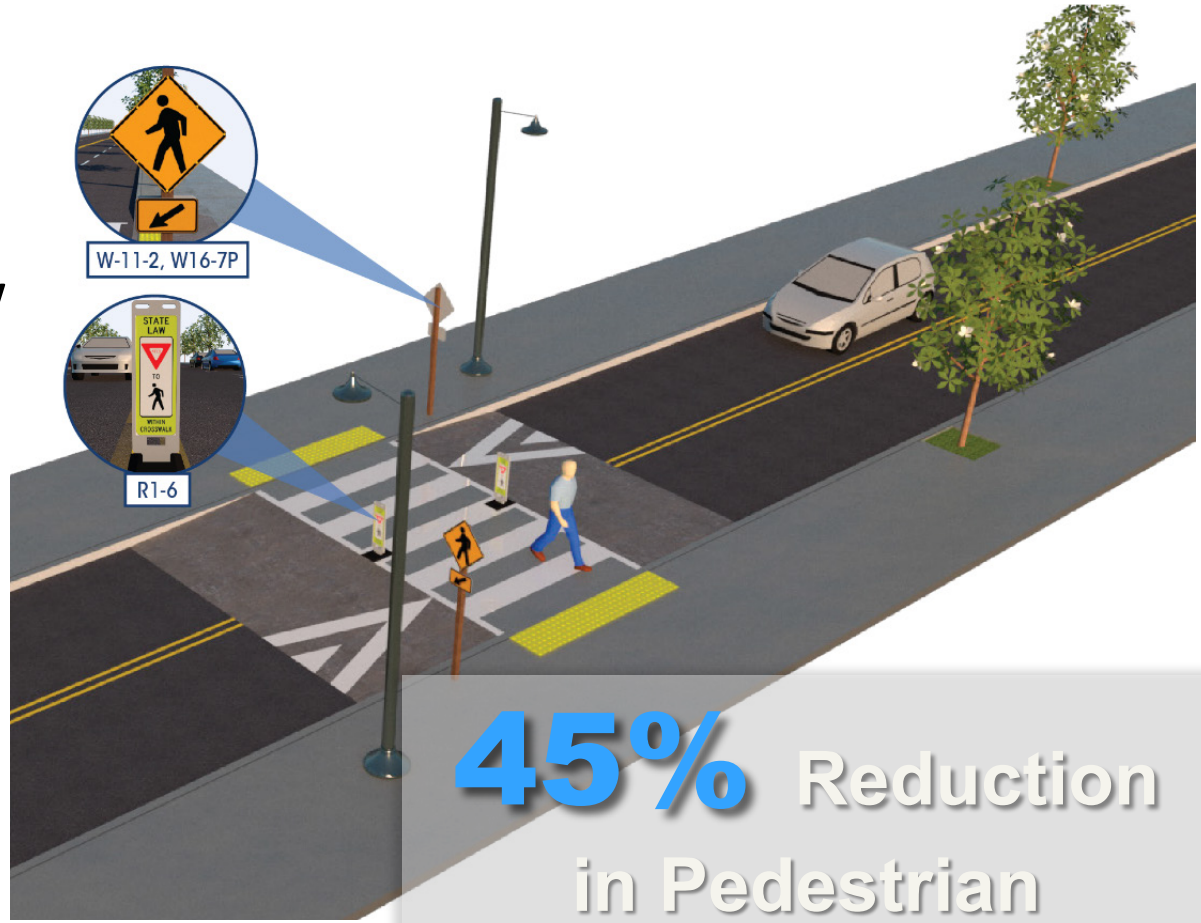
SOURCE: Michigan DOT

STEP's "Spectacular Seven"

- Crosswalk Visibility Enhancements
- **Raised Crosswalks** 
- Pedestrian Refuge Island
- Rectangular Rapid Flashing Beacon (RRFB)
- Pedestrian Hybrid Beacon (PHB)
- Leading Pedestrian Interval (LPI)
- Road Diets

Raised Crosswalks

- Makes pedestrian more prominent in driver's field of view
- Acts as traffic calming measure
- Allow pedestrians to cross at grade with sidewalk



45% Reduction in Pedestrian Crashes

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Raised Crosswalks

- Most suitable for
  - 2 to 3 Lanes
  - Speed limit ≤ 30
  - AADT < 9000
- Least suitable for
  - Bus/truck routes
  - Primary route for emergency vehicles
  - Poor drainage

