PBIC

Engineering Strategies to Improve Child Pedestrian Safety

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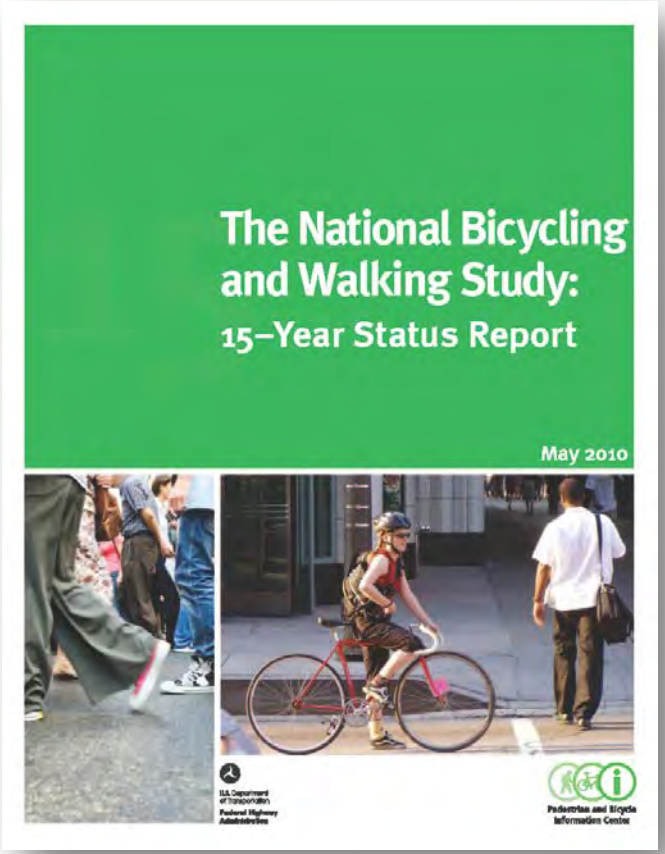
Pedestrian and Bicycle Information Center

Safe Kids Worldwide Injury Prevention Conference | June 2013

Pedestrian and Bicycle Information Center

- Established by Congress in 1999
- Identify needs and develop/distribute accurate and user-friendly information
- Expand partnerships to generate a network of informed individuals and organizations
- Provide direct support to communities to become vibrant, safe, and sustainable places to live and travel by foot and bike



PBIC and Safe Kids

- Began working with Safe Kids Worldwide in 2010
- Facilitate workshops for Walk This Way grant recipients to select locations and countermeasures
- Collect data to assess the effectiveness of modifications

Philadelphia, Pennsylvania

Presentation Overview

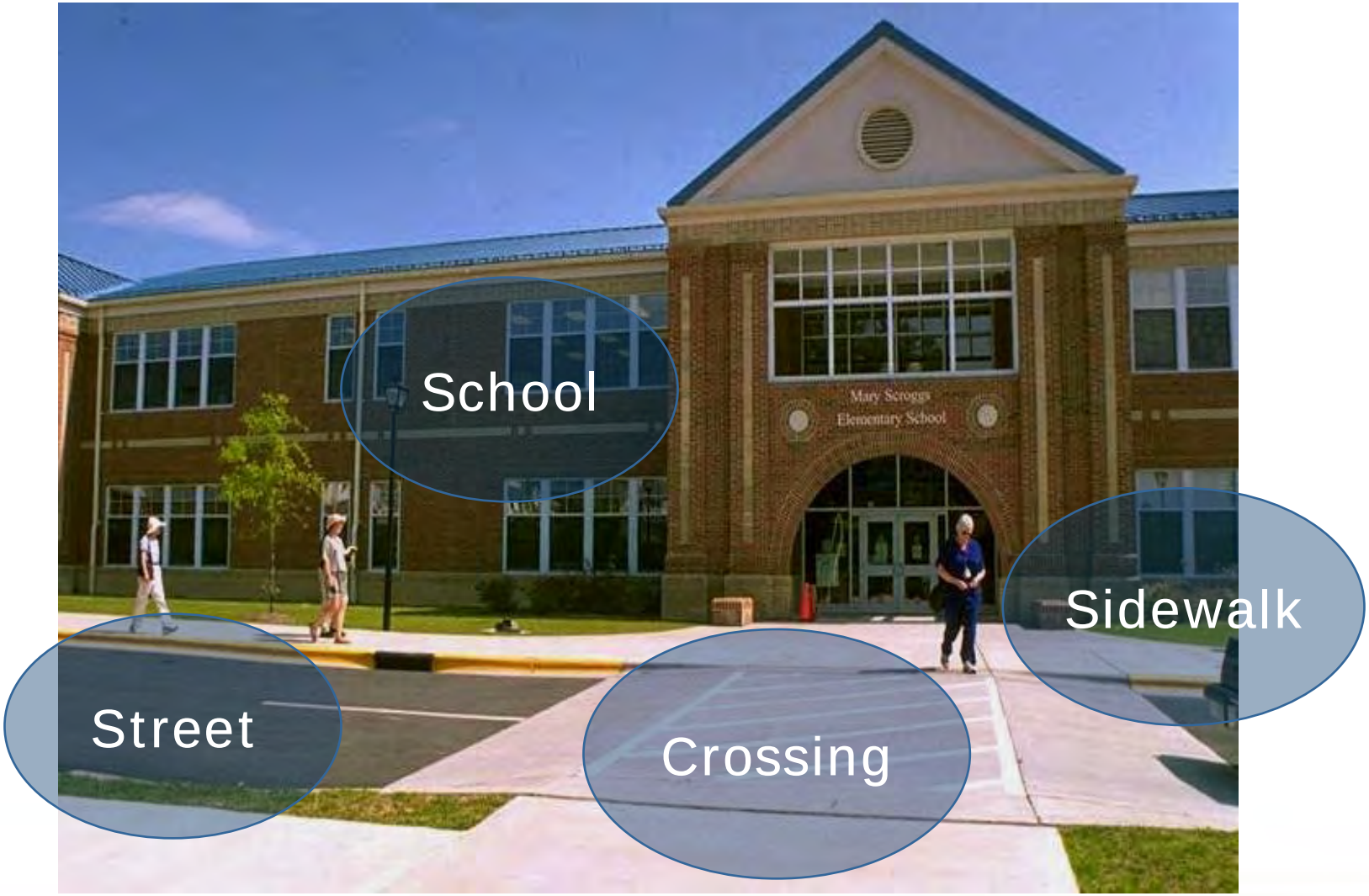
- Common Issues and Problems
  - Around the School
  - Along the School Route
  - Crossing the Street
  - Traffic Speed
- Engineering Strategies
- Resources for Improving Safety

Creating safe routes with engineering

- Improve children's safety
- Improve accessibility
- Encourage more bicycling and walking

Walkways and crossings: Prerequisites for walking

Relationships are everything



Focus on low cost, easy to implement solutions

What's wrong with this picture?

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What's wrong with this picture?

Engineering topic outline

- **Around the School**
- Along the School Route
- Crossing the Street
- Slowing Down Traffic

