PennDOT LTAP
technical
INFORMATION
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# UNCONTROLLED PEDESTRIAN CROSSING ENHANCEMENTS

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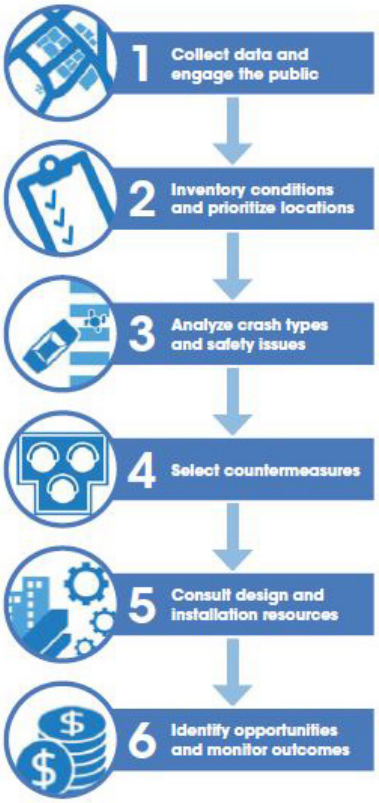
A pedestrian crossing occurs where sidewalks or designated walkways cross a road. Crossings at the intersection of two roads can be marked or unmarked. They can occur where traffic is controlled with a stop sign or traffic signal or uncontrolled and free flowing. Pedestrian crossings may also occur at non-intersection or midblock locations, but these crossings must be marked.

According to 2016 Fatality Analysis Reporting System (FARS) data, pedestrian crash rates are higher at uncontrolled crossing locations, often because the pedestrian crossing accommodations are inadequate. However, many municipalities find it overwhelming and infeasible to enhance every pedestrian crossing, and in most cases it is not necessary.

So how do you know when to enhance a pedestrian crossing and what appropriate enhancements to use? The following information will help guide municipalities on when to enhance an uncontrolled pedestrian crossing, how to identify appropriate enhancements, and how to ensure proper implementation.

The Federal Highway Administration's *Guide for Improving Pedestrian Safety at Uncontrolled Crossing Locations* provides detailed discussion on the process for selecting countermeasures at uncontrolled pedestrian crossing locations.




Process diagram for selecting countermeasures at uncontrolled pedestrian crossing locations. Steps 1 and 2 help to identify when to enhance a crossing; steps 3 and 4 assist with deciding what enhancements are appropriate; and steps 5 and 6 help to identify proper implementation. Municipalities that already have an established process for identifying priority locations may skip step 1 or steps 1 and 2.

Figure 1. Process diagram for selecting countermeasures at uncontrolled pedestrian crossing locations.

## When Should a Pedestrian Crossing Be Enhanced?

**Step 1** – The first step to identify when to enhance a pedestrian crossing is to collect data and engage the public. Collect, review, and document such data as:

- crash statistics,
- existing policies on pedestrian improvements already in place,
- existing local or regional master plans or future project plans, and
- informal public concerns and requests.

A larger municipality can be broken down into regions to make the data collection more manageable. Municipalities may also initiate a pedestrian safety action plan or conduct a walkability audit at various locations to further involve the public and obtain more information.

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The information gathered from the collected data can be used to narrow down and prioritize the locations for safety improvements. These locations can be corridors, neighborhoods, a connection between neighborhoods, or school routes, among others.

**Step 2** – Next, inventory existing conditions and collect more detailed data at the identified priority locations. Such information would include:

- roadway characteristics (speed limit, lane configurations, parking, horizontal and vertical geometry, etc.),
- vehicle speeds (documented through a spot-speed study),
- existing traffic control and pedestrian accommodations,
- pedestrian/vehicular volumes,
- sight distance,
- land uses, and
- pedestrian generators.

A worksheet can be developed to consistently document required data at each pedestrian crossing. (See example below.)

Another tool to help prioritize locations for enhanced pedestrian crossing would be a crash map, which reveals clusters or "hot spots" of pedestrian crashes over the last five years of available data. Municipalities may also employ a systemic approach when pedestrian crashes are low but the potential or risk of crashes is high because of land use or road characteristics.