Photo: Peter Furth, NACTO.org

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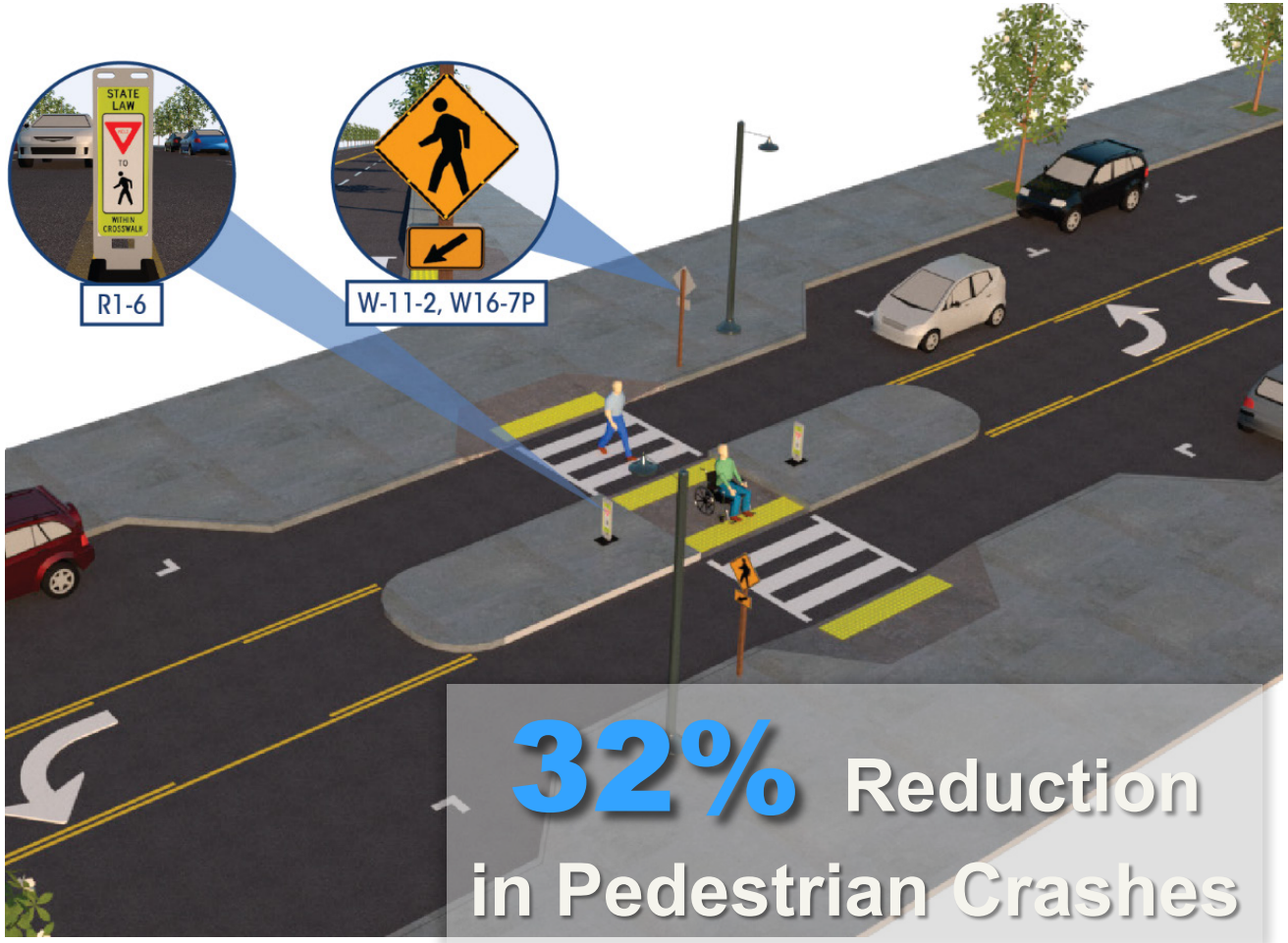
Road Diets

Pedestrian Refuge Island

- Crossing in two stages reduces pedestrian exposure
- Place to rest and wait for gap
- May enhance visibility and reduce vehicle speeds



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Pedestrian Refuge Island

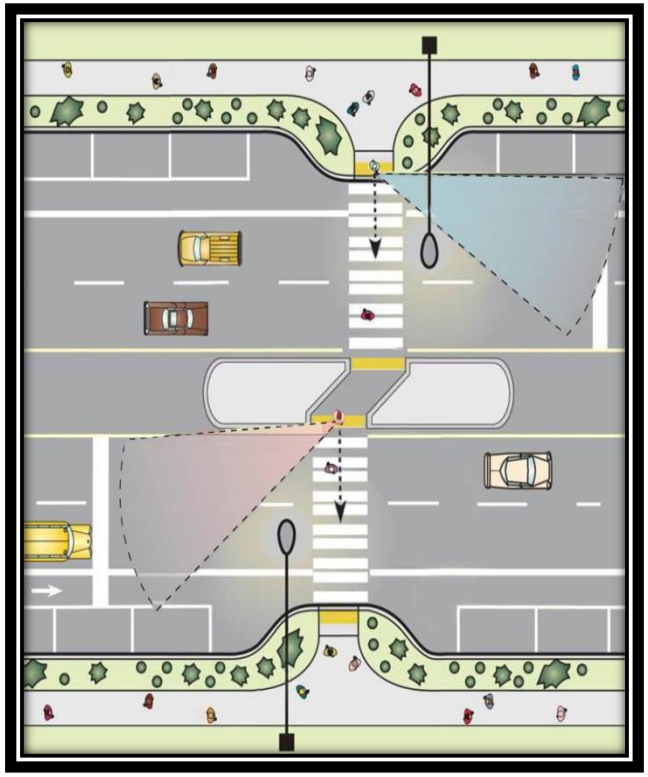

Image Credit:
UNC Highway Safety Research Center

STEP's "Spectacular Seven"