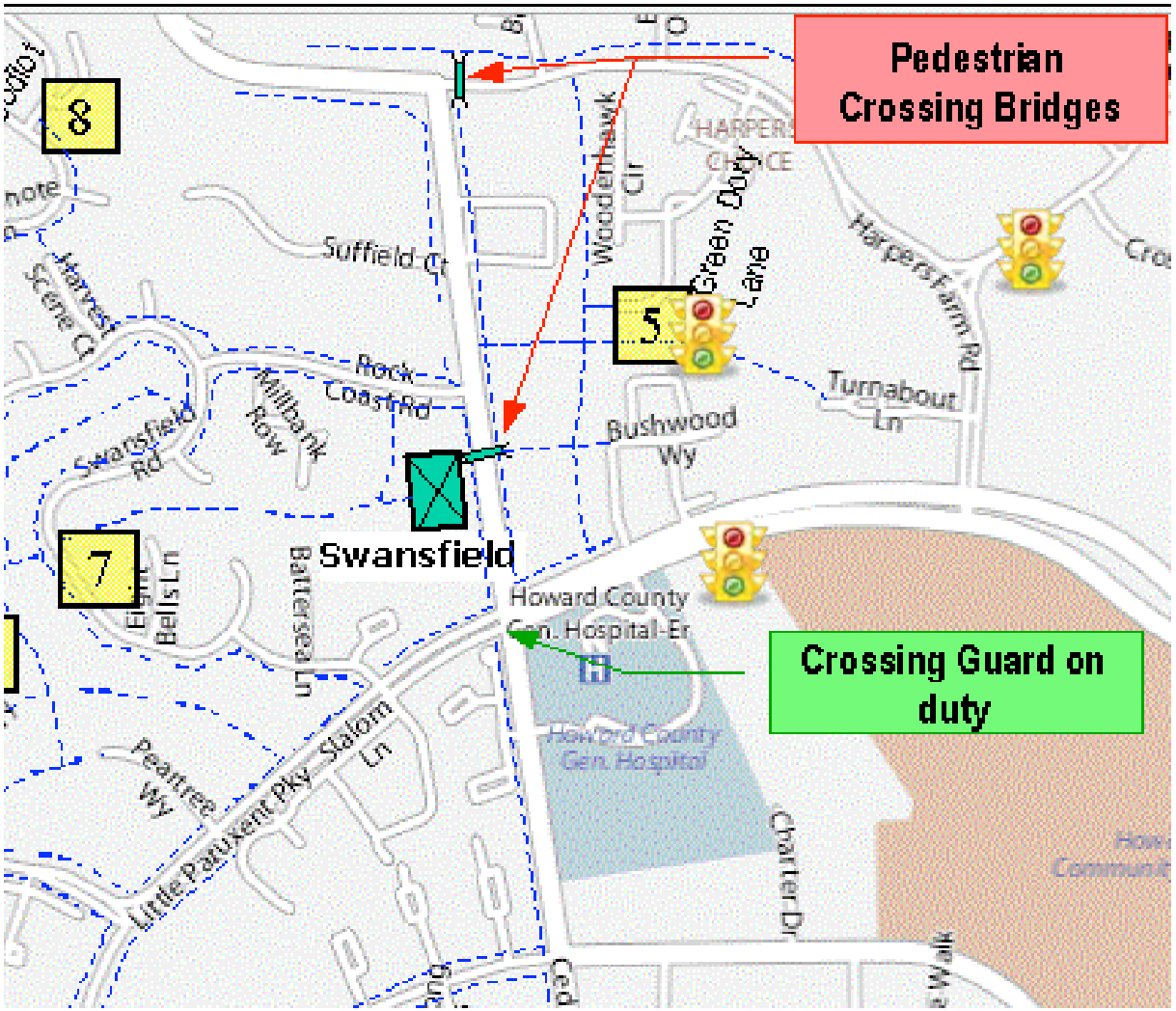
School zone


STATE HIGHWAY 152
AVENUE
DRIVE
CRESTWOOD DRIVE
HOPE AVE
CENTER AVE
ROAD
WALNUT DR
CLARK
BRENNER
ANZA DR
FAWN PL
WILLOWGLEN PLACE
DRIVE
ROAD
AVENUE
NATHAN ROAD
MONTE VISTA ELEMENTARY SCHOOL
WILLOW GLEN PARK
MERU LANE
AVENUE
HOPE TERRACE
CONNIE WAY
CEDAR VISTA
WILLOWGLEN
FRIAR LANE
CALLE CITA
VIA ROJO
CITA
LINCOLN
ROAD
LINCOLNWOOD
ESSEX ST
DIXON ST

Existing conditions map

Sidewalks and pathways

Walking school bus locations 6



School area speed limit signing

Changeable message signs

Speed feedback signs

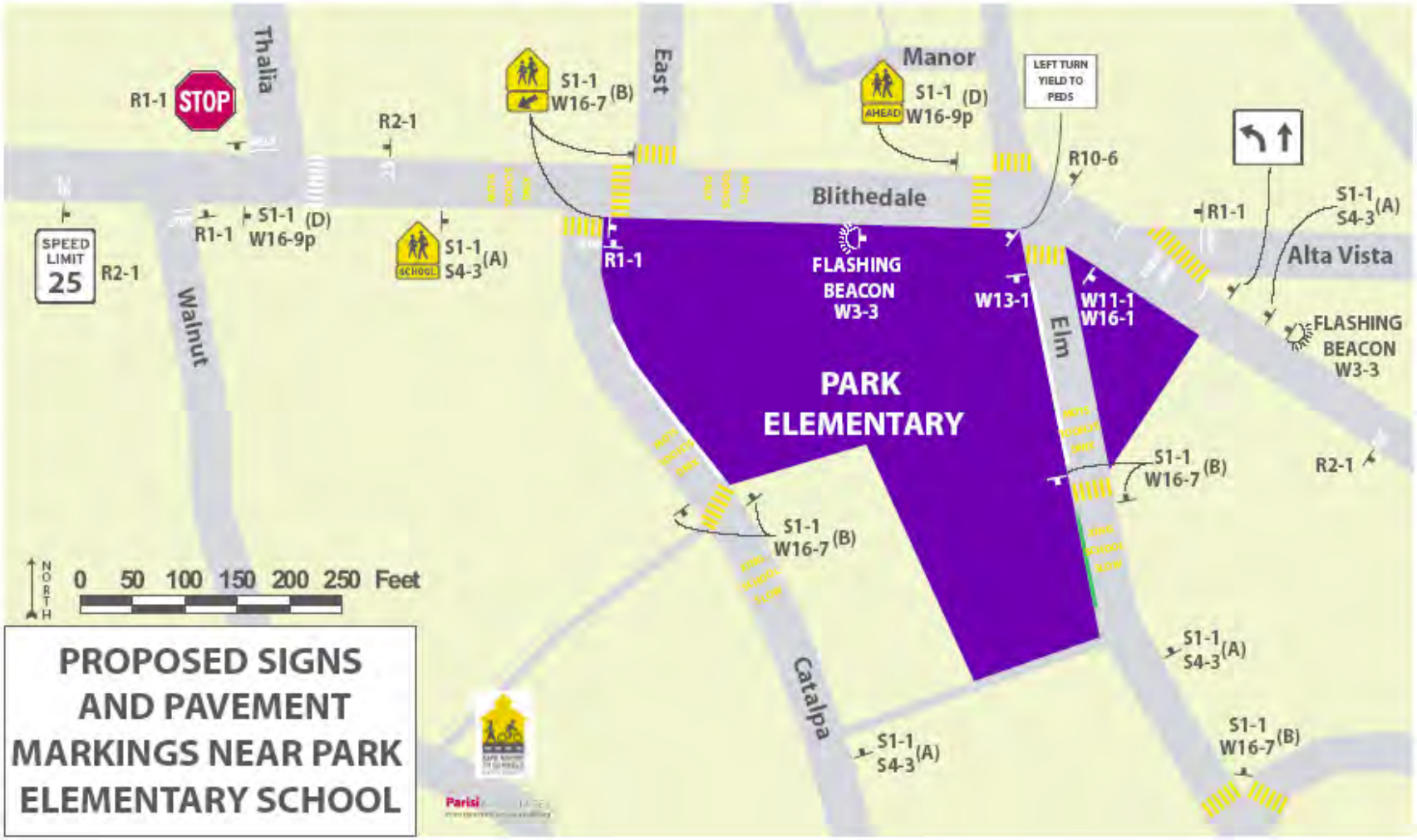
School crosswalk signs and advance warning signs

Parking regulations

Keep signs simple

School pavement markings

Sample school traffic control plan



Engineering topic outline

- Around the School
- **Along the School Route**
  - **Sidewalks**
  - **On-street bicycling**
  - **Pathways**
  - **Connectivity**
- Crossing the Street
- Slowing Down Traffic

Perception versus reality

Sidewalks are essential

Connections to the school

Good sidewalk buffer

No sidewalk buffer

Provide wide enough sidewalks

- Recommended minimum: 5’
- Preferred min: 6’
- At schools: 8’-10’

Install street lighting

Meet ADA requirements for universal design

Curb ramp design

- Two ramps per corner
- Eight ramps per intersection

Warning strip – 4’ x 2’

Along the school route: Pathways

Formal and informal connections

Formal, paved path to school

Neighborhood initiated, unpaved path to local school

Engineering topic outline

- Around the School
- Along the School Route
- **Crossing the Street**
  - **Introduction**
  - **Shortening crossing distances**
  - **Marking crosswalks**
  - **Creating visible crossings**
  - **Using stop signs and traffic signals**
- Slowing Down Traffic

