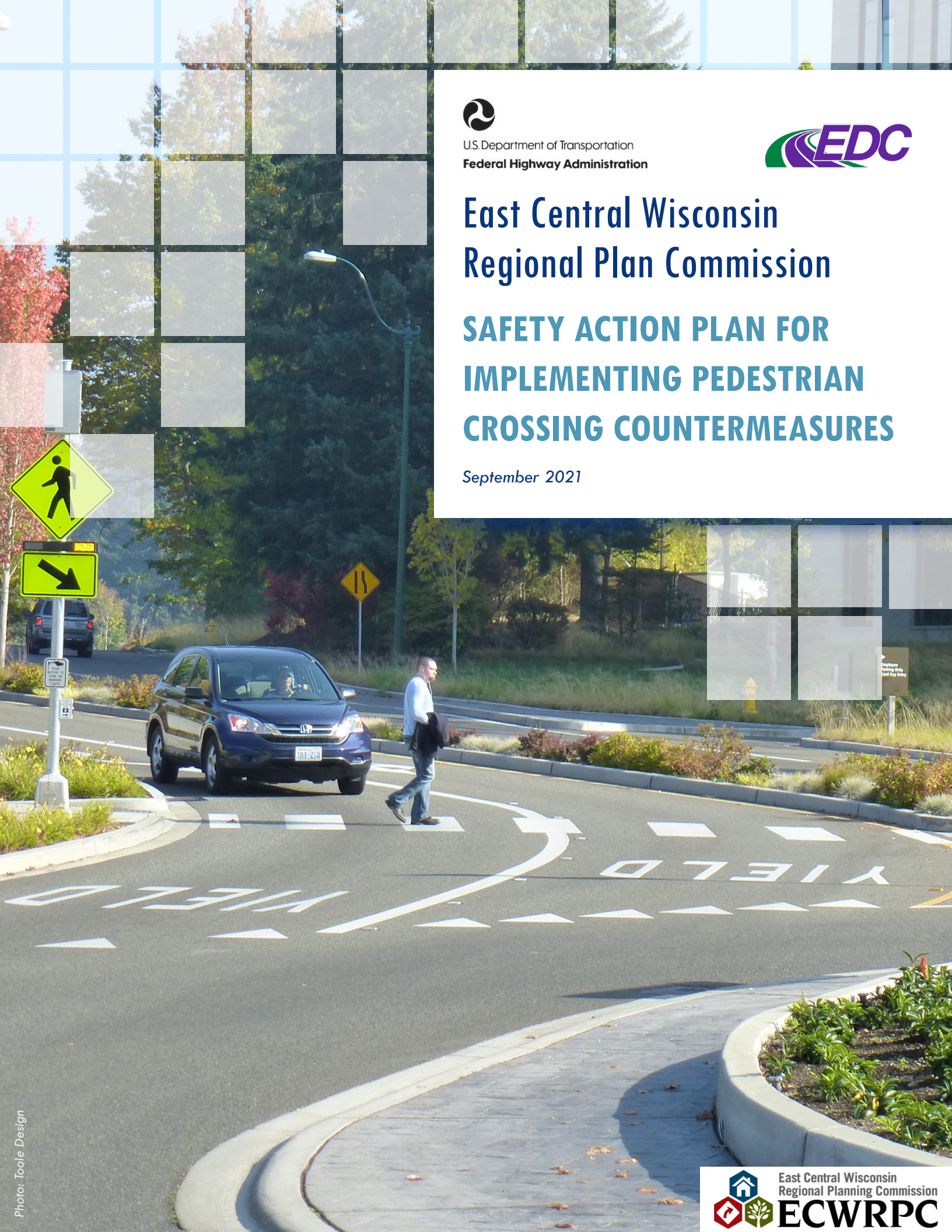

U.S. Department of Transportation
Federal Highway Administration

EDC

# East Central Wisconsin Regional Plan Commission

## SAFETY ACTION PLAN FOR IMPLEMENTING PEDESTRIAN CROSSING COUNTERMEASURES

*September 2021*

Photo: Toole Design

East Central Wisconsin Regional Planning Commission
ECWRPC

*Acknowledgments*

This Plan was developed by a group of dedicated individuals that are committed to reducing the number of lives taken prematurely on Wisconsin's roadways.

Working Group Individuals (alphabetical by last name):

- Kim Biedermann – Associate Planner, Regional Bicycle & Pedestrian Coordinator
- Matt Halada – Principal Planner, Transportation
- Melissa Kraemer Badtke – Executive Director
- Katie Livernash – Planner, Safe Routes to School
- Wilhelmina Paustian – Associate Planner, Transportation / Safe Routes to School
- Ashley Tracy – Associate Planner, Safe Routes to School

Support From:

- Rebecca Crowe – FHWA

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U.S. Department of Transportation
**Federal Highway Administration**

EDC

# Table of Contents



# List of Tables

# List of Abbreviations

| | |
|---|---|
| **AADT** | Annual Average Daily Traffic |
| **AASHTO** | American Association of State Highway and Transportation Officials |
| **ADA** | Americans with Disabilities Act |
| **ADT** | Average Daily Traffic |
| **CMF** | Crash Modification Factor |
| **CRF** | Crash Reduction Factor |
| **EDC** | Every Day Counts |
| **FARS** | Fatality Analysis Reporting System |
| **FHWA** | Federal Highway Administration |
| **GIS** | Geographic Information System |
| **HSIP** | Highway Safety Improvement Program |
| **HSP** | Highway Safety Plan |
| **LPI** | Leading Pedestrian Interval |
| **MUTCD** | Manual on Uniform Traffic Control Devices |
| **NHTSA** | National Highway Traffic Safety Administration |
| **PHB** | Pedestrian Hybrid Beacon |
| **RRFB** | Rectangular Rapid Flash Beacon |
| **RSA** | Road Safety Audit |
| **SHSP** | Strategic Highway Safety Plan |
| **STBG** | Surface Transportation Block Grant |
| **STEP** | Safe Transportation for Every Pedestrian |
| **TZD** | Toward Zero Deaths |
| **VMT** | Vehicle Miles Traveled |
| **VZ** | Vision Zero |

# Executive Summary

This Safety Action Plan ("Plan") has been developed as part of the Safe Transportation for Every Pedestrian (STEP) initiative and targets specific countermeasures for improving pedestrian safety at crossings. STEP is a Federal Highway Administration (FHWA) effort that is part of the Every Day Counts (EDC) Round 5 effort. The East Central Wisconsin Regional Plan Commission (ECWRPC) is leading this initiative. The STEP Action Plan for Implementing Pedestrian Crossing Countermeasures program has been targeted at state departments of transportation (DOTs) – ECWRPC is the first regional agency to undertake a STEP Action Plan. Unlike DOTs, ECWRPC does not implement roadway projects. However, ECWRPC serves as a resource for local implementing agencies and allocates funding for roadway projects within the region.

