U.S. Department of Transportation
Federal Highway Administration

Pedestrian and Bicycle Information Center

Pedestrian Safety Guide and Countermeasure Selection System (PEDSAFE)

Presented by:

Charlie Zegeer, UNC Highway Safety Research Center

Dan Nabors, Vanasse Hangen Brustlin, Inc.

Peter Lagerwey, Toole Design Group

September 4, 2013

Today's presentation

- Introduction and housekeeping
- *Audio issues? Dial into the phone line instead of using "mic & speakers"*
- PBIC Trainings

  http://www.walkinginfo.org/training
- Registration and Archives at

  http://www.walkinginfo.org/webinars
- Questions at the end
- Follow-up E-mail with certificate of attendance for 1.5 hours of instruction

U.S. Department of Transportation
Federal Highway Administration

Pedestrian and Bicycle Information Center

New PEDSAFE Guide Now Available

www.pedbikesafe.org/PEDSAFE/

PEDSAFE

Purpose

- To assist transportation professionals in making effective use of countermeasures that affect pedestrian safety and mobility.
- Provides a wide range of resources on pedestrian-related engineering and roadway treatments

Background

- PEDSAFE 2013 is primarily a web-based resource
- Previous version of PEDSAFE was released in September of 2004 and was in printed and web-based format
- PEDSAFE includes:
  - details on 67 engineering treatments (19 new ones)
  - updates on safety research (CMF's)
  - crash/countermeasure matrix
  - links to other resources
  - updated countermeasure costs
  - A total of 85 new and updated case studies
  - updated expert system tool

PEDSAFE Presentation Outline

- Background of the pedestrian safety problem
- Pedestrian crash characteristics
- Data analysis & countermeasure selection
- PEDSAFE Countermeasures (67)
- New PEDSAFE countermeasures (19)
- Expert system web-based tool
- PEDSAFE Case studies (85)

Features of PEDSAFE 2013

- Latest MUTCD and AASHTO guidelines
- Best engineering practices
- Most recent safety research (CMF's)
- Updates of countermeasure costs (from 40 states)
- About 2 dozen new case studies (success stories)
- Many new links to other web resources
- Expanded and enhanced expert system tool
- Web resource compatible with smart phones

Roads and streets should be designed to be reasonable safe for all types of road users, including pedestrians and bicyclists

U.S. Pedestrian Crashes

- Approximately 4,000 pedestrians killed each year (13% of traffic deaths)
- 1.33 pedestrian fatality rate per 100,000*
- 60,000 to 70,000 pedestrians injured each year

* Fatality Analysis Reporting System (FARS). (2009). National Rates: Fatalities. Retrieved from http://www-fars.nhtsa.dot.gov/States/StatesPedestrians.aspx

Pedestrians Most at Risk

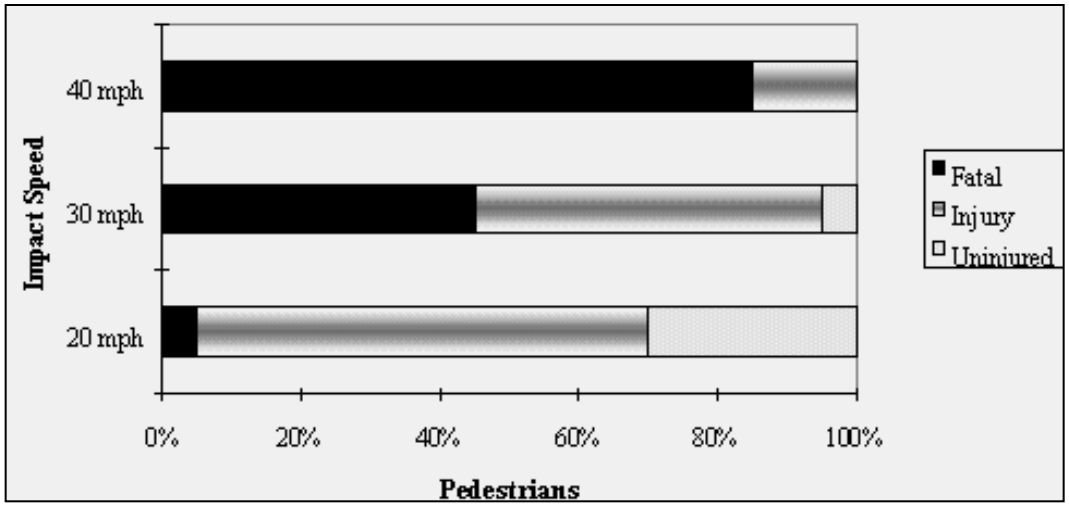
- Children
- Older Adults
- Pedestrians with Disabilities

www.pedbikeimages.org / Laura Sandt

www.pedbikeimages.org / Dan Burden

Major Issue: Vehicle Speeding

- Higher speeds increase the likelihood of fatal injuries



Pedestrian Injury Severity Based on Vehicle Speed

Roadway Features

- Roadway factors that affect pedestrian safety
  - Lack of Sidewalks
  - High Traffic Volume
  - High Vehicle Speeds
  - More Traffic Lanes
  - Lack of a Median (on Multi-lane Roads)
  - Presence of Transit Stops w/o safe crossings