- Crosswalk Visibility Enhancements
- Raised Crosswalks
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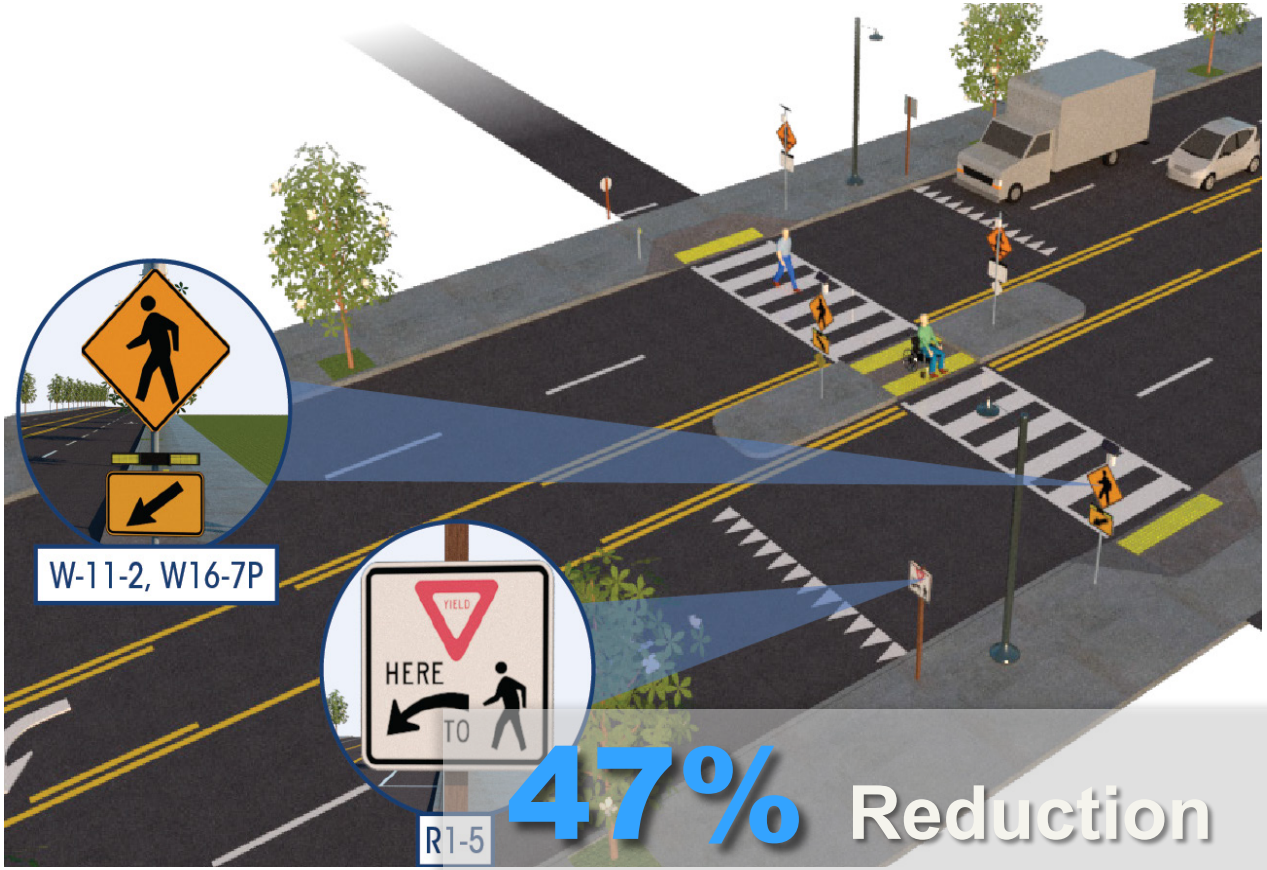
- Road Diets

Rectangular Rapid Flashing Beacon (RRFB)

- Multiple lanes create challenges crossing at unsignalized locations
- Can make pedestrians more visible at a marked crosswalk



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Rectangular Rapid Flashing Beacon (RRFB)

"a *pedestrian-actuated* conspicuity enhancement to supplement standard pedestrian, school, and trail crossing warning signs at uncontrolled, marked crosswalks" [MUTCD]

Rectangular Rapid Flashing Beacon (RRFB)