This plan was developed with direct input from ECWRPC – staff participated in a three-hour virtual work session to review existing practices and policies impacting pedestrian crossings, and to develop the recommended actions reflected in this Plan. This was preceded by a thorough review of the current use of the countermeasures and pedestrian safety processes.

## Recommendations

This Plan recommends actions that when implemented are likely to reduce the number and rate of pedestrian crashes, fatalities, and injuries on roadways within ECWRPC's ten-county planning area. If local transportation agencies also follow the actions identified in this plan, the benefits may be greater. ECWRPC has taken actions in the past several years to raise awareness of pedestrian travel and to improve pedestrian safety, particularly thought its Safe Routes to School (SRTS) program. More importantly, ECWRPC is poised to take additional steps to implement the following STEP recommendations in this plan:

***RECOMMENDATION:*** ECWRPC should adopt a single overarching mission or vision statement for transportation focused on multimodal travel and safety for all modes. This single mission statement should guide all transportation planning work at ECWRPC.

***RECOMMENDATION:*** ECWRPC should specifically identify pedestrian safety in the next revisions of the Appleton TMA and Oshkosh MPO LRTPs and should consider explicitly identifying pedestrian safety whenever roadway safety is discussed in policies, reports, or program descriptions. Goals related to pedestrian safety should encourage a "spirit of collaboration" among local agencies to support implementation or pedestrian safety actions.

***RECOMMENDATION:*** ECWRPC should highlight pedestrian safety in public outreach materials, explaining the importance of pedestrian safety on local roadways, discussing trends, and identifying initiatives ECWRPC and local agencies are carrying out to keep pedestrians safe.

***RECOMMENDATION:*** ECWRPC should develop performance measures focused on pedestrian safety and include them in relevant planning documents. These performance measures could track outcomes such as a reduction in pedestrian crashes within the region, or production items such as the number of pedestrian safety countermeasures installed within one half mile of schools in the region.

***RECOMMENDATION:*** ECWRPC should track and report on serious injuries and fatalities to pedestrians and bicyclists as these users face different operational and safety factors than users of motor vehicles. ECWRPC should consider tracking these figures individually at a smaller scale than region wide (such as urban vs. rural or by county) to highlight varying safety trends in different areas of the region.

***RECOMMENDATION:*** ECWRPC will continue to collect and map pedestrian crashes and use the information to proactively identify high pedestrian crash locations and segments. Crash data should be reviewed when vetting projects funded by the agency, and projects with pedestrian crash hotspots or significant numbers of pedestrian crashes along the corridor should be required to include pedestrian crossing safety countermeasures.

***RECOMMENDATION:*** ECWRPC should promote the crash dashboards to local roadway agencies and highlight how the data can be used when planning projects. A webinar focused on the capabilities of the dashboards could be a useful training for local agency staff.

***RECOMMENDATION:*** ECWRPC should consider conducting pedestrian crash typing on a trial basis for a small number of pedestrian crash hotspots or upcoming project corridors to identify crash trends that may be addressed with STEP countermeasures. The Pedestrian and Bicycle Crash Analysis Tool (PBCAT) may be useful for this analysis. ECWRPC should consider partnering with a local roadway agency or college/university to conduct this analysis.

***RECOMMENDATION:*** ECWRPC should continue its regional pedestrian and bicycle count program and should implement the recommendations of the ongoing count methodology project when complete.

***RECOMMENDATION:*** ECWRPC should explore establishing an online active transportation count dashboard modeled on the crash dashboards it has already deployed. The dashboard should display count locations and raw count data in addition to extrapolated annual counts for both pedestrians and bicyclists. The dashboard should include data from other local agencies.

***RECOMMENDATION:*** ECWRPC should require the installation of permanent equipment capable of counting pedestrians and/or bicyclists as a part of active transportation facilities funded through the Surface Transportation Block Grant-Urban (STBG-U) program and Transportation Alternatives Programs (TAP) that ECWRPC administers for the region.

***RECOMMENDATION:*** ECWRPC should develop a comprehensive inventory of marked crosswalks, potentially relying on data provided by local agency partners. The inventory should collect attribute data (lighting, crosswalk marking pattern, countermeasures present, curb ramps, etc.) as well as locational data and should use the Guide for Improving Pedestrian Safety at Uncontrolled Locations to identify opportunities to improve crossing treatments. The existing inventory maintained by the SRTS team could serve as a starting point for this comprehensive inventory.

***RECOMMENDATION:*** ECWRPC should consider creating a map of the Five Year Surface Transportation Program (which includes 3R, reconstruction, and other significant roadway projects) that includes pedestrian crash locations, pedestrian exposure (if available), pedestrian crash types (if available), and risk factors (see next recommendation). This map should be used on individual roadway projects to identify locations for pedestrian crossings and countermeasures and guide design decisions by local agencies and Wisconsin DOT.

***RECOMMENDATION:*** ECWRPC should conduct analyses that proactively identifies critical corridors, intersections, or “hot spots” for pedestrian safety crossing improvements. Such a systemic analysis can use the criteria established in the MUTCD, including speed, number of lanes, presence of a median, crossing distance, etc. GIS would be the most appropriate tool for identification of key intersections using a prioritization.

***RECOMMENDATION:*** ECWRPC should adopt this plan as an official agency planning document. Following adoption, the plan recommendations should be incorporated into the annual workplan.

***RECOMMENDATION:*** When key policy and planning documents are updated, ECWRPC will review for opportunities to include policy and planning guidance for improving pedestrian safety, with the intent of reducing pedestrian injuries and fatalities. Such documents include the Bicycle and Pedestrian Plan, the Long Range Transportation Plans, the SRTS Strategic Plan, the Regional Comprehensive Plan, the Appleton TMA Congestion Management Process Plan, the Transportation Improvement Plans, local SRTS plans, and others.

***RECOMMENDATION:*** ECWRPC should consider developing a model crosswalk policy for local roadway agencies that provides detailed guidance on how, when, and where to install crosswalks at unsignalized intersections, stop-controlled approaches, and mid-block locations. The procedure should incorporate guidance from the MUTCD, Wisconsin Facility Design Manual (FDM), and local agency policies. A model policy that local agencies can adopt can help promote consistency in crosswalk installation and marking styles throughout the ten county region.