Principles for creating safe crossings

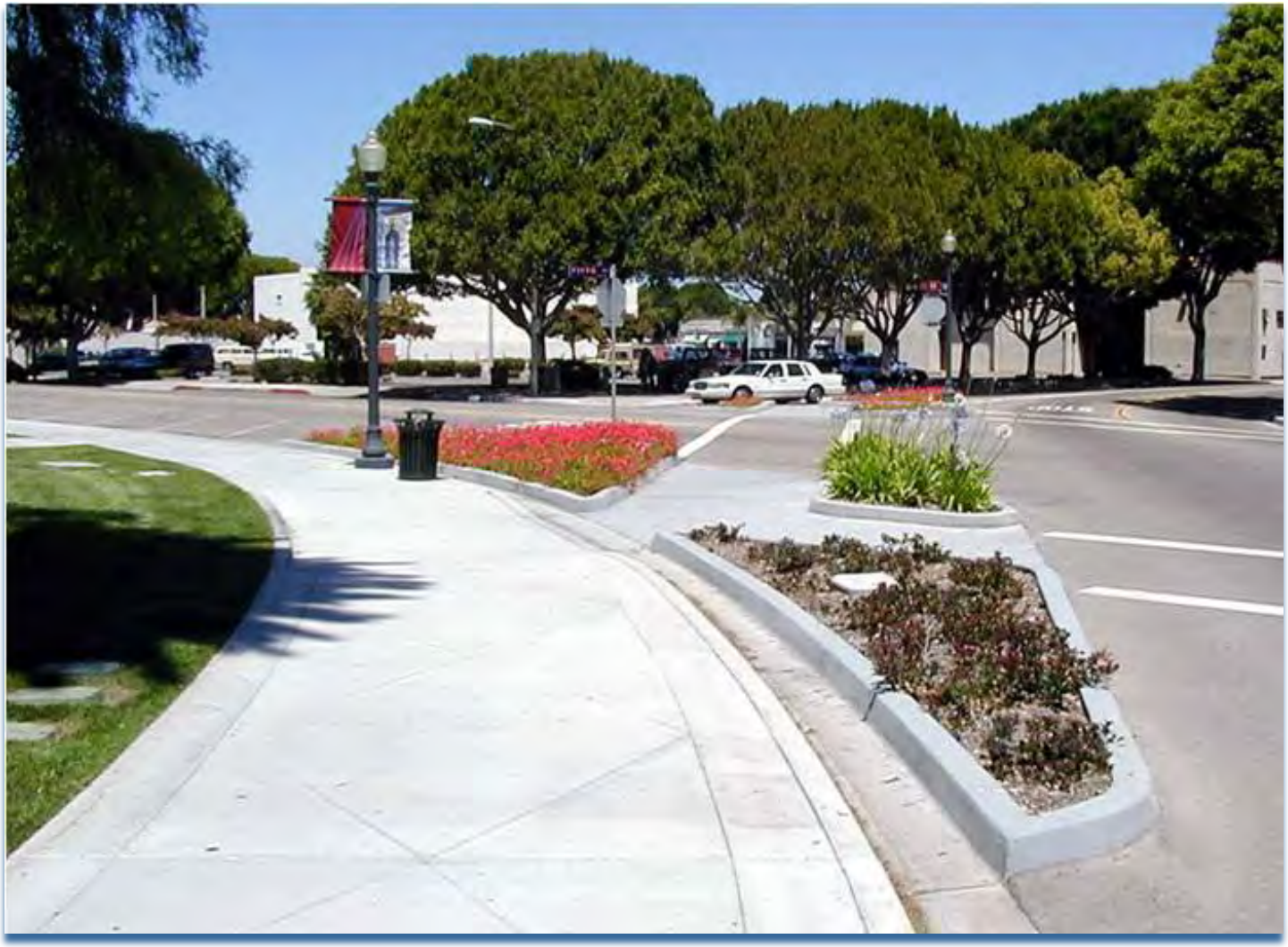
- Establish a school crossing
- Reduce crossing distance
- Use appropriate traffic control
  - Marked crosswalks
  - Warning signs or flashers
  - Stop signs and traffic signals
  - Crossing guards
- Slow vehicle speeds

Wide, multi-lane roads are barriers

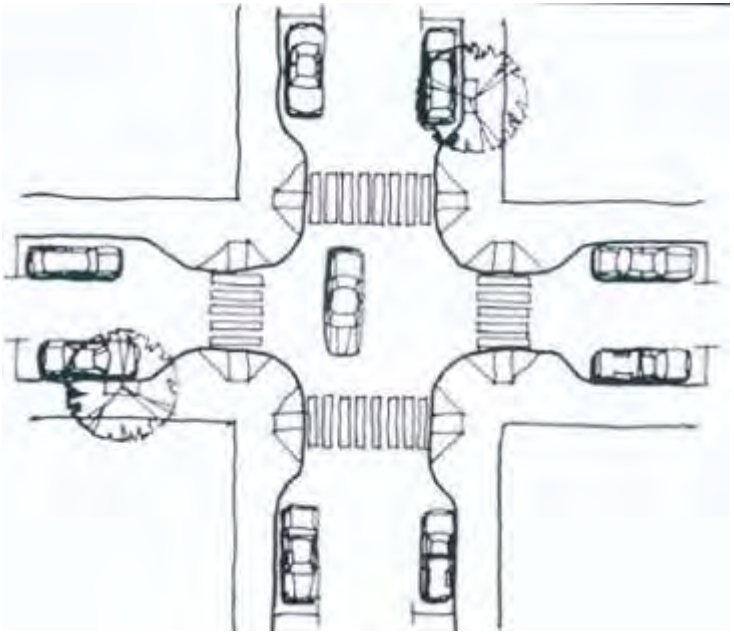
Pedestrian and bicycle bridges

- Expensive
- Often not used
- Consider topography and circumstances

Tools to reduce crossing distance

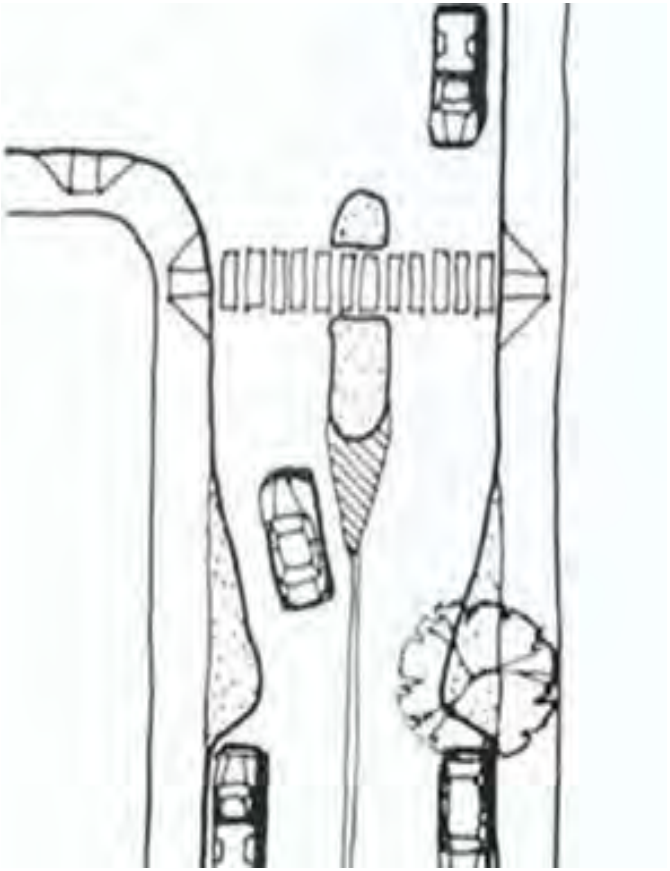


Curb extensions at crossings



Reduce the crossing distance

Crossing islands



Waiting areas and "stand-back" lines

Road diets can benefit many

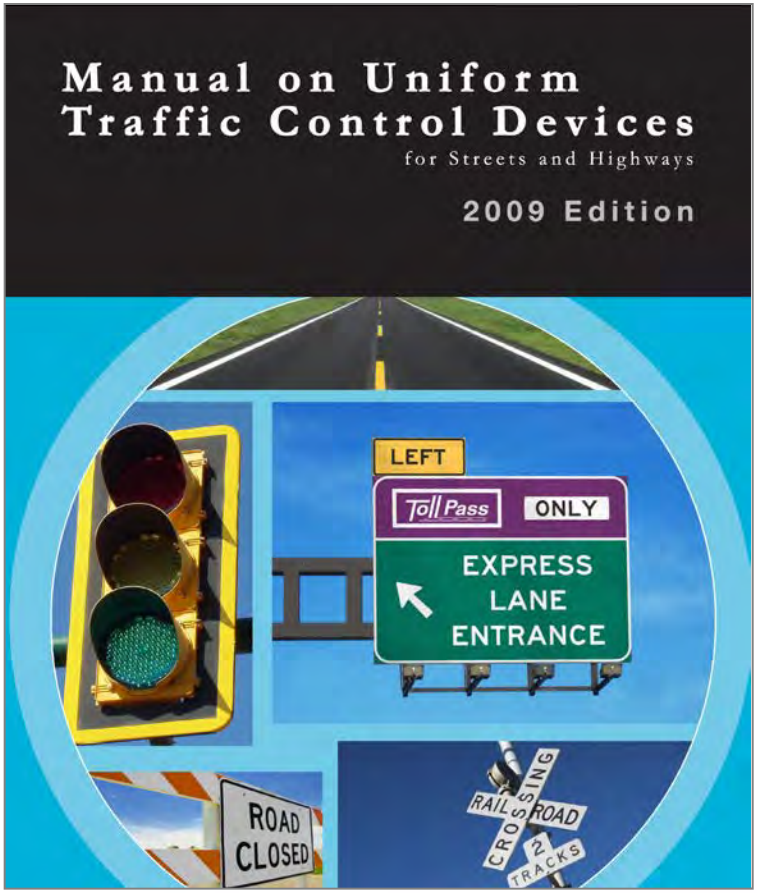
Marking crosswalks

Why install marked crosswalks?