FHWA Policy Memorandums

Manual on Uniform Traffic Control Devices (MUTCD)

Resources > Interim Approvals Issued by FHWA

Interim Approval 21 – Rectangular Rapid-Flashing Beacons at Crosswalks

mutcd.fhwa.dot.gov

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Pedestrian Hybrid Beacon (PHB)

- Best suited for multilane crossings on high-volume high-speed facilities where signal warrants not met

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Pedestrian Hybrid Beacon (PHB)

1

Blank for drivers

2

Flashing yellow

3

Steady yellow

4

Steady red

5

Wig-Wag

Return to 1

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Leading Pedestrian Interval (LPI)


Road Diets

Leading Pedestrian Interval (LPI)

- Intended to help enforce pedestrian right-of-way
- Pedestrians given head start to establish presence in crosswalk

59% Reduction in Pedestrian Crashes

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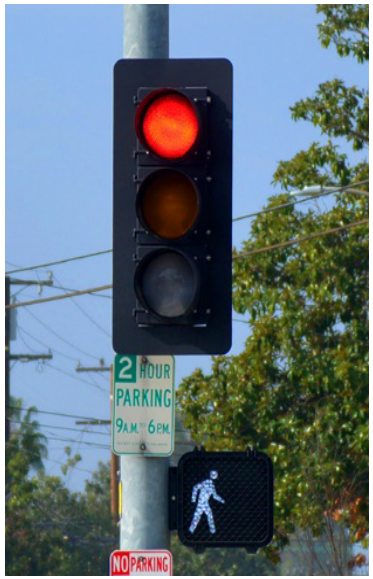
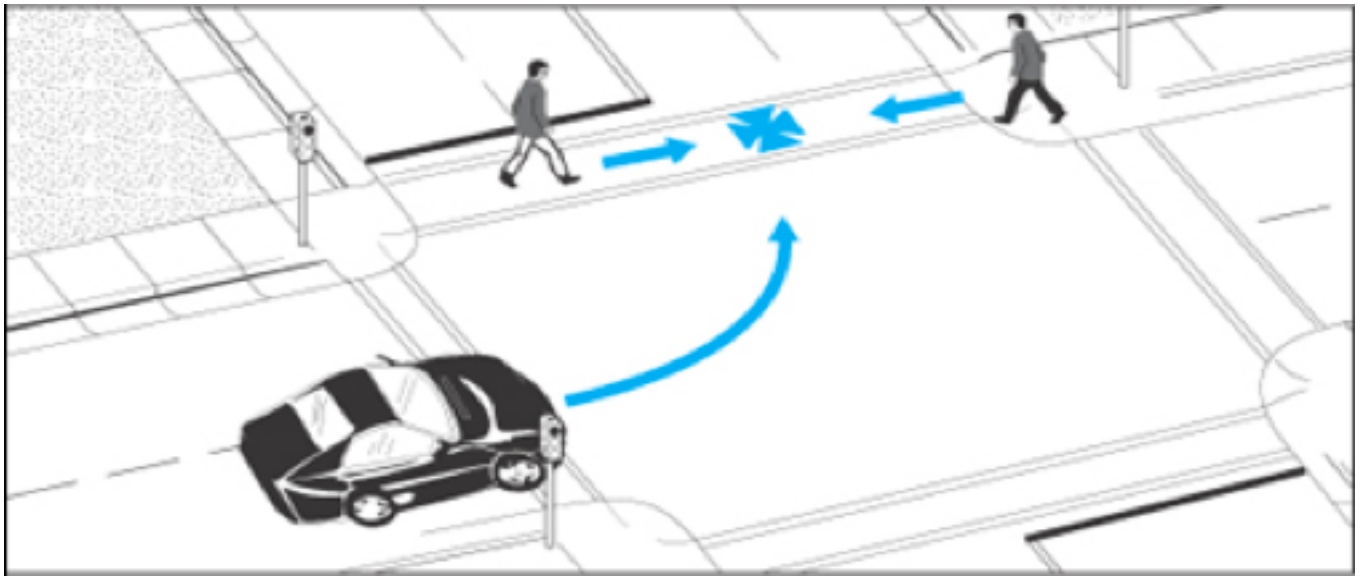
Leading Pedestrian Interval (LPI)





- Particularly effective in reducing conflicts with Left turning vehicles
- RTOR restrictions may be appropriate at locations with high volume of Right turns