www.pedbikeimages.org / Janet Barlow

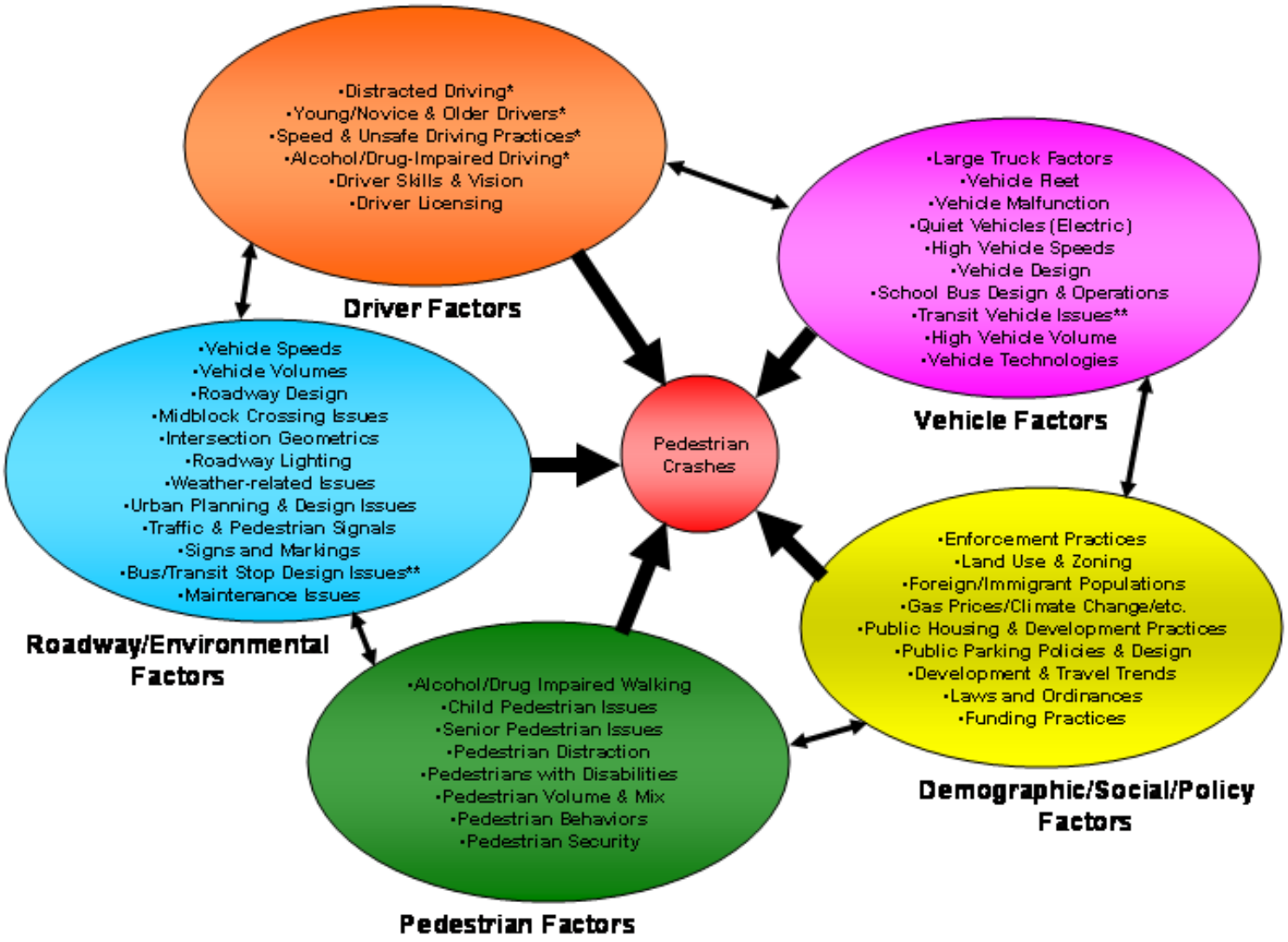
Key Trends

- Users Distracted & Impaired
- Lack of Adequate Enforcement & Education
- Needed Infrastructure
  - Signs and Signals
  - Traffic Calming
  - Geometric Designs

www.pedbikeimages.org / Mike Cynecki

www.pedbikeimages.org / Dan Burden

Pedestrian Crash Factors



PEDSAFE

Pedestrian Safety Guide and Countermeasure Selection System

Guide: Background | Statistics | Analysis | Implementation | **Countermeasures:** Selection Tool | Matrices | **Case Studies** | **Resources**

The **Pedestrian Safety Guide and Countermeasure Selection System** is intended to provide practitioners with the latest information available for improving the safety and mobility of those who walk. The online tools provide the user with a list of possible engineering, education, or enforcement treatments to improve pedestrian safety and/or mobility based on user input about a specific location.

GUIDE

Background
Understand what is needed to create a viable pedestrian system.

Statistics
Learn about the factors related to the pedestrian crash problem.

Analysis
How crash typing can lead to the most appropriate countermeasures.

Implementation
Needed components for treatments.

COUNTERMEASURES

Selection Tool
Find countermeasures based on desired objectives.

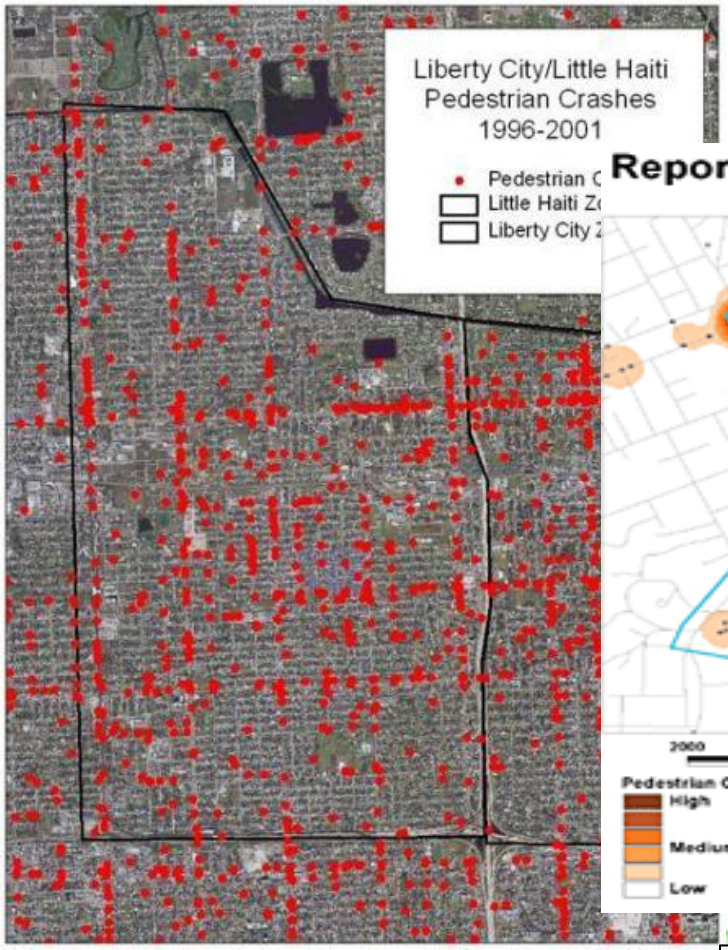
Selection Matrices
Find countermeasures based on crash types and performance objectives.

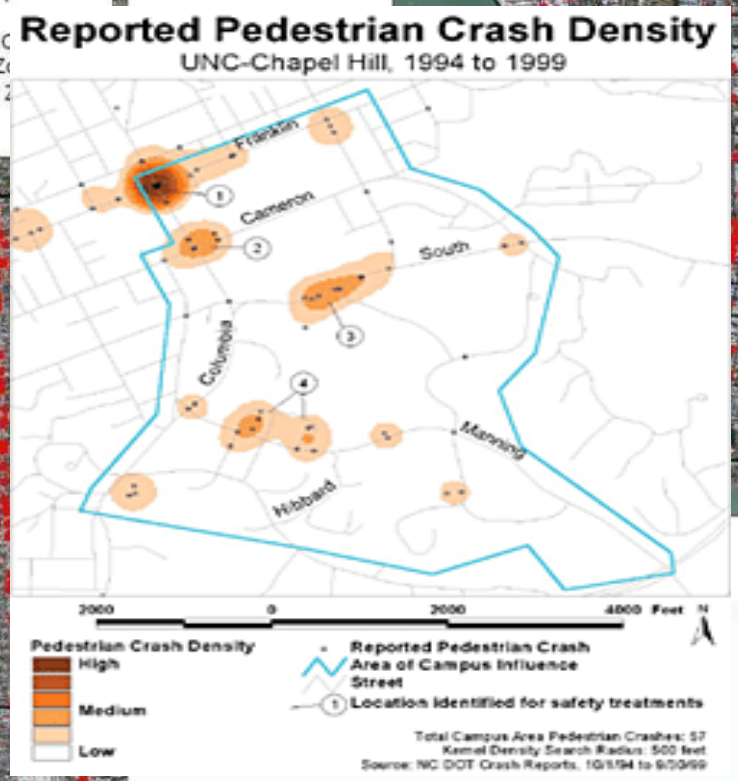
Countermeasure List
A comprehensive list of all countermeasures.