***RECOMMENDATION:*** ECWRPC should continue to promote the adoption of local Complete Streets policies that are more comprehensive and detailed than the Regional and TMA/MPO policies. ECWRPC should consider providing assistance to local agencies to develop local policies and should consider developing a model policy based on the Regional Complete Streets Policy.

***RECOMMENDATION:*** ECWRPC should require that detailed documentation for all exceptions to the Complete Streets policies. ECWRPC should also ensure that review of requests for exceptions are adequate for ensuring that granted exceptions are legitimate and meet the exception criteria outlined in the policies. Exceptions to the policies should be rare and should clearly demonstrate why all modes are not being accommodated on specific projects.

***RECOMMENDATION:*** ECWRPC should require that all STBG-U projects comply with the Regional Complete Streets Policy (or a locally adopted policy that is at least as comprehensive) in order to be considered for funding.

***RECOMMENDATION:*** ECWRPC should consider additional scoring opportunities for projects that include STEP pedestrian crossing safety countermeasures in the STBG-U and Transportation Alternatives programs. Additionally, projects with pedestrian crossings within a defined distance of a school or that is part of a designated school walking route should be required to include appropriate STEP pedestrian crossing safety countermeasures.

***RECOMMENDATION:*** ECWRPC should continue to work with Wisconsin DOT to ensure that HSIP-funded projects in the region address pedestrian safety. ECWRPC should work with Wisconsin DOT to determine how HSIP funds could be used to implement low cost safety countermeasures for pedestrian risk factors identified through a systemic analysis or other data driven methods.

***RECOMMENDATION:*** ECWRPC should work with roadway agencies within the region to ensure that appropriate pedestrian crossing countermeasures are installed by the implementing agency when streets are constructed, reconstructed, rehabilitated, or resurfaced. Countermeasures may also be installed as standalone projects by implementing agencies to address identified safety issues.

***RECOMMENDATION:*** ECWRPC should work with roadway agencies within the region to ensure that maintenance of pedestrian crossing countermeasures is clearly defined when an agency other than the roadway owner is responsible for maintenance of the countermeasure treatment.

***RECOMMENDATION:*** ECWRPC should develop an inventory of local agency Transition Plans and emphasize to local agencies that they are required to maintain a Transition Plan under Federal law. Over time, ECWRPC should require that any local agency applying for or receiving funding administered by ECWRPC have a current Transition Plan, as is the case in Minnesota where the Minnesota Department of Transportation requires recipients of federal funding to have a transition plan in place or underway.

***RECOMMENDATION:*** ECWRPC will continue its public involvement strategy and continue to explore new means of engagement including social media and online forums and pop-up events that meet people where they are. ECWRPC should continue to involve pedestrian stakeholders in planning and safety efforts, as appropriate.

***RECOMMENDATION:*** ECWRPC should ensure that RFP and RFQ authors include requirements for pedestrian planning or design expertise as needed.

***RECOMMENDATION:*** ECWRPC will continue to seek out opportunities for staff to attend trainings and webinars related to pedestrian safety, systemic safety, and, specifically, the STEP countermeasures. ECWRPC will also encourage local agency partners to attend similar trainings. Trainings should be considered an integral part of workforce development for ECWRPC.

# 1

# Introduction and Background

Pedestrians are among the most vulnerable road users, accounting for approximately 17 percent of all roadway fatalities nationally in 2019, per the Fatality Analysis Reporting System (FARS).[1] Pedestrians are especially vulnerable at non-intersection locations where 74 percent of pedestrian fatalities occur. In the State of Wisconsin, pedestrians account for approximately 10 percent of all roadway fatalities.

## Why Create this Pedestrian Safety Action Plan?

The purpose of this Plan is to provide specific recommendations for improving conditions for walking at pedestrian crossing locations, which occur where sidewalks or designated walkways cross a roadway. The recommendations are primarily focused on uncontrolled locations where no traffic control (e.g., traffic signal or stop sign) is present. These common crossing types occur at intersections (where crosswalks may be marked or unmarked) and at non-intersection or midblock locations (where crosswalks must be marked to give pedestrians the legal right-of-way). Nationally, uncontrolled pedestrian crossing locations often correspond to higher pedestrian crash rates than controlled locations, frequently due to inadequate pedestrian crossing accommodations.[2]

By focusing on uncontrolled crossing locations, the East Central Wisconsin Regional Plan Commission (ECWRPC) will address a significant safety problem and improve crossing comfort for pedestrians of all ages and

### Every Day Counts (EDC)

The STEP initiative is part of EDC-5. In 2009, the Federal Highway Administration (FHWA) launched Every Day Counts (EDC) in cooperation with the American Association of State Highway and Transportation Officials (AASHTO) to speed up the delivery of highway projects and to address the challenges presented by limited budgets. EDC is a State-based model to identify and rapidly deploy proven but underutilized innovations to shorten the project delivery process, enhance roadway safety, reduce congestion and improve environmental sustainability.

Proven innovations through EDC facilitate greater efficiency at the State and local levels, saving time and resources that can be used to deliver more projects for the same money. By advancing 21st century solutions, the highway community is making every day count to ensure our roads and bridges are built better, faster and smarter.

#### HOW IT WORKS

Through the EDC model, FHWA works with State and local transportation agencies and industry stakeholders to identify a new collection of innovations to champion every two years. Innovations are selected collaboratively by stakeholders, taking into consideration market readiness, impacts, benefits and ease of adoption of the innovation. After selecting the EDC technologies for deployment, transportation leaders from across the country gather at regional summits to discuss the innovations and share best practices. These summits begin the process for States, local public agencies and Federal Lands Highway Divisions to focus on the innovations that make the most sense for their unique program needs, establish performance goals and commit to finding opportunities to get those innovations into practice over the next two years.

Throughout the two-year deployment cycle, specifications, best practices, lessons learned, and relevant data are shared among stakeholders through case studies, webinars, and demonstration projects. The result is rapid technology transfer and accelerated deployment of innovation across the nation.

1 NHSTA, "FARS Data Query: 2018 Data." Fatality Analysis Reporting System (FARS) Encyclopedia. (2020). Retrieved From https://www-fars.nhtsa.dot.gov/QueryTool/QuerySection/SelectYear.aspx.

2 FHWA. Guide for Improving Pedestrian Safety at Uncontrolled Crossing Locations. (2018).

abilities. Recommendations in this Plan follow STEP guidance for implementing lower-cost countermeasures that can be deployed based on specific needs. They have a proven record of reducing crashes and represent underutilized innovations that can have an immediate impact.