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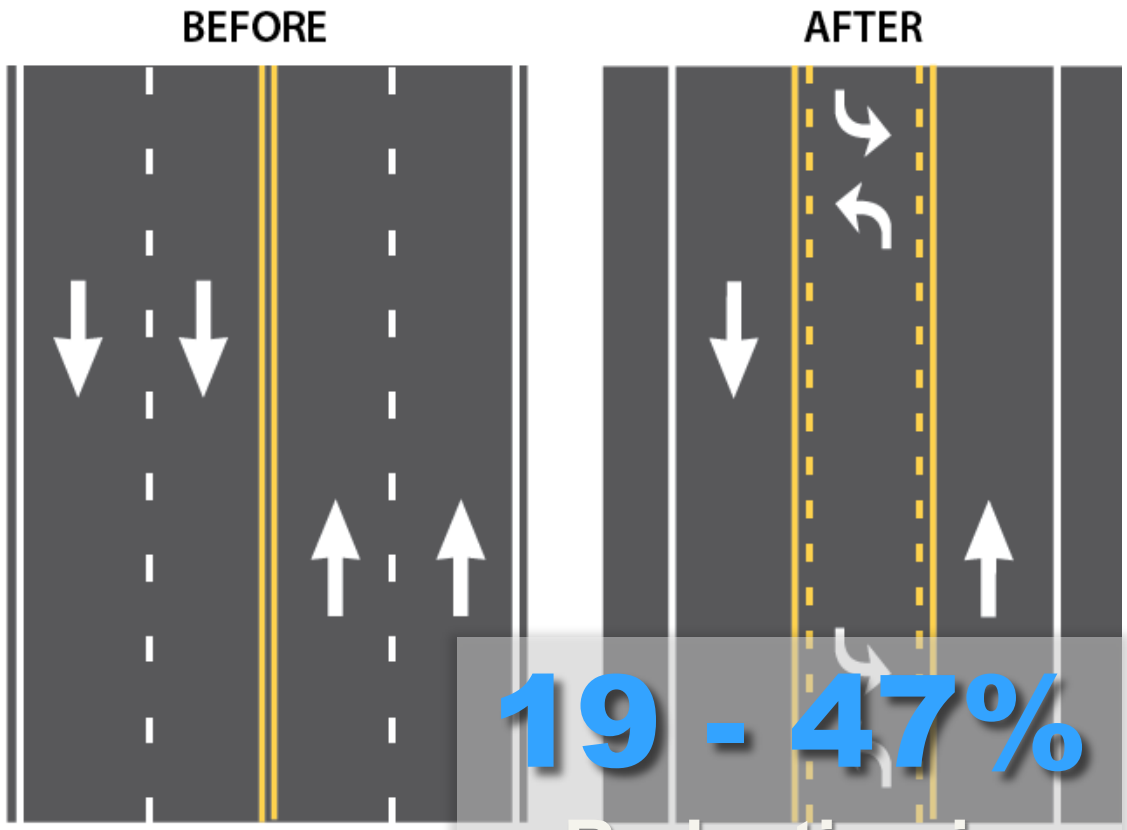
Road Diets

Road Diets

- Reconfiguration of roadway cross-section to better serve all modes
- Can incorporate some of the STEP treatments already discussed



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Road Diets

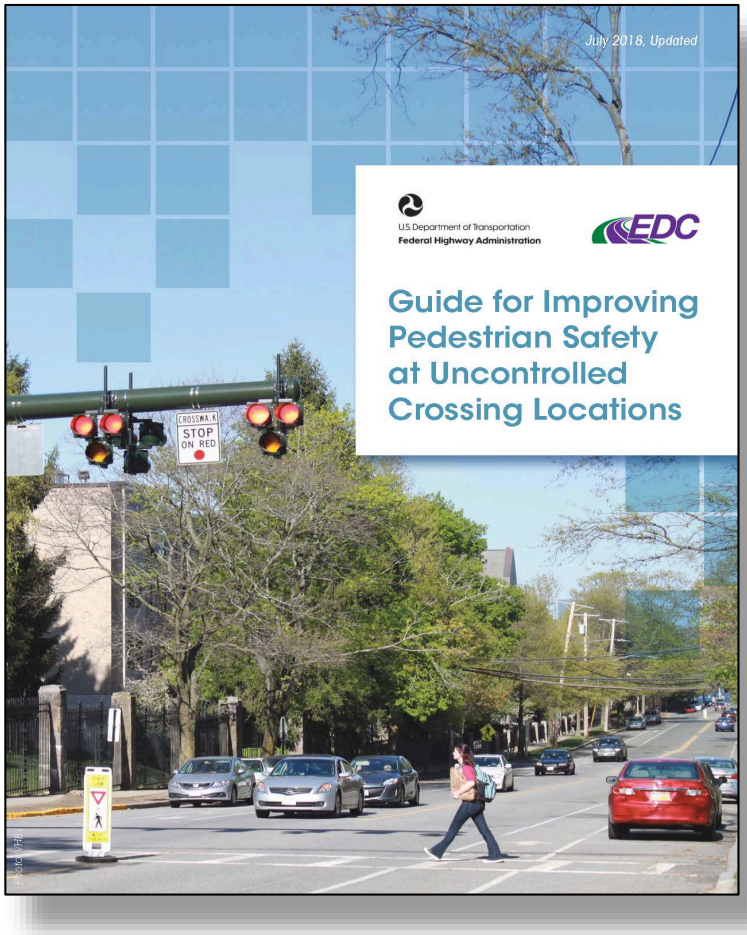
- Utilize existing footprint
- Rebalance allocation of street space
- TWLTL (need not be continuous)