## Example Crossing Inventory Worksheet

City of Boulder Pedestrian Crossing Treatment Installation Guidelines

**Crossing Location Evaluation Worksheet** *Rev. 11/2/11*

***STEP 1 - LOCATION DESCRIPTION***

Major Street: _____ Crossing Location: _____

Is this a multi-use path crossing? ☐ Yes ☐ No Posted Speed Limit: _____ mph

Existing Traffic Control: ☐ Stop Sign ☐ Traffic Signal ☐ Uncontrolled

Existing Crossing Treatments (if any): _____

_____

Nearby Pedestrian Generators (School, transit stop, commercial, etc.): _____

_____

***STEP 2 - PHYSICAL DATA***

Roadway Configuration:
☐ 2-Lane
☐ 3-Lane w/Striped Median
☐ 3 Lane w/Raised Median
☐ 4 Lane
☐ 5 Lane w/Striped Median
☐ 5 Lane w/Raised Median
☐ 6 Lane
☐ Other: _____

Crossing Distance By Direction: _____ ft total _____ ft to median *(If applicable + note direction)* _____ ft to median *(If applicable + note direction)*

Nearest Marked or Protected Pedestrian Crossing: _____ Distance to: _____ft

(*For uncontrolled location only*) Stopping Sight Distance (SSD) = _____ ft _____ ft.

Is SSD ≥ 8x Speed Limit? ☐ Yes ☐ No If No, are improvements to SSD feasible? ☐ Yes ☐ No

## What Are the Appropriate Enhancements?

Once the locations have been identified and prioritized, the selection of countermeasures can begin.

**Step 3** – Analyze the crash types and observe safety issues. Diagrams can be created to summarize crash types and reveal patterns. Keep in mind that a safety issue may exist even if pedestrian crashes are low or nonexistent.

As part of this step, further review the crash data and conduct site visits to observe such factors as:

- driver and pedestrian behavior,
- analysis of vehicle speeds,
- compliance with traffic control devices,
- pedestrian crossing distance,
- time of day/week/year,
- alcohol involvement, and
- special populations, such as children, older adults, or persons with disabilities

**Step 4** – Now, select the appropriate countermeasures based on the collected and assessed data. The table below, developed by the Federal Highway Administration (FHWA) in the *Guide for Improving Pedestrian Safety at Uncontrolled Crossing Locations*, provides a comprehensive matrix and list of countermeasures suggested for uncontrolled crossing locations based on roadway and traffic features.

As an example, at a marked uncontrolled intersection where the speed limit is 35 mph with 9,500 vehicles per day and the roadway configuration is three lanes without a raised median, the table suggests that countermeasures 1, 3, and 7 should be strongly considered and lists countermeasures 5 and 6

### Application of Countermeasures by Roadway Characteristics

| Roadway Configuration | Speed Limit | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | ≤30 mph | 35 mph | ≥40 mph | ≤30 mph | 35 mph | ≥40 mph | ≤30 mph | 35 mph | ≥40 mph |
| | Vehicle AADT <9,000 | | | Vehicle AADT 9,000–15,000 | | | Vehicle AADT >15,000 | | |
| 2 lanes* | ❶ 2 3 4 5 6 | ❶ ❸ 5 6 7 | ❶ ❸ 5 6 ❼ | ❶ 3 4 5 6 | ❶ ❸ 5 6 7 | ❶ ❸ 5 6 ❼ | ❶ 3 4 5 6 7 | ❶ ❸ 5 6 7 | ❶ ❸ 5 6 ❼ |
| 3 lanes with raised median* | ❶ 2 3 4 5 | ❶ ❸ 5 7 | ❶ ❸ 5 ❼ | ❶ 3 4 5 7 | ❶ ❸ 5 ❼ | ❶ ❸ 5 ❼ | ❶ ❸ 4 5 7 | ❶ ❸ 5 ❼ | ❶ ❸ 5 ❼ |
| 3 lanes w/o raised median† | ❶ 2 3 4 5 6 7 | ❶ ❸ 5 6 7 | ❶ ❸ 5 6 ❼ | ❶ 3 4 5 6 7 | ❶ ❸ 5 6 ❼ | ❶ ❸ 5 6 ❼ | ❶ ❸ 4 5 6 7 | ❶ ❸ 5 6 ❼ | ❶ ❸ 5 6 ❼ |
| 4+ lanes with raised median‡ | ❶ ❸ 5 | ❶ ❸ 5 7 | ❶ ❸ 5 ❼ | ❶ ❸ 5 7 | ❶ ❸ 5 ❼ | ❶ ❸ 5 ❼ | ❶ ❸ 5 ❼ | ❶ ❸ 5 ❼ | ❶ ❸ 5 ❼ |
| 4+ lanes w/o raised median‡ | ❶ ❸ 5 6 7 8 | ❶ ❸ 5 ❻ 7 8 | ❶ ❸ 5 ❻ ❼ 8 | ❶ ❸ 5 ❻ 7 8 | ❶ ❸ 5 ❻ ❼ 8 | ❶ ❸ 5 ❻ ❼ 8 | ❶ ❸ 5 ❻ ❼ 8 | ❶ ❸ 5 ❻ ❼ 8 | ❶ ❸ 5 ❻ ❼ 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,