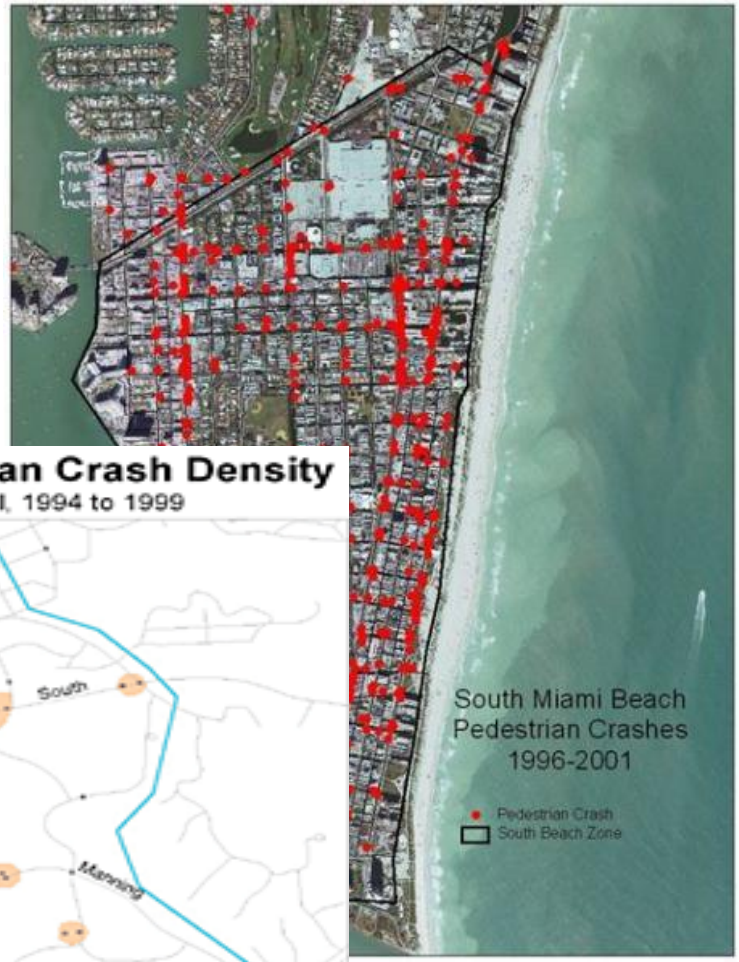
Authors and Acknowledgements

U.S. Department of Transportation
Federal Highway Administration

High-Crash Zones

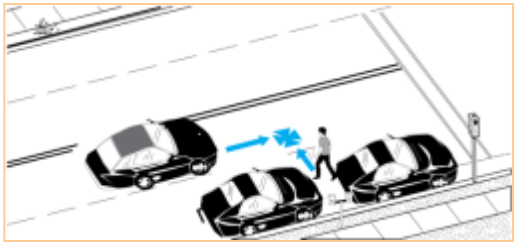


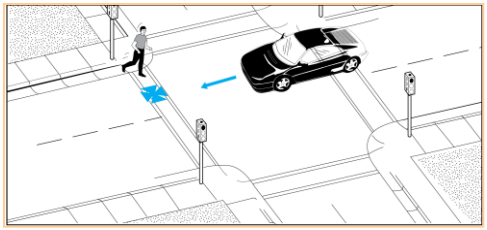


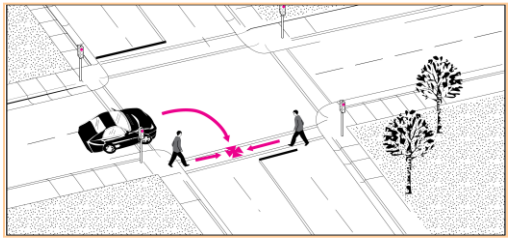


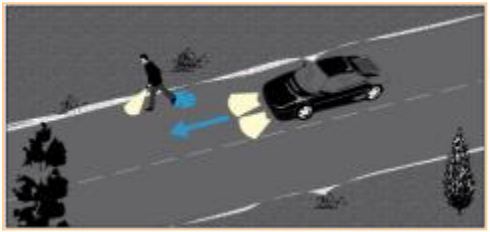
Pedestrian Crash Types and Behavior

- Some crash types occur more than others
  - Dart-Out
  - Dash
  - Midblock Crossing
  - Walking Along Roadway
  - Turning Vehicle
- Nighttime Crashes are also particularly severe









Countermeasure Options

Along the Road

- Sidewalks & Walkways
- Street Furniture and Improvements

At Crossing Locations

- Curb ramps
- Marked crosswalks & enhancements
- Curb extensions
- Crossing islands
- Raised pedestrian crossings
- Lighting & illumination
- Parking restrictions
- Overpasses/underpasses
- **Automated pedestrian detection**
- **Leading pedestrian interval**
- **Advance yield/stop lines & signs**

Countermeasure Options

Transit

- Transit stop improvements
- **Access to transit**
- **Bus bulbouts**

Roadway Design

- Bicycle lanes
- Lane narrowing
- Road diets
- Driveway improvements
- Raised medians
- One-way/two-way
- Improved right-turn slip lanes

Countermeasure Options

Intersection Design

- Roundabouts
- Modified T-intersections
- Intersection median barriers
- Curb radius reduction
- **Modify skewed intersections**
- **Modify complex interchanges**

Countermeasure Options

Traffic Calming Devices

- Temporary T.C. Devices
- Chokers
- Chicanes
- Mini-circles
- Speed humps
- Speed tables
- Gateways
- Landscaping
- Paving treatments
- Serpentine design

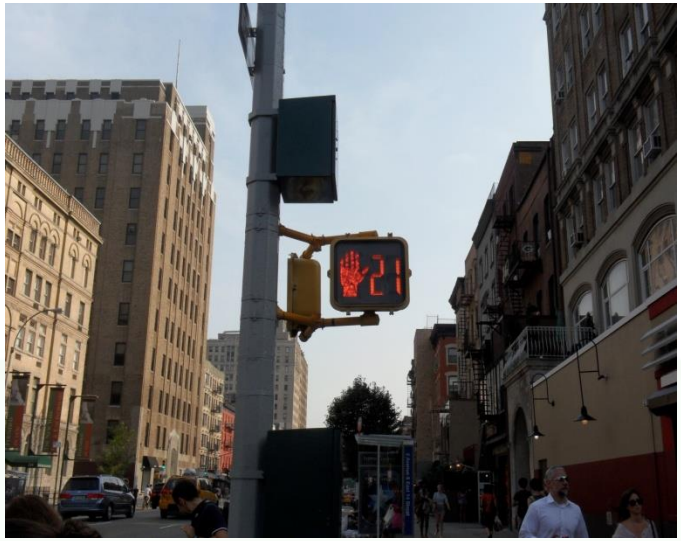
Traffic Management Measures

- Diverters
- Full street closure
- Partial street closure
- **Left-turn prohibition**

Countermeasure Options

Signs and signals

- Traffic signals
- Pedestrian signals
- Pedestrian signal timing
- Traffic signal enhancements
- RTOR restrictions
- **Advanced stop/yield signs and markings**
- **Left-turn phasing**
- **Push buttons and signal timing**
- **Pedestrian hybrid beacon**
- **Rectangular rapid flashing beacon**
- **Puffin crossing**



Countermeasure Options

Other Measures

- School zone treatments
- Neighborhood identity
- Speed monitoring
- **On-street parking enhancements**
- Pedestrian & driver education
- Police enforcement
- **Automated enforcement systems**
- Pedestrian streets & malls
- **Work zone measures**
- **Railroad crossing treatments**
- **Shared streets**
- **Streetcar planning & design**

Parking Restrictions (at crossing locations)

DESCRIPTION

Parking removed on the approach to a pedestrian crossing

PURPOSE

Improve sight distance

COST

$2,000 to $20,000

CMF

0.73 (Elvik, R. and Vaa, T., 2004)

Image Source: Federal Highway Administration (FHWA)

CONSIDERATIONS

- ⇨ Communicate parking removal
- ⇨ Enforce with signage & paint

Automated Pedestrian Detection

DESCRIPTION

Automated detection to switch signal to WALK phase; may give more walk time

PURPOSE

Provides timely detection; visually impaired do not need to push button; may provide extra crossing time

COST

$10,000 to $90,000

CMF

N/A

Image Source: Federal Highway Administration (FHWA)

. CONSIDERATIONS

⇨ Consider detector location

Leading Pedestrian Interval (LPI)

DESCRIPTION

Walk signal given 3-7 seconds before motorists are given green light

PURPOSE

Minimize turning vehicle conflicts by giving pedestrians time to establish their presence in the crosswalk before motorists can start turning

CMF

.95 (ITE, 2004)

Source: Federal Highway Administration (FHWA)

Leading Pedestrian Interval (LPI)

CONSIDERATIONS

- High ped volumes – consider exclusive pedestrian phase
- Audible indicator for visually impaired pedestrians
- Right-turn-on-red laws may limit effectiveness – consider restricting RTOR

COST

Modify existing signal ($0 to $3,500)

Install new signal ($40,000 - $100,000)

Source: Federal Highway Administration (FHWA)

Advance Yield/Stop Signs

DESCRIPTION

Stop or Yield sign placed 20 to 50 feet ahead of an unsignalized, mid-block marked crosswalk