- Indicate a preferred pedestrian crossing location
- Alert drivers to an often-used pedestrian crossing
- Indicate school walking routes

Where to install marked crosswalks

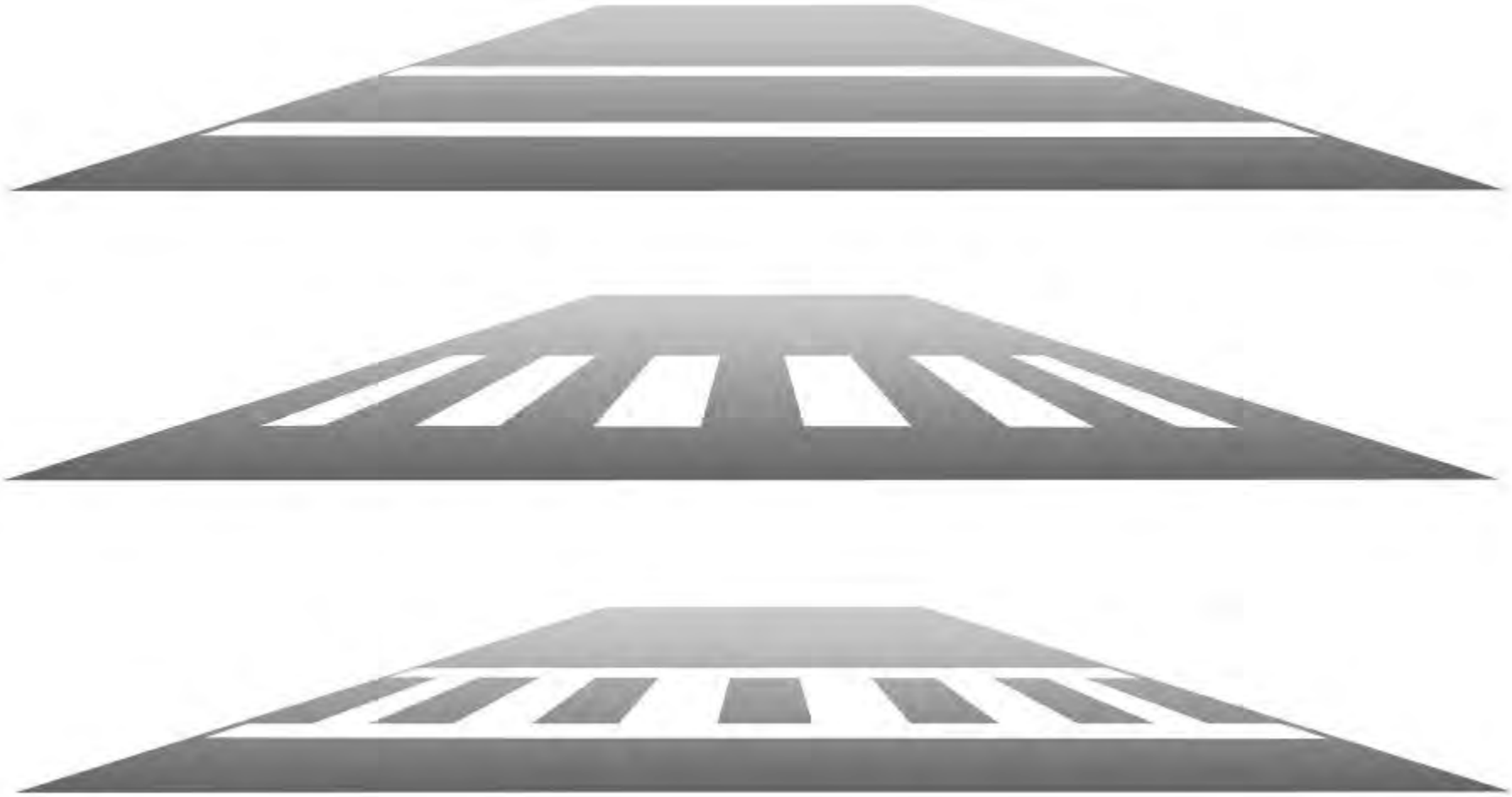
- Signalized intersections
- School routes
- Uncontrolled crossings
  - Two-lane roads
  - Multi-lane roads with ADT less than 12,000 vehicles/day
  - Multi-lane roads up to 15,000 ADT if a median is provided



This crosswalk meets guidelines

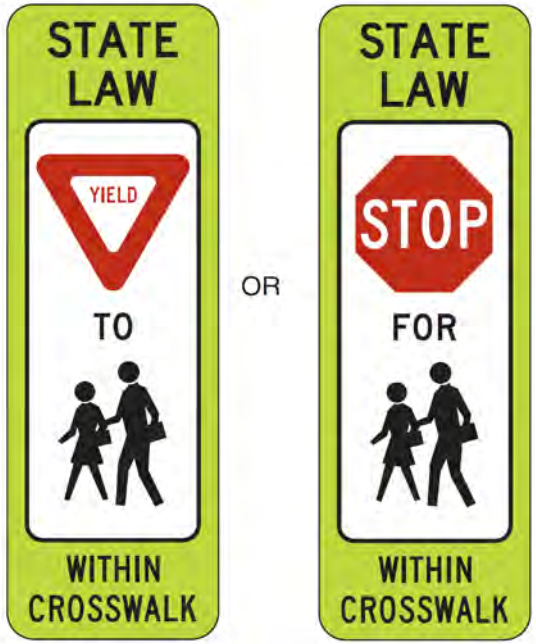
This one doesn't meet guidelines

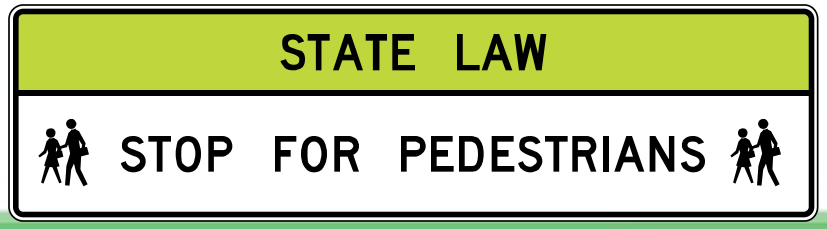
Install high-visibility markings

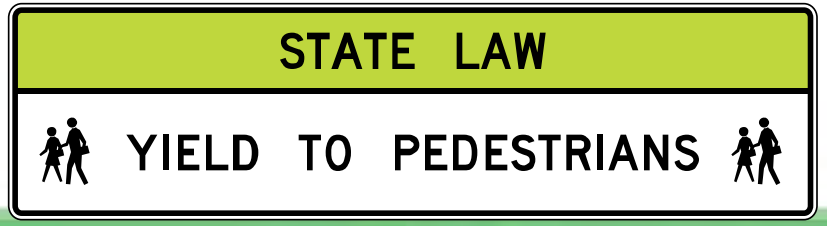


Ladder style is easier to see.