This Plan also builds on existing agency goals and strategies for improving safety, supports the examination of existing conditions, and uses a data-driven approach to match countermeasures with demonstrated problem locations. Plan recommendations are structured to allow for immediate implementation.

## What is STEP?

This Safety Action Plan ("Plan") has been developed as part of the Safe Transportation for Every Pedestrian (STEP) initiative and targets seven specific countermeasures (described later in this guide) for improving pedestrian safety at crossings. STEP is a Federal Highway Administration (FHWA) initiative which is part of the Every Day Counts (EDC) Round 5 effort. EDC is a FHWA-State Department of Transportation (DOT) collaboration which focuses on underutilized innovations. Every two years a new set of initiatives is identified. STEP was identified beginning with the fourth round of EDC innovations because of the cost-effectiveness and known safety benefits of the countermeasures it offers.

Expecting pedestrians to travel significantly out of their way to cross a roadway to reach their destination is unrealistic and counterproductive to encouraging healthier transportation options. By focusing on uncontrolled locations, agencies can address a significant national safety problem and improve quality of life for pedestrians of all ages and abilities.

## How this Plan was Developed

This Plan is intended to be used in conjunction with two USDOT/FHWA publications:

» **FHWA Guide for Improving Pedestrian Safety at Uncontrolled Crossing Locations (2018)**
This guide assists State or local transportation or traffic safety departments that are considering developing a policy or guide to support the installation of countermeasures at uncontrolled pedestrian crossing locations. This document provides guidance to agencies, including best practices for each step involved in selecting countermeasures. By focusing on uncontrolled crossing locations, agencies can address a significant national safety problem and improve quality of life for pedestrians of all ages and abilities. Agencies may use this guide to develop a customized policy or to supplement existing local decision-making guidelines.

» **FHWA How to Develop a Pedestrian and Bicycle Safety Action Plan (2017)**
The purpose of this guide is to assist agencies in developing and implementing a safety action plan to improve conditions for bicycling and walking. The guide lays out a vision for improving safety, examining existing conditions, and using a data-driven approach to match safety programs and improvements with demonstrated safety concerns. This guide helps agencies enhance their existing safety programs and activities, including identifying safety concerns and selecting optimal solutions. It also serves as a reference for improving pedestrian and bicyclist safety through a multidisciplinary and collaborative approach to safety, including street designs and countermeasures, policies, and behavioral programs.

The Plan report also references other FHWA publications, American Association of State Highway Transportation Officials (AASHTO) guides, the Manual on Uniform Traffic Control Devices (MUTCD), and relevant State publications for additional information. A complete list of referenced documents and other resources is found at the end of this document.

The three-part process used to develop this Plan helps ensure that recommended actions represent the best use of agency resources:

1. **Discovery:** Current policies, plans, design guidance, prioritization methodologies, crash data and implementation strategies were identified and assembled with the assistance of ECWRPC staff.
2. **Work Session:** ECWRPC staff met on July 28, 2021 to review materials assembled during the Discovery phase, and to develop the recommended actions reflected in this Plan.
3. **Draft and Final Plan:** Based on the work session, a draft Plan was developed, reviewed by ECWRPC, revised, and finalized.

The recommendations in this Plan provide a roadmap for reducing the number and rate of pedestrian crashes, fatalities, and injuries. The recommendations identify current policies and practices that should be continued, as well as others that should be modified or added to strengthen the goals of the Plan.

## What is Not Included in This Plan?

Building a safe and connected pedestrian network requires consideration of topics beyond what is included in this Plan. There are other engineering-based countermeasures that exist for unsignalized and signalized intersections and for walking along streets and highways. Pedestrian crossings near schools are not specifically addressed in the Plan and will be subject to other State guidance. Crossing requirements per the Americans with Disabilities Act (ADA) are not specifically addressed in this Plan, although ADA requirements must be addressed as part of any pedestrian crossing improvements project. Resources and further guidance are provided at the end of this Plan.

# 2

# Vision, Goals, and Performance Measures

## Vision

The transportation system should accommodate people of all ages and abilities, including people too young to drive, people who cannot drive, and people who choose not to drive. People can be expected to walk along and across all roadways, except where prohibited. Walking is an important element of a multimodal transportation system that supports all users. Well-designed, well-maintained facilities, with low crash frequencies and severities, are important to creating safe and convenient walking conditions.

ECWRPC is committed to improving safety for all travel modes, including pedestrians. ECWRPC has adopted the following vision statement as part of its Regional Complete Streets Policy: "The ECWRPC region will have an equitable, balanced, and effective transportation system where every roadway user can travel safely, efficiently, and comfortably while having many transportation options available for all users regardless of their modes of transportation." Other agency planning documents also contain mission or vision statements related to roadway safety, but there is not a single vision or mission statement that guides all transportation related work at the agency

The recommendations contained in this Plan support the vision articulated in the Regional Complete Streets Policy.

> ***RECOMMENDATION:*** ECWRPC should adopt a single overarching mission or vision statement for transportation focused on multimodal travel and safety for all modes. This single mission statement should guide all transportation planning work at ECWRPC.

## Goals

ECWRPC recognizes the importance of setting clear, measurable goals for improving pedestrian safety as a way of monitoring progress in reducing fatalities, injuries, and crashes. This is reflected in Appleton Transportation Management Area (TMA) and Oshkosh Metropolitan Planning Organization (MPO) 2050 Long Range Transportation Plans (LRTP) that were developed by ECWRPC. These goals include:

- Increase the safety of the transportation system for motorized and non-motorized users.
- Provide a safe transportation system throughout the region.

Additionally, the 2021 Fox Cities and Oshkosh MPO Bicycle and Pedestrian Plan currently under development includes goals specifically focused on pedestrian safety.

> ***RECOMMENDATION:*** ECWRPC should specifically identify pedestrian safety in the next revisions of the Appleton TMA and Oshkosh MPO LRTPs and should consider explicitly identifying pedestrian safety whenever roadway safety is discussed in policies, reports, or program descriptions. Goals related to pedestrian safety should encourage a "spirit of collaboration" among local agencies to support implementation or pedestrian safety actions.

> ***RECOMMENDATION:*** ECWRPC should highlight pedestrian safety in public outreach materials, explaining the importance of pedestrian safety on local roadways, discussing trends, and identifying initiatives ECWRPC and local agencies are carrying out to keep pedestrians safe.

## Performance Measures

Performance measures are a way to measure the effectiveness of agency policies, projects, and programs. They can be a measurement of outcomes (e.g., reduction in number of pedestrian injuries and fatalities), or they can be a measurement of production items (e.g., the number of high visibility crosswalks installed). They serve as a tool for building agency accountability. Deciding what to measure is important since it will guide the allocation of resources as agencies strive to meet performance measure objectives.