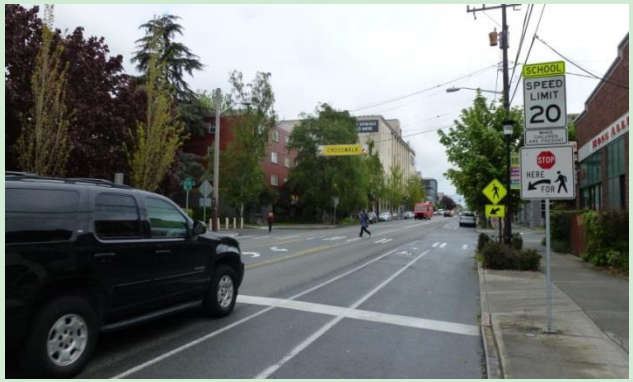


Image Source: Federal Highway Administration (FHWA)

PURPOSE

Increase visibility of pedestrians to motorists & prevent multiple-threat crashes

COST

$10,000 to $90,000

CMF

N/A

CONSIDERATIONS

- Effectiveness depends on compliance
- If placed too far in advance of the crossing, motorists may ignore line

Access to Transit

DESCRIPTION

Sidewalk access to transit stops; convenient crossing to access transit stop

PURPOSE

Provide safe and convenient access to transit stops for pedestrians of all abilities

CMF

N/A

Source: Federal Highway Administration (FHWA)

Access to Transit

CONSIDERATIONS

- Connect sidewalk to other sidewalks, intersection, destination
- Place near intersection or other mid-block crossing
- Locate on far-side where possible
- Crosswalk should b behind bus at midblock crossings

COST

Sidewalk - $50 sq. yd.; Mid-block Crossing - $2500 to $20,000; Curb Extensions - $2,000 to $20,000

Source: Federal Highway Administration (FHWA)

Bus Bulb Outs

DESCRIPTION

Bulb out for buses at bus stop location.

PURPOSE

Allow bus to stop in lane to increase reliability and safety while providing more sidewalk space for pedestrians

CMF

N/A

Source: Federal Highway Administration (FHWA)

Bus Bulb Outs

CONSIDERATIONS

- Width – 6 to 7 feet – not wider than parking lane
- At intersections, keep radii small to manage turning speed
- Bulb provides space for other amenities
- Bulbs may effect travel flow of other vehicles, especially on two-lane arterials

Source: Federal Highway Administration (FHWA)

COST

$15,00 to $70,000

Modify Skewed Intersections

DESCRIPTION

Occurs when streets intersect at something other than 90 degrees.

PURPOSE

Reconstruct intersection to 90 degrees to reduce pedestrian crossing distance and slow vehicular turning speeds.

COST

Varies – may require ROW

CMF

N/A

Image Source: Federal Highway Administration (FHWA)

. CONSIDERATIONS

- ⇨ Reduces crashes for all modes
- ⇨ Avoid skewed intersections in the planning phase whenever possible

Pedestrian Accommodations at Complex Intersections

DESCRIPTION

Complex intersections such as diamond, cloverleaf and single-point urban interchanges (SPUI)

PURPOSE

Safe pedestrian crossings at complex intersections

COST

Varies

CMF

N/A

Image Source: Federal Highway Administration (FHWA)

CONSIDERATIONS

- Incorporate pedestrian facilities into design of complex intersections
- Design like other intersections that accommodate pedestrians

Temporary Traffic Calming Measures

DESCRIPTION

Temporary traffic calming measures such as cones or temporary curbing

PURPOSE

Test a potential traffic calming measure

CMF

N/A

Source: Federal Highway Administration (FHWA)

CONSIDERATIONS

- Involve the neighborhood in evaluation
- Pick a location that has a high likely-hood of success

Left Turn Prohibitions

DESCRIPTION

Use of a physical barrier to prevent left turns

PURPOSE

To avoid conflicts that occur when there are concurrent walk and left turn movements

CMF

.90 (Gan, A., Shen, J., 2005))

Source: Federal Highway Administration (FHWA)

Left Turn Prohibitions

CONSIDERATIONS

- Evaluate to determine other streets are adversely affected
- Will create out-of-the-way travel
- Effect on service/emergency vehicles should be evaluated
- Requires neighborhood support
- Will not address mid-block speeding

Source: Federal Highway Administration (FHWA)

COST

$10,000 to $30,000 per 100 ft.

Traffic Control Devices

Unsignalized Treatments

- Advanced Stop Lines
- Signing

Beacons

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

Signal Treatments

- Traffic Signals and Enhancements
- Pedestrian Signals
- Pedestrian Signal Phasing
- **Left Turn Phasing**
- Right-Turn-On-Red Restrictions
- **Push Buttons** & Signal Timing Progressions

Rectangular Rapid Flash Beacon (RRFB)

DESCRIPTION

The RRFB design differs from the standard flashing beacon by utilizing:

- ⇨ A rapid flashing frequency
- ⇨ Brighter light intensity
- ⇨ Ability to aim the LED lighting

PURPOSE

To provide a high-visibility strobe-like warning to drivers when pedestrians use a crosswalk

CMF Not available

Rectangular Rapid Flash Beacon (RRFB)

CONSIDERATIONS

- Should supplement standard crossing warning signage and markings
- Solar-power panels can be used
- RRFB should be reserved for locations with significant pedestrian safety issues
- Less well-suited for multi-lane roadways

COST

- Avg.: $22,250; Low: $4,520; High $52,310

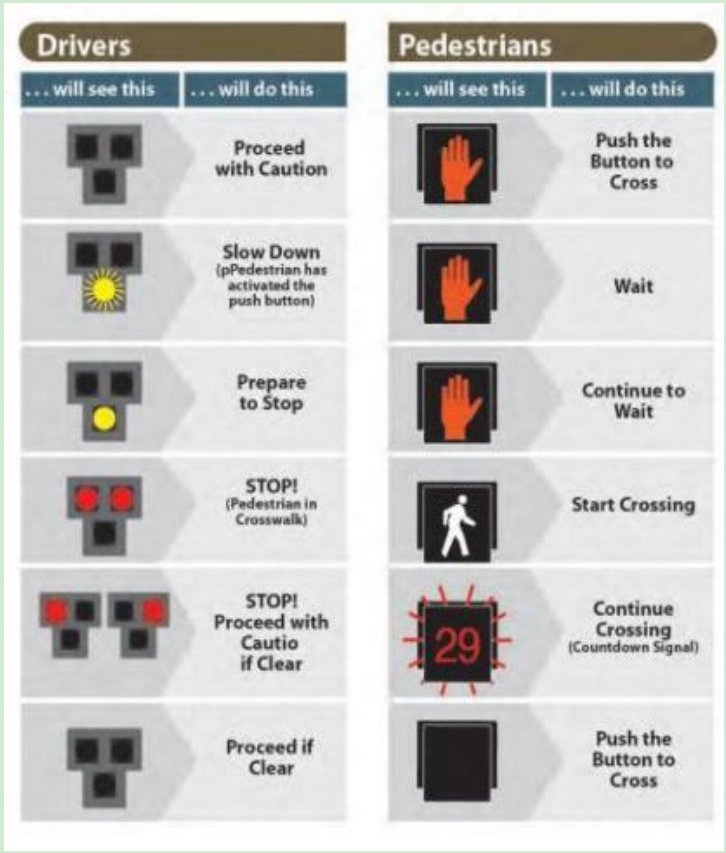
Pedestrian Hybrid Beacon

DESCRIPTION

- Beacons with three sections
- "CROSSWALK STOP ON RED" signs
- Marked crosswalk
- Countdown pedestrian signal heads

PURPOSE

Assist pedestrians in crossing a street or highway at a marked crosswalk



Source: Living Streets

CMF

All crashes: 0.71
Pedestrian crashes: 0.31 (FHWA-HRT-10-042, 2010)