❶ 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 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., Lagerwey, 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 (http://www.cmfclearinghouse.org/); and the Pedestrian Safety Guide and Countermeasure Selection System (PEDSAFE) website (http://www.pedbikesafe.org/PEDSAFE/).*

as options. Low-cost improvements that can be applied include marking the crosswalks with high-visibility markings (Type C or ladder-style), installing pedestrian warning signs at the crosswalks, installing advance "yield here to pedestrian" signs and yield lines, and restricting parking if a parking lane exists. In addition, the installation of pedestrian hybrid beacons (rectangular rapid flashing beacons or pedestrian flashing devices) should be considered if funding is available.

Curb extensions and a pedestrian refuge island can also be considered and would be especially useful if a parking lane exists because of a long pedestrian crossing length. Definitions of each countermeasure are provided in the guide. Keep in mind that marking a crosswalk where none currently exists will require full compliance with the Americans with Disabilities Act (ADA) regulations. For example, curb ramps must be installed.

During a road safety audit (RSA) an independent multidisciplinary team would create a formal report that includes the information summarized in step 3 and proposed countermeasures as indicated in step 4.

## Ensuring Proper Implementation

After the enhancements have been selected, they must be installed. Properly installing each countermeasure is just as important as selecting the appropriate measure for providing consistency and improved compliance.

**Step 5** – Consult the following resources prior to installation: PennDOT Publication 46 for traffic engineering, PennDOT Publications 111 and 212 for traffic control, and PennDOT Publication 236 and the Manual on Uniform Traffic Control Devices (MUTCD) for signage.

These publications will provide standard installation guidance and details such as using the correct devices, placing the devices in the proper locations and at the correct height, implementing the correct pavement marking widths, using the correct type and number of sign posts, etc.

- The MUTCD is recognized as the national standard for all traffic control devices installed on any street, highway, bikeway, or private road open to public travel and provides uniformity for the design, location, and operation of all official traffic signs, signals, markings, and other traffic-control devices.
- Pub 212 adopts the MUTCD in Pennsylvania. Pub 212 supplements the MUTCD by establishing new regulations regarding additional study requirements, warrants, principles, and guidelines not included in the MUTCD.
- Pub 46 is the Traffic Engineering Manual and is also a design supplement to the MUTCD.
- Pub 236 is the Handbook of Approved Signs that identifies approved signs for use in Pennsylvania. Pub 236 provides sign standards that show the shape, color, dimensions, legends, application, and placement of approved signs that shall be used in lieu of signs found in the MUTCD.
- Pub 111 are standard drawings that provide construction details for the installation of pavement markings and signs.

When purchasing devices, refer to PennDOT Bulletin 15 to ensure only PennDOT-approved products are used.

**Step 6** – Once a countermeasure is implemented, monitor the results through new crash data, driver and pedestrian behavior, and traffic speeds to confirm the effectiveness of the countermeasure and to demonstrate the value of the investment.

## RESOURCES

- Publication 46, Chapter 11.9, Unsignalized Midblock Crosswalks
- PennDOT form TE-113 (7-09), Mid-Block Crosswalk Engineering and Traffic Study (This form is available online at www.dot.state.pa.us/public/PubsForms/Forms/TE-113.pdf.)