State DOTs work with FHWA to establish and track safety performance measures as part of their Highway Safety Improvement Program (HSIP). The following performance measures are used by Wisconsin DOT to track and measure safety performance as five-year rolling averages, and are included in the Appleton TMA LRTP:

- Number of fatalities (all modes)
- Rate of fatalities (all modes) per 100 million VMT
- Number of serious injuries (all modes)
- Rate of serious injuries (all modes) per 100 million VMT
- Number of non-motorized fatalities and serious injuries

Other performance measures focused on pedestrian safety are limited within ECWRPC planning documents.

***RECOMMENDATION:*** ECWRPC should develop performance measures focused on pedestrian safety and include them in relevant planning documents. These performance measures could track outcomes such as a reduction in pedestrian crashes within the region, or production items such as the number of pedestrian safety countermeasures installed within one half mile of schools in the region.

***RECOMMENDATION:*** ECWRPC should track and report on serious injuries and fatalities to pedestrians and bicyclists as these users face different operational and safety factors than users of motor vehicles. ECWRPC should consider tracking these figures individually at a smaller scale than region wide (such as urban vs. rural or by county) to highlight varying safety trends in different areas of the region.

# 3

# Prioritizing Pedestrian Crossing Improvements

## Individual Crash Location Analysis

Pedestrian crashes, especially those involving fatalities, are relatively rare at any given individual location. Consequently, to improve pedestrian safety requires identification of problem roadway segments as well as intersection and mid-block locations. A simple mapping of crash locations involving pedestrians will quickly identify high crash locations and corridors. Typically, five years of crash data is appropriate, though in rapidly changing areas three years might be sufficient.

ECWRPC maintains robust crash mapping dashboards of all motor vehicle crashes, including those involving pedestrians. The dashboards pull data from a crash database maintained by Wisconsin DOT. The crash dashboards display all reported motor vehicle crashes and can be filtered by crash type, date, mode, and other factors. ECWRPC uses the data to identify trends and patterns for specific projects. For example, as part of the ongoing update to the Fox Cities and Oshkosh MPO Bicycle and Pedestrian Plan, bicycle crashes in Oshkosh were reviewed to identify patterns and high crash areas. Additionally, the crash data is being used as part of an equity analysis being conducted as part of the Fox Cities and Oshkosh MPO Bicycle and Pedestrian Plan update. ECWRPC and local agencies also use crash data to review crash patterns when initiating a roadway project.

> ***RECOMMENDATION:*** ECWRPC will continue to collect and map pedestrian crashes and use the information to proactively identify high pedestrian crash locations and segments. Crash data should be reviewed when vetting projects funded by the agency, and projects with pedestrian crash hotspots or significant numbers of pedestrian crashes along the corridor should be required to include pedestrian crossing safety countermeasures.

> ***RECOMMENDATION:*** ECWRPC should promote the crash dashboards to local roadway agencies and highlight how the data can be used when planning projects. A webinar focused on the capabilities of the dashboards could be a useful training for local agency staff.

## System-wide Crash Analysis

To conduct more sophisticated analyses of pedestrian crashes, more data than the crash location are needed. Detailed data, including crash location, time, demographic information about the individuals involved in the crash, and whether drugs or alcohol were involved, are extremely useful to determine whether there are patterns to pedestrian crashes, and if so, to select the best countermeasures to address them. Analysis of detailed data can provide information on where crashes occur, when they occur, and characteristics of the people involved in the crash.

Categorizing crashes by type can also be helpful for analysis. Pedestrian crash typing was pioneered by the National Highway Traffic Safety Administration in the 1970s to better define the sequence of events leading up to crashes and the orientation of both the pedestrian and driver when the crash occurred. While there are over 60 specific pedestrian crash types, pedestrian crashes can generally be sorted into twelve crash type groupings for selecting countermeasures. Crash typing categorizes all crashes based on situational and behavioral circumstances and is a way to target countermeasures in engineering, education,

and enforcement programs at very specific types of crashes.

ECWRPC does not identify pedestrian crash types, nor does Wisconsin DOT or local agencies in the region, and does not have routine access to the crash reports necessary to conduct such analysis.

> ***RECOMMENDATION:*** ECWRPC should consider conducting pedestrian crash typing on a trial basis for a small number of pedestrian crash hotspots or upcoming project corridors to identify crash trends that may be addressed with STEP countermeasures. The Pedestrian and Bicycle Crash Analysis Tool (PBCAT) may be useful for this analysis. ECWRPC should consider partnering with a local roadway agency or college/university to conduct this analysis.

## Pedestrian Volume and Behavior Analysis

Pedestrian counts along with field observations (e.g., driver yielding, conflicts, and pedestrian assertiveness) can be useful in understanding pedestrian behavior and in considering the need for facilities. Counts and behavior studies, when combined with crash data, can also provide insights into specific crash causes and potential countermeasures, and allow the determination of crash rates. On-site observations will often reveal behavior patterns that lead to design changes. Before and after counts can be used to measure success, which in turn can be used to help secure funding for additional improvements at other locations. Pedestrian counts are also important to assess when and where signals, stop signs, and marked crosswalks should be installed.

ECWRPC currently conducts bicycle and pedestrian counts throughout the region as requested by local agencies. ECWRPC has undertaken a separate project to develop count factors that will allow them to better estimate the pedestrian/bicycle breakdown of combined counts and better extrapolate annual counts from short duration counts. That project will provide recommendations for updates to the count program to improve accuracy and coverage throughout the region. In addition to counting pedestrians and bicyclists, ECWRPC has used MioVision video equipment to look at how pedestrians are using a specific facility or site. Additionally, local agencies may perform counts when specific proposed treatments are under consideration.

> ***RECOMMENDATION:*** ECWRPC should continue its regional pedestrian and bicycle count program and should implement the recommendations of the ongoing count methodology project when complete.

> ***RECOMMENDATION:*** ECWRPC should explore establishing an online active transportation count dashboard modeled on the crash dashboards it has already deployed. The dashboard should display count locations and raw count data in addition to extrapolated annual counts for both pedestrians and bicyclists. The dashboard should include data from other local agencies.

> ***RECOMMENDATION:*** ECWRPC should require the installation of permanent equipment capable of counting pedestrians and/or bicyclists as a part of active transportation facilities funded through the Surface Transportation Block Grant-Urban (STBG-U) program and Transportation Alternatives Programs (TAP) that ECWRPC administers for the region.