Pedestrian Hybrid Beacon

CONSIDERATIONS

- Activated by pedestrian detectors, such as pushbuttons
- May be appropriate where traffic signals are unwarranted
- Can be used at corners and midblock locations
- Addresses multiple threat crashes
- Successful deployments: school crossings, parks, and senior centers

Source: pedbikeimages.org - Mike Cynecki (2009)

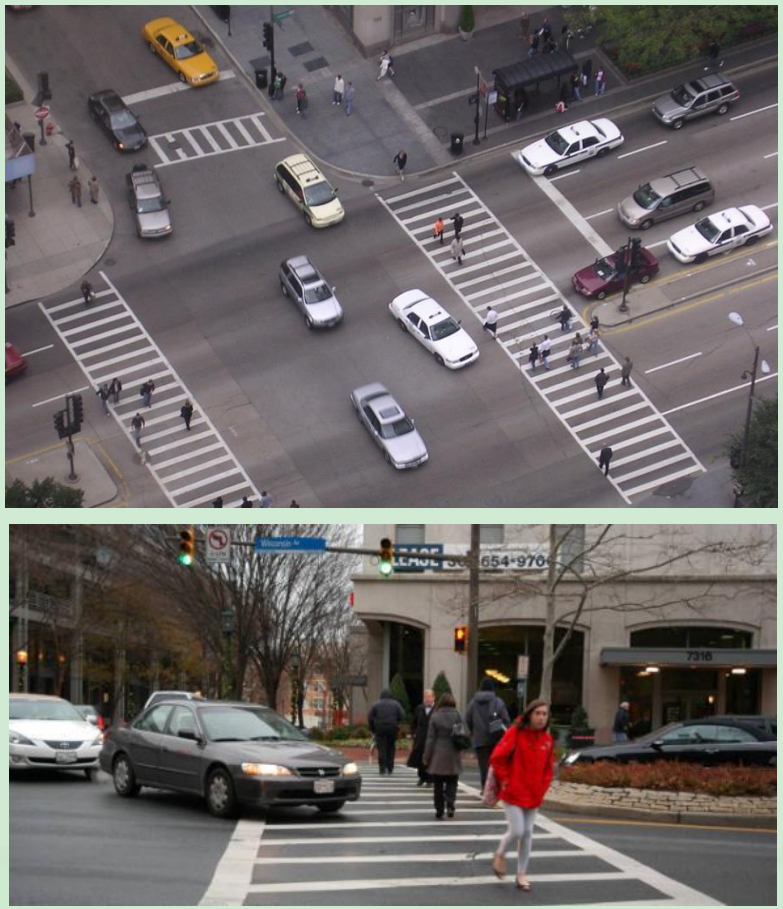
COST

- Low: $21,440; High: $128,660

Left Turn Phasing

DESCRIPTION

Permissive, protected/permissive, protected left turn, split phasing provide different levels of conflict. Protected left turn phase provides a green arrow for left turning vehicles while stopping both on-coming traffic and parallel pedestrian crossings to eliminate conflicts.



PURPOSE

Reduce conflicts with pedestrians crossing parallel to vehicle traffic

CMF Convert permissive or permissive/protected phasing: 0.57

Left Turn Phasing

CONSIDERATIONS

- Exclusive left turn lane decreases rear-end crash potential
- Protected left turn impacts intersection capacity
  - Longer cycle lengths
  - Signal system coordination
- Protected/permissive left turn phasing only partially eliminates vehicle-pedestrian conflicts
- Protected/permissive left turn phasing can create “yellow trap”

Source: Flickr - Benny Mazur (2007)

COST

New signal equipment ranges from $8,000 to $150,000

Push Buttons

DESCRIPTION

Primary attributes:

- ⇨ Located within easy reach of pedestrians intending to cross
- ⇨ Signage to identify crossing
- ⇨ Option: LED to confirm press

PURPOSE

Provide ability to activate a pedestrian signal and confirm crossing indication

CMF

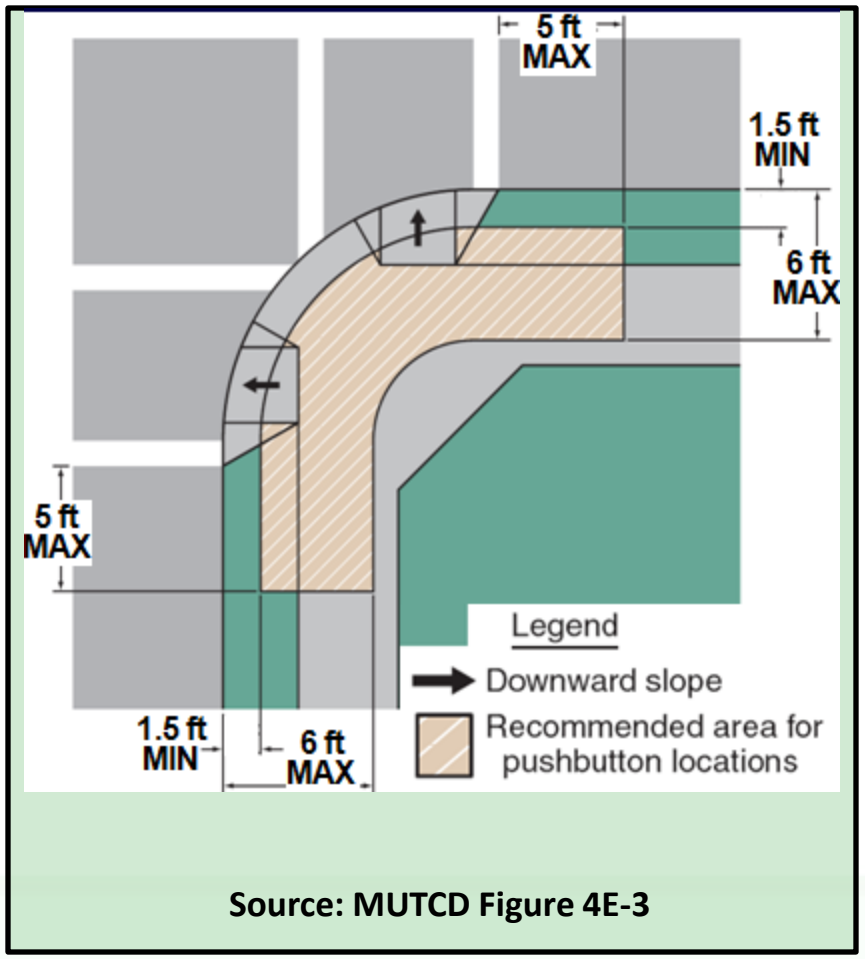
Not available

Source: pedbikeimages.org - Dan Burden (2006)

Push Buttons

CONSIDERATIONS

- Guidance: Section 4E.08 of MUTCD
- Conspicuous and convenient
- Comply with ADA standards
- Appropriate at actuated signal
- Median placement
- Not necessary with automatic pedestrian signal intervals or at small alleyways



Source: MUTCD Figure 4E-3

COST

With sign and pedestal/post is approximately $800 to $1200.