In-street and overhead signing



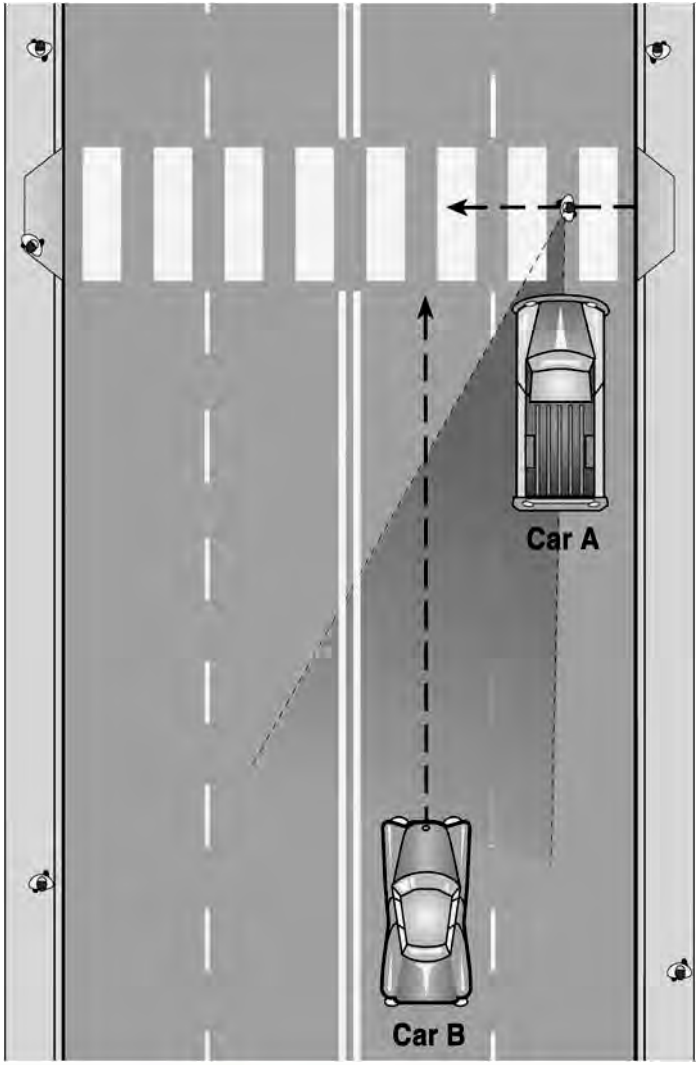




“Multiple threat” crashes

1st car stops to let pedestrian cross, blocking sight lines

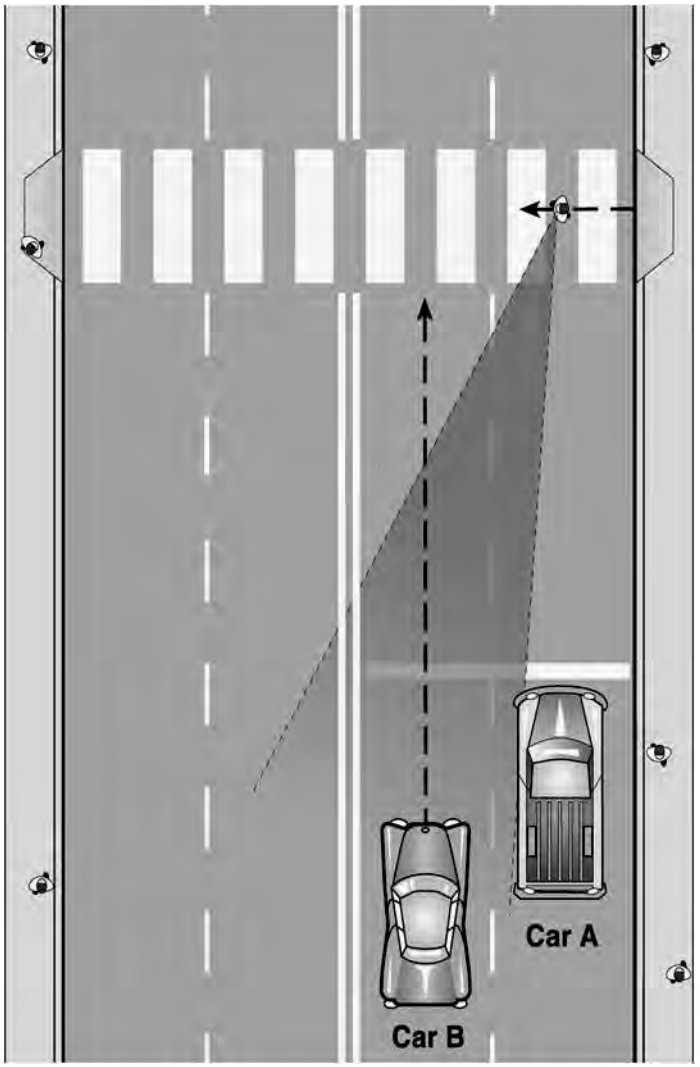
2nd car doesn’t stop, hits pedestrian at high speed



Solution: Advance stop/yield line

1st car stops further back, opening up sight lines

2nd car can be seen by pedestrian



‘Yield here’ and ‘Stop here for pedestrian’ signs

Signs in the 2003 MUTCD (Use where local law says yield to pedestrians)

Signs in the 2009 MUTCD (Use where local law says stop for pedestrians)

Advance yield line (shark's teeth)

Advance stop line

Rectangular rapid flash beacon (RRFB)

- Beacon is yellow and has a rapid flash
- Motorist yield rates increased from about 20% (pre-RRFB) to 80% (with RRFB)
- Must be pedestrian activated (by pushbutton or passive detection)
- Not yet in MUTCD – Interim approval from FHWA in July 2008

Rectangular rapid flash beacon

Parking restrictions at corners

Better visibility for both drivers and pedestrians

Traffic signal guidelines

- Mark all crosswalks where pedestrians cross
- Pedestrian signals in all directions
- Adequate crossing time for pedestrians
- Stop bars for vehicles on all approaches

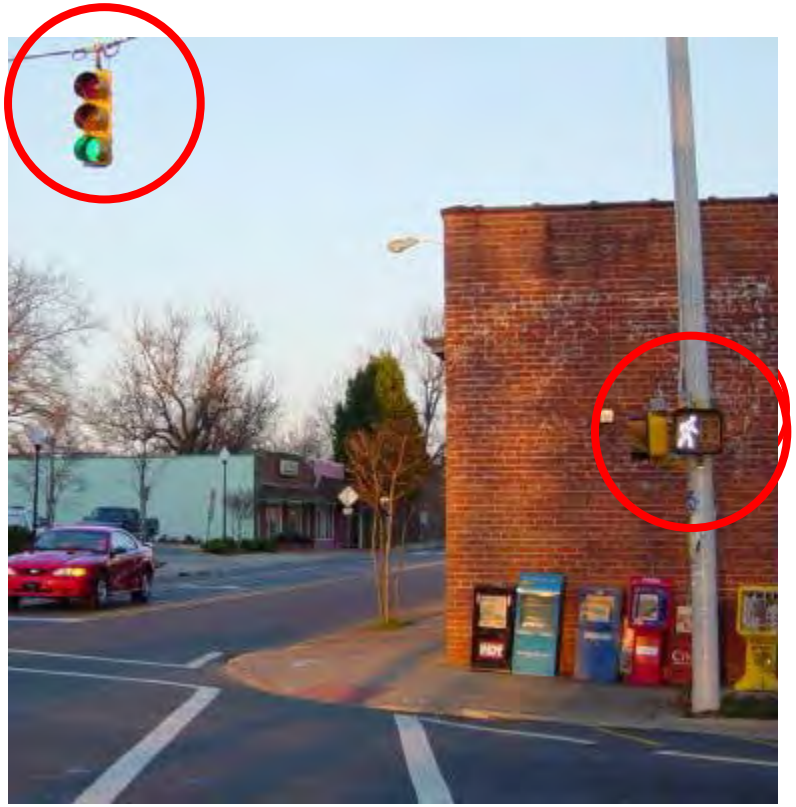
Modify traffic signal timing

Countdown pedestrian signal

Pedestrian pushbuttons

- Buttons may be needed at some crossings
- Signals can be put in pedestrian “recall” for key times of day

Minimize turning conflicts



Concurrent signal

Leading pedestrian interval

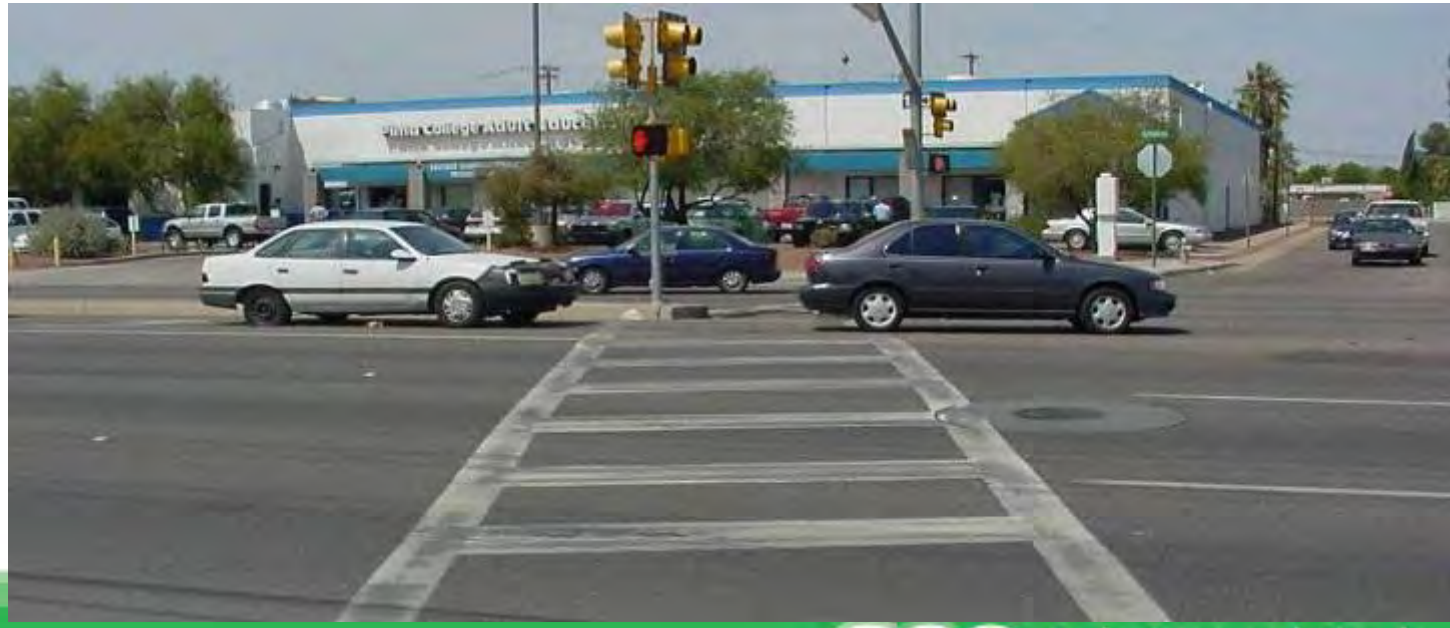
No right-turn-on-red

Pedestrian Hybrid Beacon aka “HAWK”
(High Intensity Activated Crosswalk)