## Inventory of Crossing Locations

A systematic inventory of crossing locations is necessary for prioritizing locations and selecting countermeasures. Ideally an inventory would detail the presence of a marked crosswalk at all legal pedestrian crossing locations (controlled and uncontrolled), the type of crosswalk marking, the presence of ADA-compliant curb ramps, and the presence of any crossing countermeasures. As an example of how regional agencies can inventory crossing locations, the Madison Area MPO maintains an online geographic inventory of pedestrian crossings within its planning area. While the inventory does not detail all STEP pedestrian safety countermeasures present at crossing locations, it does include the presence of marked crosswalks, RRFBs and PHBs (within the City of Madison), and the accessibility of crossings. Ideally the inventory should note the compliance of crossings with any local or regional marked crosswalk policy that may be developed in the future. The inventory can be used to create a strategy for making improvements at crossing locations throughout the region.

The ECWRPC Safe Routes to School (SRTS) team maintains an inventory of crosswalks at school-specific locations, however, ECWRPC does not maintain a comprehensive inventory of locations where there are marked crosswalks within the entire region.

> ***RECOMMENDATION:*** ECWRPC should develop a comprehensive inventory of marked crosswalks, potentially relying on data provided by local agency partners. The inventory should collect attribute data (lighting, crosswalk marking pattern, countermeasures present, curb ramps, etc.) as well as locational data and should use the Guide for Improving Pedestrian Safety at Uncontrolled Locations to identify opportunities to improve crossing treatments. The existing inventory maintained by the SRTS team could serve as a starting point for this comprehensive inventory.

## Prioritizing Pedestrian Crossing Improvements and Selecting Countermeasures

A pre-defined methodology for prioritizing pedestrian improvements ensures that resources are allocated in a way that best meets goals to reduce pedestrian injuries and fatalities. A prioritization methodology should be:

- **Responsive** to ECWRPC and local agency and community values.
- **Flexible:** Rather than being a rigid, "one-size-fits-all" tool, a prioritization methodology should be flexible and allow practitioners to choose the most appropriate approach that reflects agency goals, local needs, and resource availability.
- **Transparent:** A prioritization process should be broken down into a series of discrete steps, each of which can be easily documented and explained to the public.

As a non-implementing agency, ECWRPC does not select locations for crossings or countermeasures to improve those crossings. However, ECWRPC could establish a systemic process and analysis for use by local agencies to prioritize specific locations and identify pedestrian crossing improvements on individual roadway projects. Generally, potential locations for improvements will be identified by local jurisdictions in advance of a roadway project or by Wisconsin DOT during the safety and operational analysis for a roadway project.

> ***RECOMMENDATION:*** ECWRPC should consider creating a map of the Five Year Surface Transportation Program (which includes 3R, reconstruction, and other significant roadway projects) that includes pedestrian crash locations, pedestrian exposure (if available), pedestrian crash types (if available), and risk factors (see next recommendation). This map should be used on individual roadway projects to identify locations for pedestrian crossings and countermeasures and guide design decisions by local agencies and Wisconsin DOT.

> ***RECOMMENDATION:*** ECWRPC should conduct analyses that proactively identifies critical corridors, intersections, or "hot spots" for pedestrian safety crossing improvements. Such a systemic analysis can use the criteria established in the MUTCD, including speed, number of lanes, presence of a median, crossing distance, etc. GIS would be the most appropriate tool for identification of key intersections using a prioritization.

# 4

# Policy Recommendations

"Institutionalization" is the integration of pedestrian considerations into agency policies, plans, projects, and programs. The intent is to make walking and pedestrian safety a mainstream activity.

The following implementation strategies provide a roadmap for implementation of this Plan through institutionalization, with the intent of making pedestrian safety a routine part of all ECWRPC and partner agencies activities.

## Policy and Planning Documents

In addition to FHWA, AASHTO, and MUTCD guidance, ECWRPC has developed agency policy and planning guidance on transportation related topics. They define approaches to solving safety problems, setting priorities, and providing decision making guidance. Policy and planning documents provide a means to increase awareness of pedestrian safety issues while also providing specific objectives for reducing injuries and fatalities.

At any given time, one or more policy, planning, and other agency documents are undergoing revisions and updates. This is the ideal time to make changes that begin to institutionalize pedestrian considerations.

***RECOMMENDATION:*** ECWRPC should adopt this plan as an official agency planning document. Following adoption, the plan recommendations should be incorporated into the annual workplan.

***RECOMMENDATION:*** When key policy and planning documents are updated, ECWRPC will review for opportunities to include policy and planning guidance for improving pedestrian safety, with the intent of reducing pedestrian injuries and fatalities. Such documents include the Bicycle and Pedestrian Plan, the Long Range Transportation Plans, the SRTS Strategic Plan, the Regional Comprehensive Plan, the Appleton TMA Congestion Management Process Plan, the Transportation Improvement Plans, local SRTS plans, and others.

## Marked Crosswalk Policy

Marked crosswalks delineate optimal or preferred locations for a pedestrian to cross a street and indicate to drivers where to expect pedestrians. Pavement markings must follow one of the types as shown in the MUTCD. New marked crosswalk installations at uncontrolled locations require an engineering study.

Marked crosswalks help to improve pedestrian safety and the connectivity of the pedestrian network. A marked crosswalk policy creates a consistent approach for the evaluation and installation of marked crosswalks. Uniform and consistent application of marked crosswalks can help increase predictability for both pedestrians and drivers. A marked crosswalk policy should:

- Identify what factors are taken into consideration during evaluation of proposed marked crosswalks at uncontrolled locations (e.g., traffic volume, traffic speeds, crashes, destinations, roadway design, etc.)
- Establish the primary types of crossing treatments to be considered for any marked crosswalk location (including high visibility crosswalks)
- Determine a prioritization process for how crosswalk marking is implemented. Inputs to this

prioritization may include locational data such as transit stops, school walking routes, senior walking routes, high collision locations, and midblock locations with high numbers of pedestrians crossing the street.

FHWA's Guide for Improving Pedestrian Safety at Uncontrolled Crossing Locations (2018) provides options for crossing improvements once an agency has determined where to install a marked crosswalk.

As a non-implementing agency, ECWRPC does not have a marked crosswalk policy.

***RECOMMENDATION:*** ECWRPC should consider developing a model crosswalk policy for local roadway agencies that provides detailed guidance on how, when, and where to install crosswalks at unsignalized intersections, stop-controlled approaches, and mid-block locations. The procedure should incorporate guidance from the MUTCD, Wisconsin Facility Design Manual (FDM), and local agency policies. A model policy that local agencies can adopt can help promote consistency in crosswalk installation and marking styles throughout the ten county region.