PUFFIN Crossing

DESCRIPTION

Uses active detection and passive presence of pedestrians in crosswalks to determine whether the pedestrian phase of a traffic signal or beacon should be extended or canceled

PURPOSE

Reduce waiting times for both pedestrians and motorists while providing an opportunity for slower moving pedestrians to safely cross the street

CMF Not available

PUFFIN Crossing

CONSIDERATIONS

- Limited application
- Appropriate with high frequency of pedestrians needing additional time to cross
- Evaluate accuracy of various detector types at crossings in U.S.
- Used with traditional traffic signals and Pedestrian Hybrid Beacons

COST

Installation in Tucson, Arizona, in conjunction with a Pedestrian Hybrid Beacon estimated between $80,000 and $150,000

Automated Enforcement Systems

DESCRIPTION

Devices that detect and document traffic violations. These include:

⇨Red light cameras- used to detect red light running

⇨Automated speed enforcement cameras (ASE)- used to monitor and enforce speed limits

Source: trafficmike.com, 2009

PURPOSE

Reduce crashes caused by speeding and/or running red lights

CMF Red light cameras: 0.75 all crashes, 1.15 rear end; ASE: 0.83 all crashes

Automated Enforcement Systems

CONSIDERATIONS

- Public opinion regarding use is mixed
- In some states specific legislation is required to allow their use
- Implementation of these systems must also be accompanied by engineering improvements

COST

Red-light camera can range from approximately $60,000 to $150,000

Source: Ted Graef

Work Zones- Pedestrian Detours

DESCRIPTION

⇨Approx 15 percent of fatalities resulting from crashes in work zones involve non-motorists

⇨ Pedestrian detours are signed routes that lead pedestrians away from conflicts with work site vehicles and other motorists

PURPOSE

Provide safe and convenient passage to pedestrians in work zones

CMF Not available

Source: Flickr – Jaysin Trevino (2012)

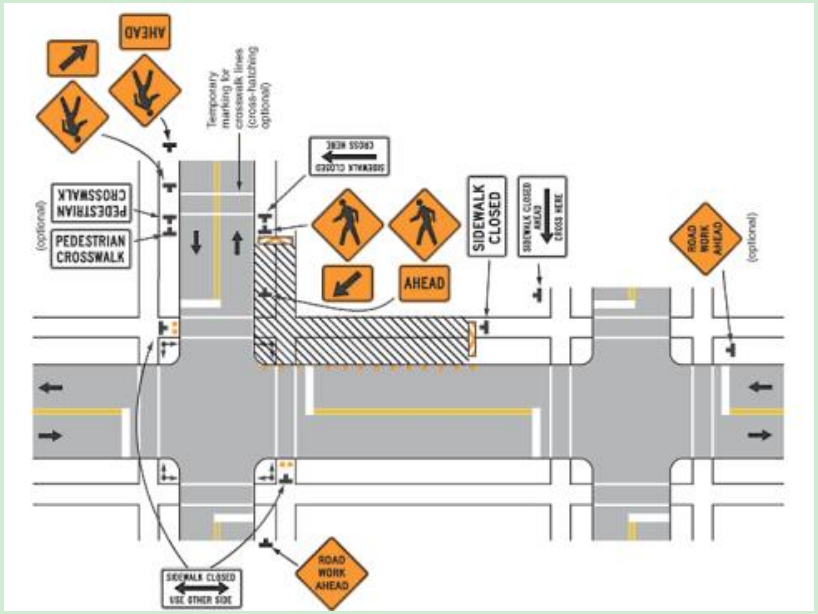
Work Zones- Pedestrian Detours

CONSIDERATIONS

- Pedestrian access to businesses, residences, and transit
- Compliance with ADA requirements
- Temporary lighting
- Consult ATSSA's "Pedestrians Checklist and Considerations for Temporary Traffic Control Zones"
- MUTCD guidance on work zones

COST

Costs vary widely depending on site conditions



Source: ATSSA's Pedestrian Safety and Accessibility in Work Zones

Pedestrian Safety at Rail Crossings

DESCRIPTION

Passive devices: fencing, channelization, swing gates, pedestrian barriers, pavement markings and texturing, etc.

Active devices: flashers, audible active warning devices, automated pedestrian gates, variable message signs, blank-out signs, etc.

Source: Flickr - Donald Lee Pardue (2010)

PURPOSE

Provide control or guidance at rail-pedestrian crossings

CMF Not available

Pedestrian Safety at Rail Crossings

CONSIDERATIONS

- Passive devices required per MUTCD; install active devices based on engineering study
- FRA's *Compilation of Pedestrian Safety Devices In Use at Grade Crossings* and *Guidance on Pedestrian Crossing Safety at or Near Passenger Stations*

Source: TCRP 17, 1996.

COST

Vary widely depending conditions. Enhancing at-grade crossings costs between $50,000 and $300,000. Pedestrian over/underpass can exceed $1.5.

Shared Streets

DESCRIPTION

An integrated space used to balance the needs of pedestrians, bicyclists, and low-speed motor vehicles. Motorists are encouraged to travel speeds 10-15 mph.

PURPOSE

Improve pedestrian safety by encouraging integration and creating a public space that can be used for social and commercial activities.

CMF

Not available

Source: [pedbikeimages.org - Dan Burden (2006)]

Shared Streets

CONSIDERATIONS

- Not appropriate for all streets
- More favorable where all modes travel at walking speeds
- Not appropriate where nonresident motorists have access and on streets with greater than 100 vph
- Keep vehicle speeds very low
- Must meet ADA standards

COST

Retrofit a shared street may be high

Source: [pedbikeimages.org - Dan Burden (2006)]

Streetcars

DESCRIPTION

⇨Connect multiple destinations with predictable routes and frequent service

⇨Provide short trips, connections to other transit systems, and an easily identifiable transit route

PURPOSE

Encourage transit use within cities and foster compact, livable neighborhoods. Secondary effects can include pedestrian-friendly environments near streetcar stops and increased economic vitality along the streetcar corridor.

Source: Wikimedia – Steve Morgan (2008)

CMF Not available

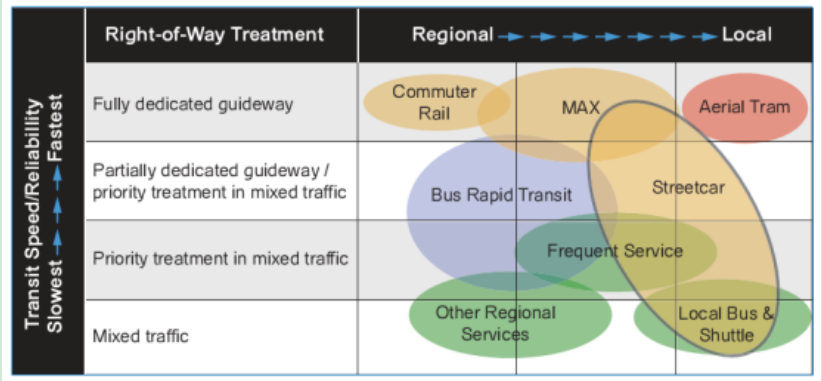
Streetcars

CONSIDERATIONS

- Location of bicycle routes and facilities
- Improvements to the roadway and/or redesign of the public space

COST

A streetcar system generally costs from $25 to $50 million per mile



Source: Portland Streetcar System Concept Plan: A Framework for Future Corridor Planning and Alternatives Analysis

PEDSAFE

Pedestrian Safety Guide and Countermeasure Selection System

Guide: Background | Statistics | Analysis | Implementation | **Countermeasures:** Selection Tool | Matrices | **Case Studies** | **Resources**

The **Pedestrian Safety Guide and Countermeasure Selection System** is intended to provide practitioners with the latest information available for improving the safety and mobility of those who walk. The online tools provide the user with a list of possible engineering, education, or enforcement treatments to improve pedestrian safety and/or mobility based on user input about a specific location.

GUIDE

Background
Understand what is needed to create a viable pedestrian system.

Statistics
Learn about the factors related to the pedestrian crash problem.

Analysis
How crash typing can lead to the most appropriate countermeasures.

Implementation
Needed components for treatments.

COUNTERMEASURES

Selection Tool
Find countermeasures based on desired objectives.

Countermeasure List
A comprehensive list of all countermeasures.

Selection Matrices
Find countermeasures based on crash types and performance objectives.

Authors and Acknowledgements

U.S. Department of Transportation
Federal Highway Administration

Selecting Improvements for Pedestrians

Addressing pedestrian safety consists of a process that includes:

- Identifying factors affecting pedestrian safety
- Analyzing factors affecting pedestrian safety
- Selecting and implementing countermeasures that address pedestrian safety

Typically, this process starts with bringing the right agencies or individuals and resources together. Transportation and land-use planners, engineers, law enforcement officers, emergency and health services, and community leaders need to work collectively to address pedestrian safety. Engaging a group of stakeholders from all four safety disciplines – engineering, education, enforcement and emergency services- can help to both identify the problems and facilitate the sharing of ideas in order to reach consensus and garner support for implementing effective countermeasures.