Included in the 2009 MUTCD

Drivers see Hybrid Beacon

Peds see Pedhead



Hybrid Beacon Sequence

1

Blank for drivers

4

Steady red

2

Flashing yellow

5

Wig-Wag

3

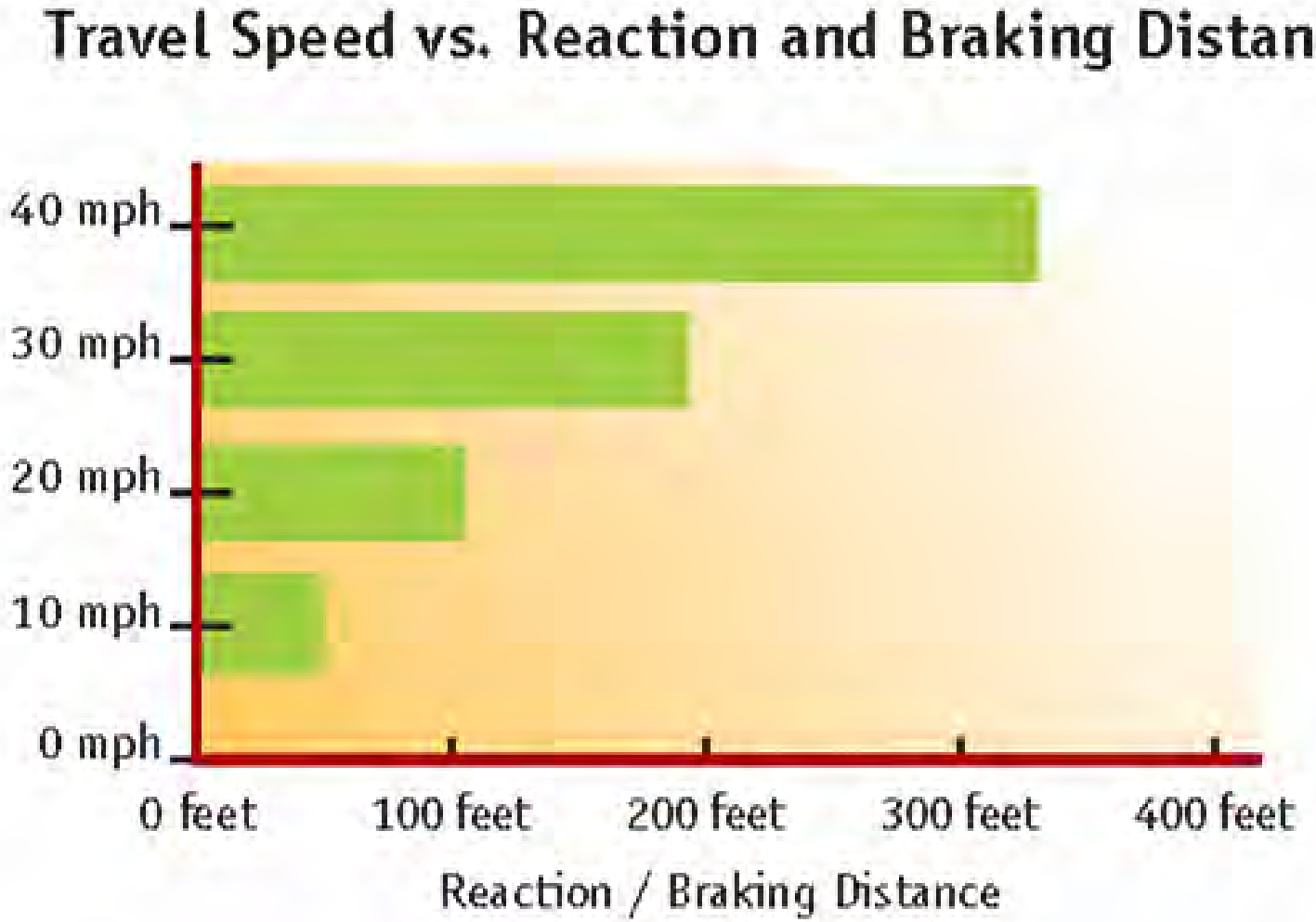
Steady yellow

Return to 1

Engineering topic outline

- Around the School
- Along the School Route
- Crossing the Street
- **Slowing Down Traffic**

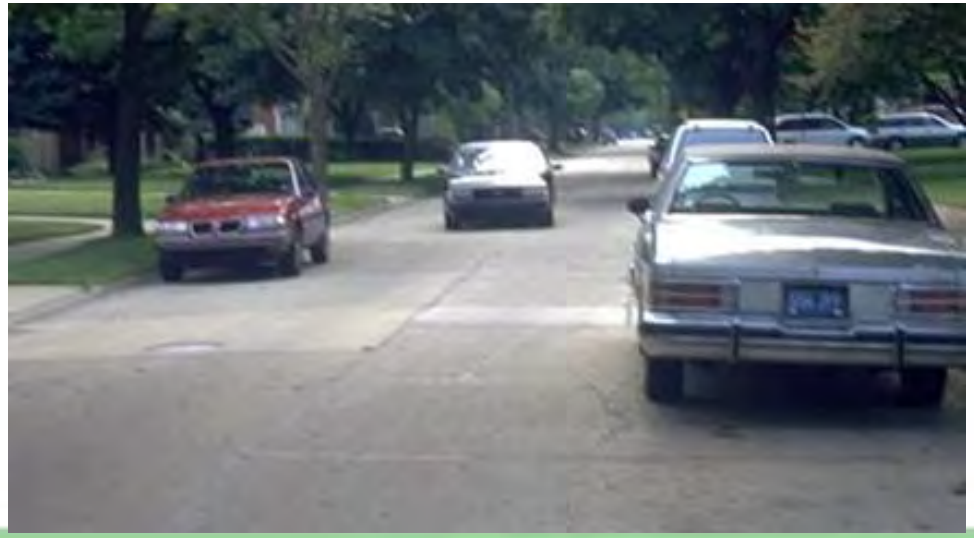
High speeds increase stopping distance



Slowing down traffic

Correct design invites correct use

Which street has lower speeds?



Narrow lanes reduce speeds

Use paint to reduce lane width

Speed humps slow traffic on local streets

Raised pedestrian crosswalks

Summary

1. Focus first on easy-to-implement and low-cost solutions

2. Also identify and program longer-term improvement needs (e.g. sidewalks)

3. Match the treatment to the type of problem

Summary

4. Provide and maintain facilities along the school route:
   - Sidewalks
   - On-street bicycle facilities
   - Paths
   - Connections
   - Pedestrian and bicycle bridges

Summary

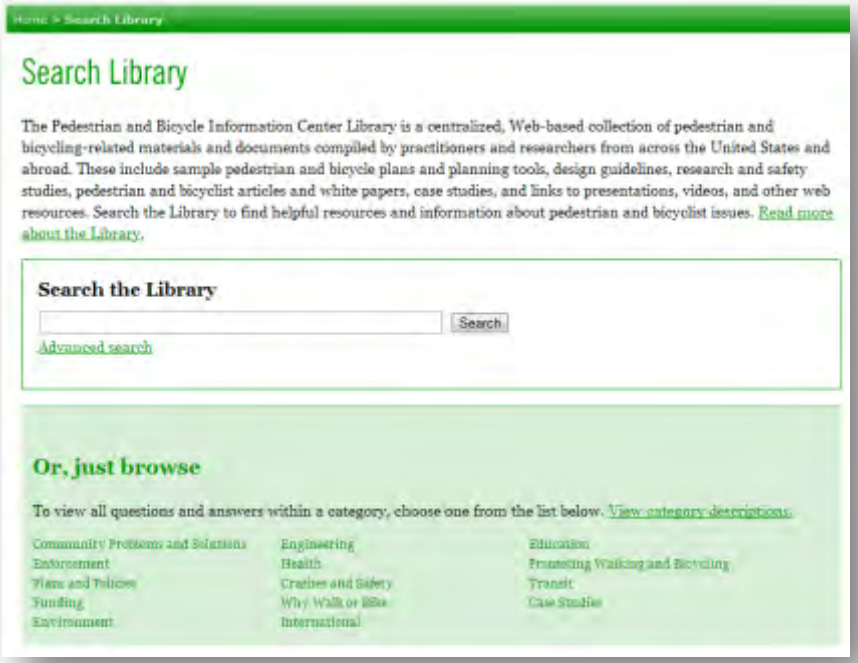
5. Provide safe street crossings:
   - Keep it simple
   - Shorten crossing distances
   - Carefully select crossing locations and marked crosswalks
   - Create visible crossings
6. Slow down traffic speeds