## Complete Streets Policies

Complete Streets are streets designed and operated to enable safe use and support mobility for all users. Those include people of all ages and abilities, regardless of whether they are travelling as drivers, pedestrians, bicyclists, or public transportation riders. The concept of Complete Streets encompasses many approaches to planning, designing, and operating roadways and rights of way with all users in mind to make the transportation network safer and more efficient. Complete Streets approaches vary based on community context. They may address a wide range of elements, such as sidewalks, bicycle lanes, bus lanes, public transportation stops, crossing opportunities, median islands, accessible pedestrian signals, curb extensions, modified vehicle travel lanes, streetscape, and landscape treatments. Complete Streets reduce motor vehicle-related crashes and pedestrian risk, as well as bicyclist risk when well-designed bicycle-specific infrastructure is included. Complete Streets policies typically require the consideration and accommodation of all users when planning, designing, and constructing transportation facilities with the intent of creating a complete network of Complete Streets over time as roadways are repaired, resurfaced, and reconstructed.

ECWRPC adopted a Regional Complete Streets Policy in 2018. Additionally, the Appleton TMA and Oshkosh MPO, which are administered by ECWRPC, adopted a nearly identical Complete Streets Policy that same year. The policies describe when projects must include Complete Streets elements and states that "ECWRPC requires projects receiving federal funding adhere to this policy" for MPO-attributable funding. The policy also recommends that local communities and agencies adopt their own Complete Streets Policy. The policies include a provision for projects in which adherence to the Complete Streets policy is unfeasible. While the requirements for being granted an exception align with national best practices, it is possible that exceptions are too often granted.

***RECOMMENDATION:*** ECWRPC should continue to promote the adoption of local Complete Streets policies that are more comprehensive and detailed than the Regional and TMA/MPO policies. ECWRPC should consider providing assistance to local agencies to develop local policies and should consider developing a model policy based on the Regional Complete Streets Policy.

***RECOMMENDATION:*** ECWRPC should require that detailed documentation for all exceptions to the Complete Streets policies. ECWRPC should also ensure that review of requests for exceptions are adequate for ensuring that granted exceptions are legitimate and meet the exception criteria outlined in the policies. Exceptions to the policies should be rare and should clearly demonstrate why all modes are not being accommodated on specific projects.

## Funding Programs

Integrating pedestrian facilities into routine construction, reconstruction, and resurfacing projects is a cost-effective way to institutionalize pedestrian facilities and complies with the Regional Complete Streets Policy. Project funding requirements and screening criteria can require the provision of pedestrian facilities

and safety treatments to ensure that projects receiving state and Federal aid are serving all users and taking pedestrian safety into account.

ECWRPC administers the Surface Transportation Block Grant-Urban (STBG-U) and Transportation Alternatives Program (TAP) for agencies in the region. The STBG-U program does not require compliance with the Regional Complete Streets Policy, but does include ranking criteria for pedestrian and bicycle accommodation; projects lacking in these areas are unlikely to score high enough to receive funding. TAP funding is targeted at pedestrian and bicycle projects.

The Highway Safety Improvement Program (HSIP) is a core federal aid program that distributes funds to help reduce fatal and serious injury collisions. ECWRPC does not administer HSIP funds for the region (Wisconsin DOT does), but works with Wisconsin DOT to determine what specific projects within the region include.

***RECOMMENDATION:*** ECWRPC should require that all STBG-U projects comply with the Regional Complete Streets Policy (or a locally adopted policy that is at least as comprehensive) in order to be considered for funding.

***RECOMMENDATION:*** ECWRPC should consider additional scoring opportunities for projects that include STEP pedestrian crossing safety countermeasures in the STBG-U and Transportation Alternatives programs. Additionally, projects with pedestrian crossings within a defined distance of a school or that is part of a designated school walking route should be required to include appropriate STEP pedestrian crossing safety countermeasures.

***RECOMMENDATION:*** ECWRPC should continue to work with Wisconsin DOT to ensure that HSIP-funded projects in the region address pedestrian safety. ECWRPC should work with Wisconsin DOT to determine how HSIP funds could be used to implement low cost safety countermeasures for pedestrian risk factors identified through a systemic analysis or other data driven methods.

## Interagency Coordination

Roadways are constructed and maintained by many different agencies, and often the agency that constructs a roadway is not the same one that maintains it. Pedestrian safety countermeasures should be installed by the agency that constructs, reconstructs, or resurfaces a roadway. This work frequently occurs when work is completed on the roadway, but it can also occur as a retrofit project focused on improving pedestrian safety. When roadway maintenance, including maintenance of countermeasure treatments, is carried out by an agency other than the implementing agency, that responsibility should be clearly spelled out through a maintenance agreement between the implementing and the maintaining agencies.

***RECOMMENDATION:*** ECWRPC should work with roadway agencies within the region to ensure that appropriate pedestrian crossing countermeasures are installed by the implementing agency when streets are constructed, reconstructed, rehabilitated, or resurfaced. Countermeasures may also be installed as standalone projects by implementing agencies to address identified safety issues.

***RECOMMENDATION:*** ECWRPC should work with roadway agencies within the region to ensure that maintenance of pedestrian crossing countermeasures is clearly defined when an agency other than the roadway owner is responsible for maintenance of the countermeasure treatment.

## Americans with Disabilities Act (ADA) Transition Plan

ADA Transition Plans ensure that all pedestrian facilities will become accessible over time, as required by the Americans with Disabilities Act. ADA Transition Plans have been required for all public agencies with more than 50 employees since 1992. ADA Transition Plans are intended to identify system needs and integrate them with the agency's planning process; the Transition Plan and its identified needs should be fully integrated into the agency's Transportation Improvement Program (TIP). Implementation of the ADA Transition Plan also provides an opportunity to make safety improvements that benefit all pedestrians. According to the ADA, whenever streets are resurfaced, ramps and other accessibility improvements must be made; this activity opens opportunities for crosswalk countermeasures.

ECWRPC does not have an ADA Transition Plan and does not maintain an inventory of local agencies that have a Transition Plan.

> ***RECOMMENDATION:*** ECWRPC should develop an inventory of local agency Transition Plans and emphasize to local agencies that they are required to maintain a Transition Plan under Federal law. Over time, ECWRPC should require that any local agency applying for or receiving funding administered by ECWRPC have a current Transition Plan, as is the case in Minnesota where the Minnesota Department of Transportation requires recipients of federal funding to have a transition plan in place or underway.