Bringing together the appropriate resources is also critical when getting started. Practitioners may consult their State's Strategic Highway Safety Plan (SHSP) to look for opportunities to address pedestrian safety. An SHSP is a data-driven, comprehensive, coordinated safety plan that provides a framework for reducing fatalities and serious injuries on all public roads within a State. The plan establishes statewide goals, objectives and key safety emphasis areas that integrate the four E's. Often, a State's SHSP will include pedestrians as an emphasis area for safety improvements. Local agencies may consult the State's SHSP to determine whether there are emphasis areas, data, or other programs that provide opportunities to coordination to address pedestrian safety

Pedestrians may conflict with left-turning vehicles when permissive signal phasing is used.

Countermeasure Selection Tool

The selection tool is designed to receive input on several variables from the user in three steps.

1. Enter the Name of the Location

First, enter the location of the site in question. This allows the user to create reports for several different sites and keep the results separated by location. It is used for reporting purposes only and is not stored permanently by the operators of this web site.

2. Select the Goal of the Treatment

Second, one must decide on the goal of the treatment. It may either be to acheive a specific performance objective, such as reduce traffic volumes, or to mitigate a specific type of pedestrian-motor vehicle collision.

3. Describe the Site

Once a specific goal has been selected, the third step is to provide answers to a series of questions related to the geometric and operational characteristics of the site in question. The answers to these questions are used to narrow the list of appropriate countermeasures for a specific goal. For example, if the location of interest were a segment of roadway, or midblock location, then the treatments associated with intersection improvements would not be applicable and thus, would not be included in the results as possible countermeasures.

For any question where the information is not known, an entry of "unknown" will simply retain the countermeasures relevant to the question, and the range of treatments will not be reduced.

Proceed to Step 1

Countermeasure Selection Tool

Name of location: Main Street at First Street
Your Performance Objective: Reduce Speed of Motor Vehicles
Site Description Answers:
Type of Area: Urban Other
Functional Class: Principle Arterial
Intersection or Midblock: Midblock
Volume: High (>= 25000 ADT)
Speed: High (> 45 mph)
No. of Lanes: 5 or more lanes
Traffic Signal: Not present (Installation is an option)
Transit Line/Route: Yes, the roadway is on a transit line/route.
School Zone/Crossing: Not Applicable
Railroad Crossing: Not Applicable
Work Zone: Not Applicable

Based upon your input, the following countermeasures were found:

Along the Roadway
Street Furniture

At Crossing Locations
Curb Extension

Roadway Design
Bike Lane/Shoulder
Road/Lane Narrowing
Fewer Lanes
Driveway Improvements
Access Management Solutions

Traffic Calming
Landscape Options
Paving Treatments

Signals and Signs
Push Buttons & Signal Timing
Sign Improvement

Other Measures
School Zone Improvement
Speed Monitoring Trailer
Automated Enforcement Systems
Work Zones - Pedestrian Detours

Start Over

Crash Type Matrix

View the Performance Objective Matrix here.

Crash Type	Along Roadway	Crossing Locations	Transit	Roadway Design	Intersection Design	Traffic Calming	Traffic Mgmt.	Signals/ Signs	Other
Dart/Dash	X	X	X	X		X		X	
Multiple Threat/Trapped		X	X	X	X	X	X	X	X
Unique Midblock		X	X	X	X	X	X	X	X
Through Vehicle at Unsignalized Location		X	X	X	X	X	X	X	X
Bus-Related		X	X	X	X	X		X	X
Turning Vehicle	X	X		X	X	X	X	X	X
Through Vehicle at Signalized Location	X	X		X		X	X	X	X
Walking Along Roadway	X	X		X		X			X
Working or Playing in Roadway		X	X	X				X	X
Non-Roadway	X	X	X	X	X			X	X
Backing Vehicle	X	X		X		X	X	X	X
Crossing an Expressway		X		X		X		X	X

PEDSAFE

Pedestrian Safety Guide and Countermeasure Selection System

Crash Type Matrix

View the Performance Objective Matrix here.

Crash Type
Through Vehicle at Unsignalized Location

Countermeasure Type
Signals and Signs

Applicable Countermeasures
Traffic Signal
Pedestrian Signal
Pedestrian Hybrid Beacon (HAWK)
Rectangular Rapid Flashing Beacon (RRFB)
Sign Improvement

Crash Type	Along Roadway	Crossing Locations	Transit	Roadway Design	Intersection Design	Traffic Calming	Traffic Mgmt.	Signals/ Signs	Other
Dart/Dash	X	X	X	X		X		X	
Multiple Threat/Trapped		X	X	X	X	X	X	X	X
Unique Midblock		X	X	X	X	X	X	X	X
Through Vehicle at Unsignalized Location		X	X	X	X	X	X	X	X
Bus-Related		X	X	X	X	X		X	X
Turning Vehicle	X	X		X	X	X	X	X	X
Through Vehicle at Signalized Location	X	X		X		X	X	X	X
Walking Along Roadway	X	X		X		X			X
Working or Playing in Roadway		X	X	X				X	X
Non-Roadway	X	X	X	X	X			X	X
Backing Vehicle	X	X		X		X	X	X	X
		X		X		X		X	X

Case Studies

Included in this section are case studies that illustrate various treatments and/or programs as implemented in a state or municipality. Examples are included from 20 states and the countries of Canada and Switzerland.

Each case study includes a description of the problem that was addressed, relevant background information, a description of the implemented solution, and any quantitative results from evaluation studies or qualitative assessments. Also included for each study is a point of contact in the event that further information is desired. Please note that in some cases, the specific individual listed may have left the position or agency. There should still be someone at the municipal or state agency that is familiar with the project and can provide any supplemental information.

By Location

- Inside the United States
- Outside the United States

By Countermeasure Group

- Pedestrian Facility Design
- Roadway Design
  - Bicycle Lanes
  - Lane Narrowing
  - Lane Reduction (Road Diet)
  - Driveway Improvements
    - Fifth Street Traffic Calming
    - Small Town Traffic Calming
    - Traffic Calming and Emergency Vehicles
  - Access Management Solutions
  - Raised Medians
  - One-way/Two-way Street Conversions
  - Improved Right-Turn Slip-Lane Design
- Intersection Design
- Traffic Calming
- Traffic Management
- Signals and Signs
- Other Measures

Case Study No. 17

Bridgeport Way Corridor Improvements

University Place, WA

Prepared by Ben Yazici, City Manager, City of Sammamish, WA; Former Assistant City Manager/ Director of Public Works for City of University Place, WA and Steve Sugg, University Place, WA.

Problem

A one mile section of Bridgeport Way in University Place, Washington, was the site of hundreds of traffic collisions between 1995 and 1998, many of which involved pedestrians. Besides being an area that has a history of safety issues for pedestrians, bicyclists and motorists, the road design and aesthetics contributed little to the city's economic development or sense of place.