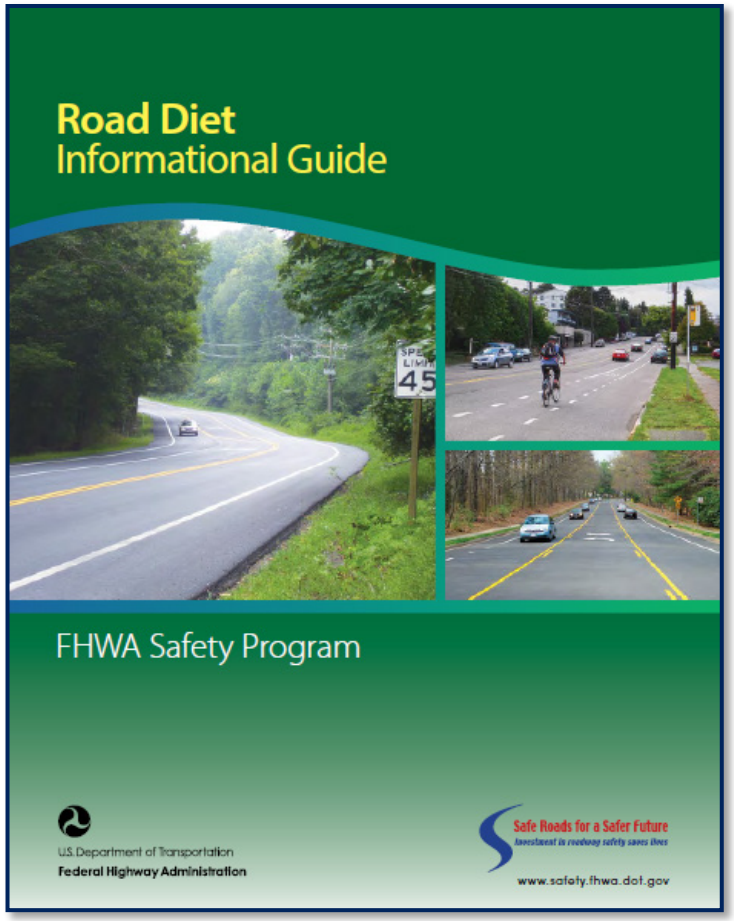
Example of a Road Diet on Southern Blvd., Bronx, New York

Implementation Considerations

- Suitability of countermeasures depends on context
  - Volumes
  - Speeds
  - Cross-section
  - Land use
- Compliance with MUTCD and State/local policies
- Stakeholder involvement (outreach and education)
  - Understanding
  - Acceptance
  - “Ownership”

Implementation Tools





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Implementation Tools

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

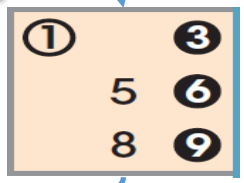
Roadway Configuration	Posted Speed Limit and AADT								
	Vehicle AADT <9,000			Vehicle AADT 9,000–15,000			Vehicle AADT >15,000		
	≤30 mph	35 mph	≥40 mph	≤30 mph	35 mph	≥40 mph	≤30 mph	35 mph	≥40 mph
2 lanes (1 lane in each direction)	❶ 2 4 5 6	❶ 5 6 7 9	① 5 6 ❼ ❾	❶ 4 5 6	❶ 5 6 7 9	① 5 6 ❼ ❾	❶ 4 5 6 7 9	① 5 6 7 9	① 5 6 ❾
3 lanes with raised median (1 lane in each direction)	❶ 2 3 4 5 7 9	❶ ❸ 5 7 9	① ❸ 5 ❼ ❾	① 3 4 5 7 9	① ❸ 5 ❼ ❾	① ❸ 5 ❼ ❾	① ❸ 4 5 7 9	① ❸ 5 ❼ ❾	① ❸ 5 ❾
3 lanes w/o raised median (1 lane in each direction with a two-way left-turn lane)	❶ 2 3 4 5 6 7 9	❶ ❸ 5 6 7 9	① ❸ 5 6 ❾	① 3 4 5 6 7 9	① ❸ 5 6 ❼ ❾	① ❸ 5 6 ❾	① ❸ 4 5 6 7 9	① ❸ 5 6 ❾	① ❸ 5 6 ❾
4+ lanes with raised median (2 or more lanes in each direction)	❶ 5 ❸	❶ ❸ 5	① ❸ 5	① 5 ❸	① ❸ 5	① ❸ 5	① 5 ❸	① ❸ 5	① ❸ 5
4+ lanes w/o raised median (2 or more lanes in each direction)	❶ ❸ 5 6 7 8 9	① ❸ 5 6 7 8 9	① ❸ 5 6 8 9	① ❸ 5 6 7 8 9	① ❸ 5 6 ❼ 8 9	① ❸ 5 6 8 9	① ❸ 5 6 ❼ 8 9	① ❸ 5 6 8 9	① ❸ 5 6 8 9