Resources for Improving Safety

- Research and Reports
- Technical Guides and Tools
- Community Focused Resources
- Training Opportunities
- Case Studies and Success Stories

Research and Reports

- Searchable database of more than 1,300 articles and publications related to bicycling and walking

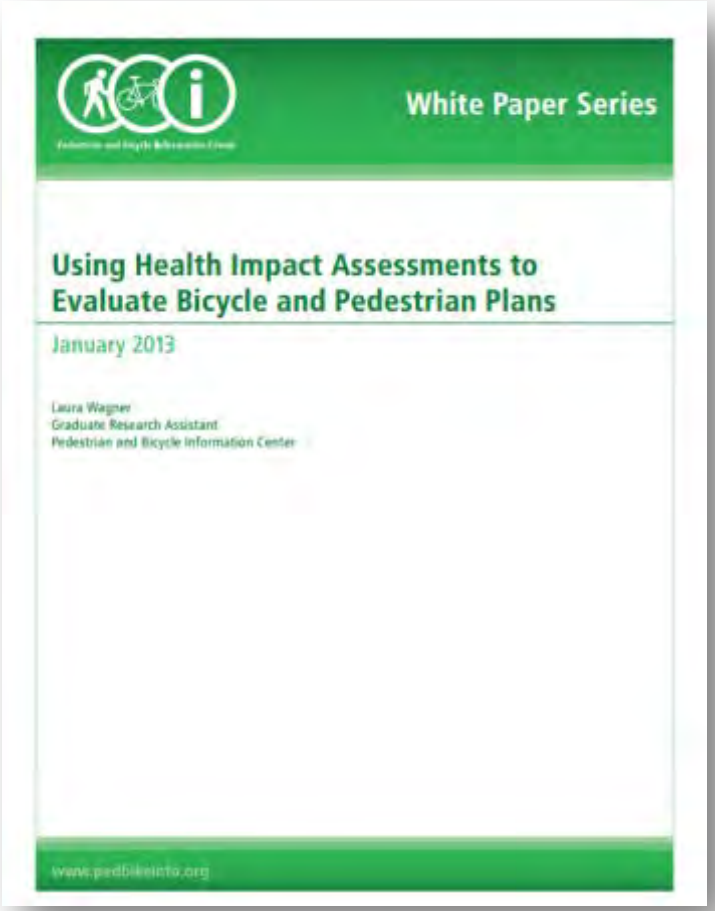


Research and Reports

- Research evaluating the effectiveness of pedestrian and bicycle safety treatments and countermeasures

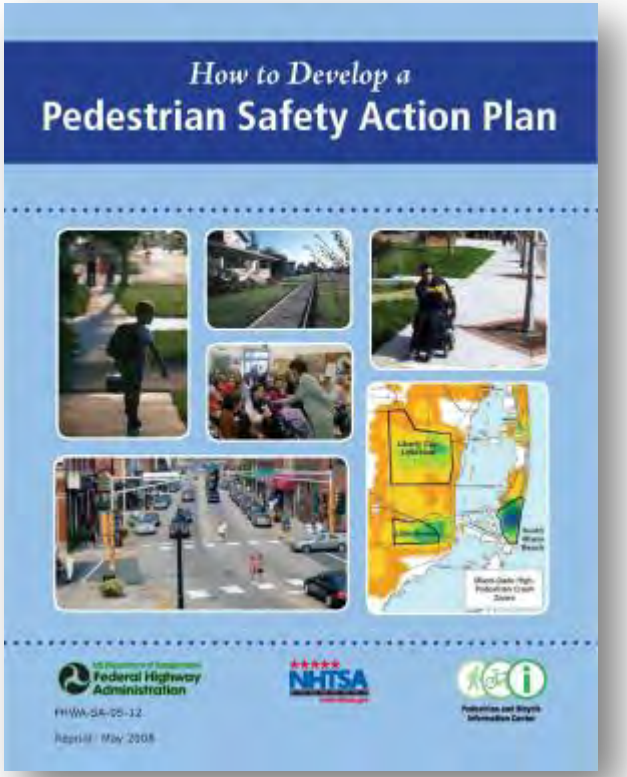
Research and Reports

- Series of white papers summarizing key research on various topics, such as:
  - Road Diets
  - Health Impact Assessments
  - Automated Enforcement



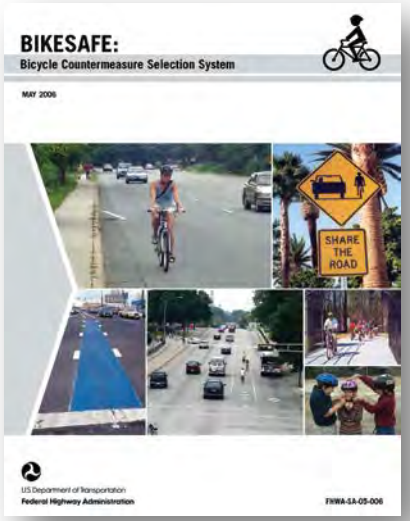
Tools and Guides

- Resources to help communities develop plans for addressing pedestrian safety



Tools and Guides

- Guidance for selecting the appropriate type of countermeasures for various roadway and crash types



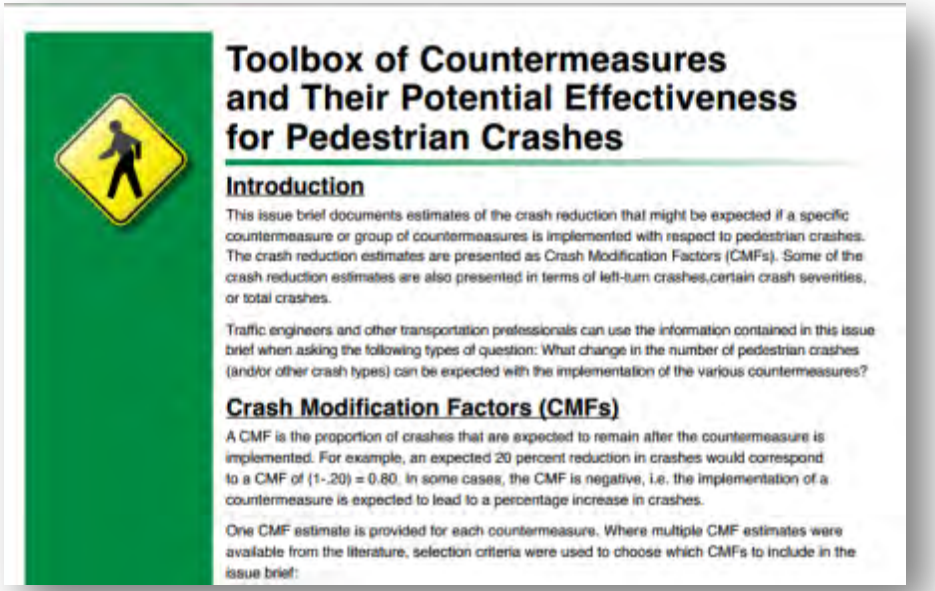
Crash Group	Countermeasures: Pedestrian Facility Design	Roadway Design	Intersection Design	Traffic Calming	Traffic Management	Signals and Signs	Other Measures
1. Dart/Dash	•	•		•	•	•	•
2. Multiple Threat/Trapped	•	•	•	•		•	•
3. Unique Midblock	•	•		•		•	•
4. Through Vehicle at Unsignalized Location	•	•	•	•	•	•	•
5. Bus-Related	•	•		•		•	•
6. Turning Vehicle	•	•	•	•	•	•	•
7. Through Vehicle at Signalized Location	•	•	•	•	•	•	•
8. Walking Along Roadway	•	•				•	•
9. Working or Playing in Roadway	•	•		•	•	•	•
10. Non-Roadway	•	•		•		•	•
11. Backing Vehicle	•	•		•			•
12. Crossing an Expressway	•					•	•

www.walkinginfo.org/pedsafe/
www.bicyclinginfo.org/bikesafe/

Pedestrian and Bicycle Information Center
www.pedbikeinfo.org

Tools and Guides

- Tools for identifying countermeasures with proven safety benefits



Toolbox of Countermeasures and Their Potential Effectiveness for Pedestrian Crashes

Introduction

This issue brief documents estimates of the crash reduction that might be expected if a specific countermeasure or group of countermeasures is implemented with respect to pedestrian crashes. The crash reduction estimates are presented as Crash Modification Factors (CMFs). Some of the crash reduction estimates are also presented in terms of left-turn crashes,certain crash severities, or total crashes.