Background

Bridgeport Way is a significant regional arterial that runs through the middle of University Place. Approximately 25,000 vehicles per day use the corridor, making Bridgeport Way the most heavily traveled roadway in the city. Prior to improvements, the 1.5 mile section that bisects University Place's main commercial area had five undivided traffic lanes (two in each direction and a two-way left-turn lane) with two-foot wide gravel shoulders that placed pedestrians close to vehicular traffic. Over 300 crashes occurred on this road section between 1996 and 1998, ten of which involved pedestrians and 91 resulted in injuries. In addition to the lack of sidewalks, insufficient lighting, absence of bicycle lanes, multiple access points and speeding vehicles increased pedestrian risk and

Bridgeport Way, prior to the redesign, bisects University Place's main commercial area.
Image Source: Debbie Klosowski

Eight Recommended Toward Zero Death (TZD) Pedestrian Safety Strategies

1. Provide pedestrian-friendly geometric guidelines

2. Implement effective traffic control treatments

3. Expand funding for SRTS & educational programs

4. Improve safety conditions for transit users

5. Promote enforcement programs

6. Improve pedestrian visibility

7. Develop & implement ITS vehicles & roadways

8. Develop a comprehensive pedestrian safety action plan

Resources

PBIC: www.walkinginfo.org

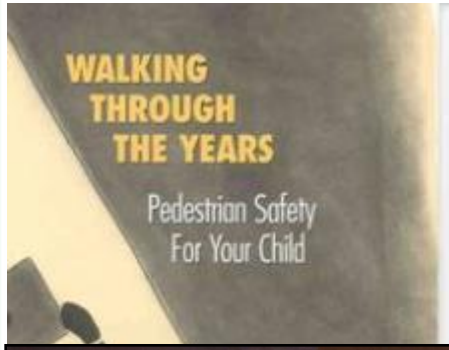
FHWA: safety.fhwa.dot.gov

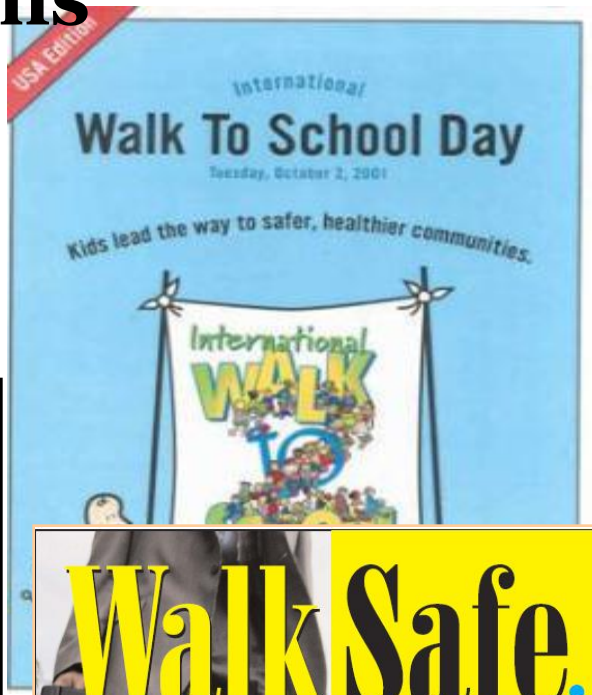
NHTSA: nhtsa.dot.gov

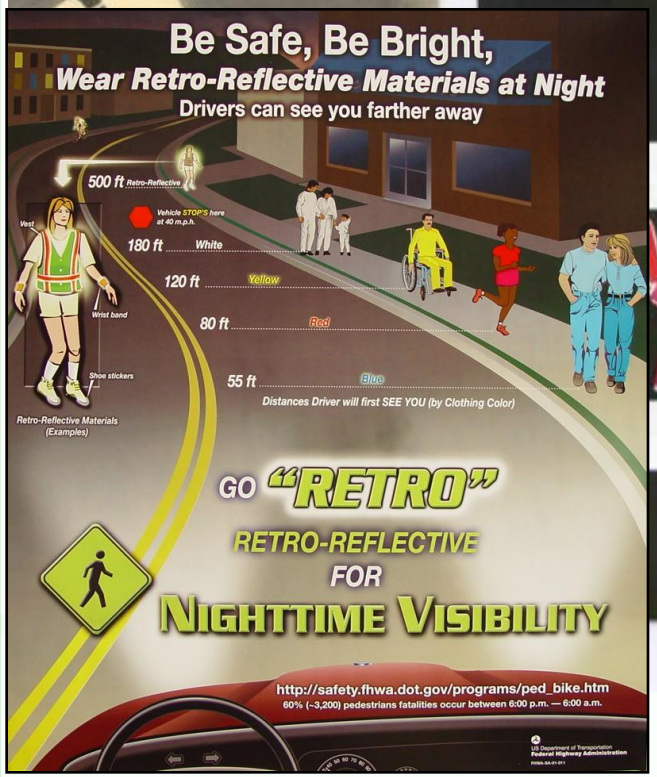
ITE: www.ite.org

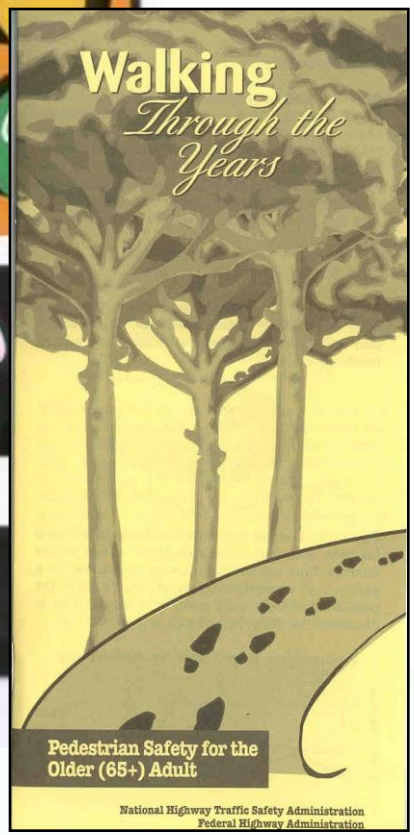
AASHTO/NCHRP: safety.transportation.org

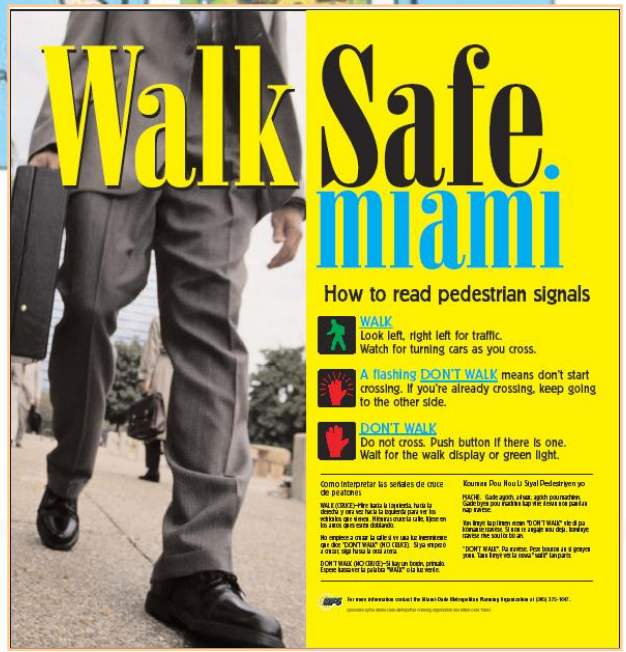
Education Programs











Enforcement

IN DANGER: As cars make their turns, a pedestrian navigates the crosswalk in the 7100 block of Collins Avenue in Miami Beach. Another pedestrian was killed nearby earlier this month.

Yield to pedestrians, police warn

Campaign will ticket violators

BY JOHNNY DIAZ

MIAMI BEACH

Drivers, beware.

Ignoring or speeding by pedestrians in crosswalks may land you an $83 fine if you don't

pedestrians.

Collaborating on the program, Miami Beach police and

be a hotspot for pedestrian crashes," said Ron Von Hosten, a researcher with the University of Florida who assisted the center with its study based on traffic accidents countywide. "It's the law to yield to the right of way of pedestrians. We want to reach out to the people to make this a walkable commu-

Sign for Crosswalks at Uncontrolled Sites

Sign for Crosswalks at Traffic Signals

Thank you!

- Archive at http://www.walkinginfo.org/webinars/
  - Downloadable/streaming recording and presentation slides
- Questions?
  - Charlie Zegeer: zegeer@hsrc.unc.edu
  - Dan Nabors: dnabors@vhb.com
  - Peter Lagerwey: plagerwey@tooledesign.com
  - General: webinars@hsrc.unc.edu
- Check out PEDSAFE: www.pedbikesafe.org/PEDSAFE/