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.*

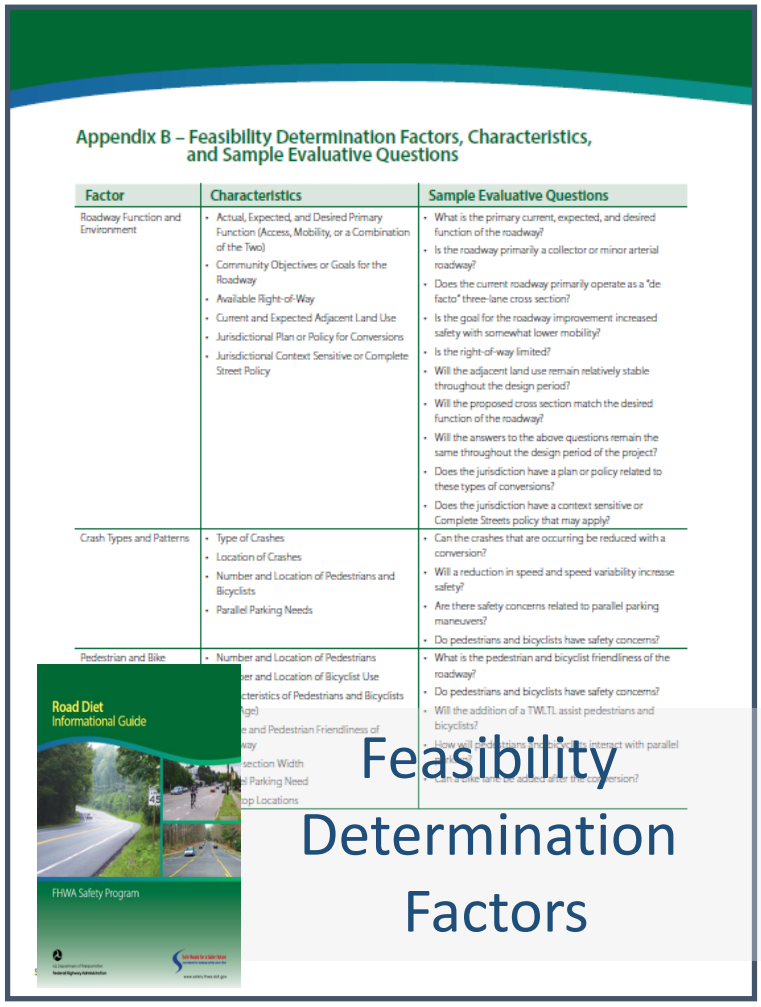
The absence of a number signifies that the countermeasure is generally not an appropriate treatment, but exceptions may be considered following engineering judgment.

1. High-visibility crosswalk markings, parking restrictions on 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.

Implementation Tools



Appendix B – Feasibility Determination Factors, Characteristics, and Sample Evaluative Questions

Factor	Characteristics	Sample Evaluative Questions
Roadway Function and Environment	• Actual, Expected, and Desired Primary Function (Access, Mobility, or a Combination of the Two) • Community Objectives or Goals for the Roadway • Available Right-of-Way • Current and Expected Adjacent Land Use • Jurisdictional Plan or Policy for Conversions • Jurisdictional Context Sensitive or Complete Street Policy	• What is the primary current, expected, and desired function of the roadway? • Is the roadway primarily a collector or minor arterial roadway? • Does the current roadway primarily operate as a "de facto" three-lane cross section? • Is the goal for the roadway improvement increased safety with somewhat lower mobility? • Is the right-of-way limited? • Will the adjacent land use remain relatively stable throughout the design period? • Will the proposed cross section match the desired function of the roadway? • Will the answers to the above questions remain the same throughout the design period of the project? • Does the jurisdiction have a plan or policy related to these types of conversions? • Does the jurisdiction have a context sensitive or Complete Streets policy that may apply?
Crash Types and Patterns	• Type of Crashes • Location of Crashes • Number and Location of Pedestrians and Bicyclists • Parallel Parking Needs	• Can the crashes that are occurring be reduced with a conversion? • Will a reduction in speed and speed variability increase safety? • Are there safety concerns related to parallel parking maneuvers? • Do pedestrians and bicyclists have safety concerns?
Pedestrian and Bike	• Number and Location of Pedestrians …er and Location of Bicyclist Use …cteristics of Pedestrians and Bicyclists …ge) …e and Pedestrian Friendliness of …way …section Width …l Parking Need …p Locations	• What is the pedestrian and bicyclist friendliness of the roadway? • Do pedestrians and bicyclists have safety concerns? • Will the addition of a TWLTL assist pedestrians and bicyclists? • How will pedestrians and bicyclists interact with parallel … … can these issues be addressed after the conversion?