Traffic engineers and other transportation professionals can use the information contained in this issue brief when asking the following types of question: What change in the number of pedestrian crashes (and/or other crash types) can be expected with the implementation of the various countermeasures?

Crash Modification Factors (CMFs)

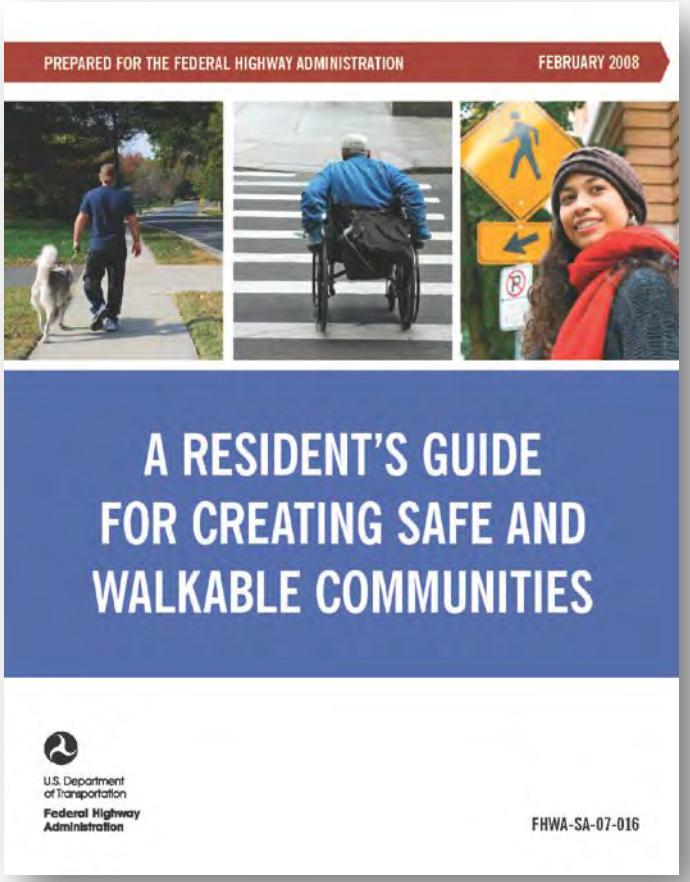
A CMF is the proportion of crashes that are expected to remain after the countermeasure is implemented. For example, an expected 20 percent reduction in crashes would correspond to a CMF of (1-.20) = 0.80. In some cases, the CMF is negative, i.e. the implementation of a countermeasure is expected to lead to a percentage increase in crashes.

One CMF estimate is provided for each countermeasure. Where multiple CMF estimates were available from the literature, selection criteria were used to choose which CMFs to include in the issue brief:

CRASH MODIFICATION FACTORS CLEARINGHOUSE

Community Resources

- Tips and guidance for advocates and community groups for improving safety

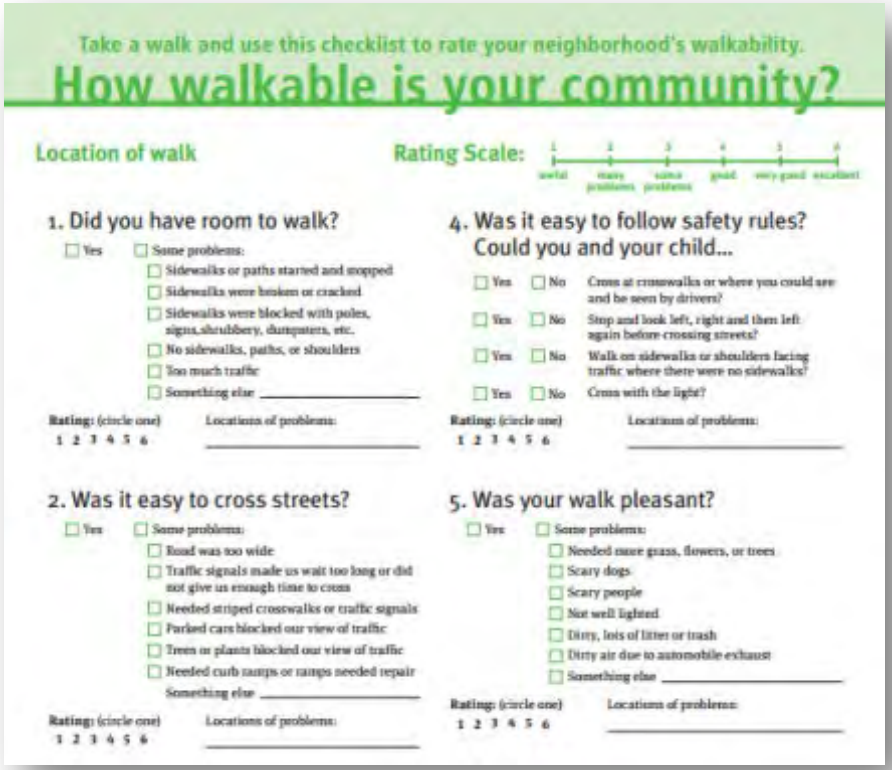


www.walkinginfo.org/residentsguide

Pedestrian and Bicycle Information Center
www.pedbikeinfo.org

Community Resources

- Tools for assessing the bikeability or walkability of a street or neighborhood



Take a walk and use this checklist to rate your neighborhood's walkability.

How walkable is your community?

Location of walk **Rating Scale:** 1 awful, 2 many problems, 3 some problems, 4 good, 5 very good, 6 excellent

1. Did you have room to walk?

☐ Yes ☐ Some problems:
- ☐ Sidewalks or paths started and stopped
- ☐ Sidewalks were broken or cracked
- ☐ Sidewalks were blocked with poles, signs, shrubbery, dumpsters, etc.
- ☐ No sidewalks, paths, or shoulders
- ☐ Too much traffic
- ☐ Something else _____

Rating: (circle one) 1 2 3 4 5 6 Locations of problems: _____

2. Was it easy to cross streets?

☐ Yes ☐ Some problems:
- ☐ Road was too wide
- ☐ Traffic signals made us wait too long or did not give us enough time to cross
- ☐ Needed striped crosswalks or traffic signals
- ☐ Parked cars blocked our view of traffic
- ☐ Trees or plants blocked our view of traffic
- ☐ Needed curb ramps or ramps needed repair

Something else _____

Rating: (circle one) 1 2 3 4 5 6 Locations of problems: _____

4. Was it easy to follow safety rules? Could you and your child...

- ☐ Yes ☐ No Cross at crosswalks or where you could see and be seen by drivers?
- ☐ Yes ☐ No Stop and look left, right and then left again before crossing streets?
- ☐ Yes ☐ No Walk on sidewalks or shoulders facing traffic where there were no sidewalks?
- ☐ Yes ☐ No Cross with the light?

Rating: (circle one) 1 2 3 4 5 6 Locations of problems: _____

5. Was your walk pleasant?

☐ Yes ☐ Some problems:
- ☐ Needed more grass, flowers, or trees
- ☐ Scary dogs
- ☐ Scary people
- ☐ Not well lighted
- ☐ Dirty, lots of litter or trash
- ☐ Dirty air due to automobile exhaust
- ☐ Something else _____

Rating: (circle one) 1 2 3 4 5 6 Locations of problems: _____

www.walkinginfo.org/checklist
www.bicyclinginfo.org/checklist

Pedestrian and Bicycle Information Center
www.pedbikeinfo.org

Community Resources

- Interactive educational tools for teaching pedestrian and bicycle safety skills

Training Opportunities

- Four in-person training courses to help communities develop pedestrian safety action plans
- Materials for teaching University-level courses on bicycle and pedestrian planning and design

Training Opportunities

- Free monthly webinars on topics related to bicycling and walking
- Archived episodes available online

New University Course Series

- 3-part series aimed at undergrad engineers:
  - Planning
  - Design
  - Evaluation/PMs
- Partnered with University of Auburn to pilot test
- Includes instructor notes and recommended syllabus and student exercises

Case Studies and Success Stories

- 190 examples of successful pedestrian and bicycle projects from around the world
- Highlight engineering projects as well as education, enforcement, and planning

Walk Friendly Communities

- Community assessment program to identify and highlight walkable communities
- Feedback provided to help communities improve programs

Connect with PBIC

- Visit us **online**:
  - www.walkinginfo.org
  - www.bicyclinginfo.org
- Find us on **Facebook**:
  - www.facebook.com/pedbike
- Sign up to receive our **quarterly e-newsletter**:
  - www.pedbikeinfo.org/newsletter/signup.cfm

Thank you!