Feasibility Determination Factors

- Roadway Function and Environment
- Crash Types and Patterns
- Pedestrian and Bike Activity
- Overall Traffic Volume and LOS
- Turning Volumes and Patterns
- Frequent Stop /Slow-Moving Vehicles
- Weaving, Speed, and Queues
- ROW Availability, Cost, Impacts
- General Characteristics

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Countermeasure Fact Sheets

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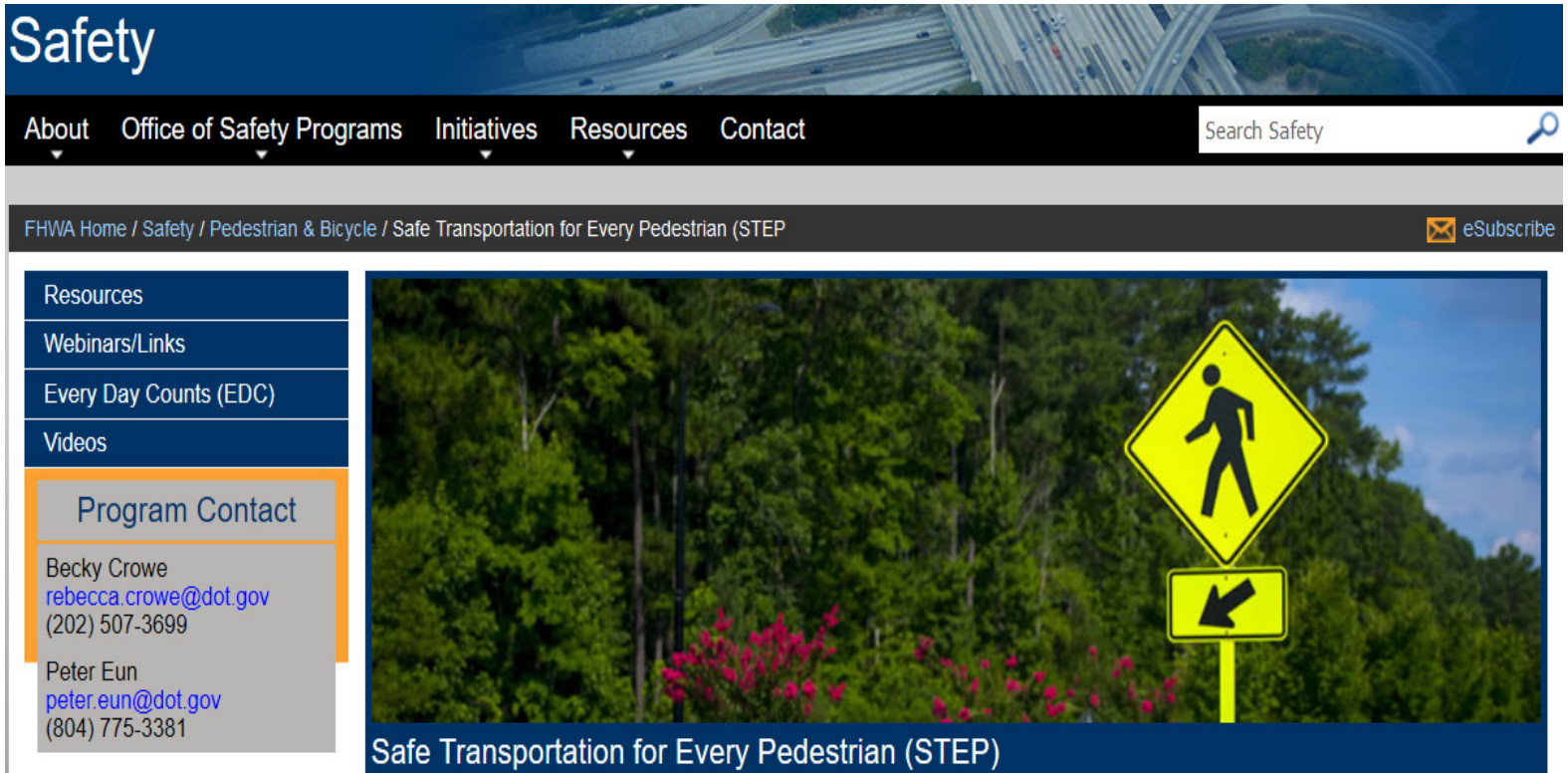
Targeted Assistance

- In-person training
  - Designing for Pedestrian Safety
  - Designing for Bicyclist Safety
  - Road Safety Assessment (RSA)
- Webinars
- Peer Exchanges
- Custom solutions

Additional Resources



https://safety.fhwa.dot.gov/ped_bike/step/

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Thank You!

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