## Public Involvement as an Implementation Strategy

ECWRPC recognizes that public involvement is a way to improve the outcomes of transportation projects. It also builds public support for programs and policies to reduce pedestrian crashes. To be effective, stakeholders must feel listened to and heard.

Public involvement is a cornerstone of ECWRPC's work, and is documented in its Public Participation Plan (PPP) adopted in 2016. The PPP "establish[es] procedures that allow for, encourage, and monitor participation for all citizens in the East Central Region, including but not limited to low income and minority individuals, and those with limited English proficiency." ECWRPC also has a bicycle and pedestrian advisory committee that oversees the implementation of the Appleton TMA and Oshkosh MPO Bicycle and Pedestrian Plan. Coordination with local agencies also takes place, which frequently highlights pedestrian needs.

> ***RECOMMENDATION:*** ECWRPC will continue its public involvement strategy and continue to explore new means of engagement including social media and online forums and pop-up events that meet people where they are. ECWRPC should continue to involve pedestrian stakeholders in planning and safety efforts, as appropriate.

## Request for Proposals/Qualifications)

Including experts in pedestrian transportation planning and design on consulting teams for larger projects ensures that opportunities for making pedestrian improvements are maximized. This can be accomplished by making sure the requests for proposals or qualifications (RFPs or RFQs) that are issued by ECWRPC include a requirement for pedestrian expertise, if relevant.

> ***RECOMMENDATION:*** ECWRPC should ensure that RFP and RFQ authors include requirements for pedestrian planning or design expertise as needed.

## Ongoing Training

ECWRPC recognizes that the field of pedestrian transportation planning and design is changing rapidly as new research is completed and innovative approaches are implemented. ECWRPC staff have attended trainings and webinars related to pedestrian safety and facility design, including on STEP countermeasures, in the past.

> ***RECOMMENDATION:*** ECWRPC will continue to seek out opportunities for staff to attend trainings and webinars related to pedestrian safety, systemic safety, and, specifically, the STEP countermeasures. ECWRPC will also encourage local agency partners to attend similar trainings. Trainings should be considered an integral part of workforce development for ECWRPC.

# 5

# Pedestrian Crossing Countermeasures Toolbox

The STEP initiative promotes the following seven countermeasures to improve pedestrian safety at crossing locations:

- Crosswalk Visibility Enhancements
- Raised Crosswalks
- Pedestrian Refuge Islands
- Leading Pedestrian Intervals
- Rectangular Rapid Flash Beacons
- Pedestrian Hybrid Beacons
- Road Diets

This chapter provide examples of these effective and lower-cost countermeasures and can be deployed to improve pedestrian visibility, increase motorist yielding rates, and reduce pedestrian crashes.

## Selecting Countermeasures

The countermeasures listed in this guide can improve the visibility of crossing locations and reduce crashes, and they each address at least one additional safety concern associated with a higher risk of collision and/or severe injury. In all cases, the countermeasures, when implemented, should follow MUTCD and other relevant AASHTO, FHWA and State guidance.

Table 1 includes a comprehensive matrix and list of STEP pedestrian crash countermeasures suggested for application at uncontrolled crossing locations per roadway and traffic features. In addition, leading pedestrian intervals should be considered when evaluating signalized crossings. The countermeasures are assigned to specific matrix cells based on safety research, best practices, and established national guidelines. When a pedestrian crossing is established, the countermeasure options in the cells should be reviewed before selecting the optimal group of crossing treatments. Previously obtained characteristics such as pedestrian volume, operational speeds, land use context, and other site features should also be considered when selecting countermeasures. Table 2 highlights the specific safety issues that each countermeasure addresses, although it does not include leading pedestrian intervals. ECWRPC encourages local agencies to follow the guidance included in these tables, and reference the MUTCD and other national, State, and local guidelines when making the final selection of countermeasures.

## 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 ● 9 | ● 4 5 6 | ● 5 6 7 ● 9 | ○ 5 6 ● 9 | ● 4 5 6 7 ● 9 | ○ 5 6 7 ● 9 | ○ 5 6 ● 9 |
| 3 lanes with raised median (1 lane in each direction) | ● 2 3 4 5 | ● ● 5 7 9 | ○ ● 5 ● 9 | ○ 3 4 5 7 9 | ○ ● 5 ● 9 | ○ ● 5 ● 9 | ○ ● 4 5 7 9 | ○ ● 5 ● 9 | ○ ● 5 ● 9 |
| 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 ● 9 | ○ 3 4 5 6 7 9 | ○ ● 5 6 ● 9 | ○ ● 5 6 ● 9 | ○ ● 4 5 6 7 9 | ○ ● 5 6 ● 9 | ○ ● 5 6 ● 9 |
| 4+ lanes with raised median (2 or more lanes in each direction) | ● ● 5 7 8 9 | ● ● 5 7 8 9 | ○ ● 5 ● 8 9 | ○ ● 5 7 8 9 | ○ ● 5 ● 8 9 | ○ ● 5 ● 8 9 | ○ ● 5 ● 7 8 9 | ○ ● 5 ● 8 9 | ○ ● 5 ● 8 9 |
| 4+ lanes w/o raised median (2 or more lanes in each direction) | ● ● 5 6 7 8 9 | ○ ● 5 6 7 8 9 | ○ ● 5 6 ● 8 9 | ○ ● 5 6 7 8 9 | ○ ● 5 6 ● 8 9 | ○ ● 5 6 ● 8 9 | ○ ● 5 6 ● 7 8 9 | ○ ● 5 6 ● 8 9 | ○ ● 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 signs
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 of the Guide for Improving Pedestrian Safety at Uncontrolled Crossing Locations 'Using Table 1 and Table 2 to Select Countermeasures,' for more information about using multiple countermeasures.

** It should be noted that the PHB and RRFB are not both installed at the same crossing location.

This table was developed using information from: Zegeer, C.V., J.R. Stewart, H.H. Huang, P.A. Lagerwey, J. Feaganes, and B.J. Campbell. (2005). Safety effects of marked versus unmarked crosswalks at uncontrolled locations: Final report and recommended guidelines. FHWA, No. FHWA-HRT-04-100, Washington, D.C.; FHWA. Manual on Uniform Traffic Control Devices, 2009 Edition. (revised 2012). Chapter 4F, Pedestrian Hybrid Beacons. FHWA, Washington, D.C.; FHWA. Crash Modification Factors (CMF) Clearinghouse. http://www.cmfclearinghouse.org/; FHWA. Pedestrian Safety Guide and Countermeasure Selection System (PEDSAFE). http://www.pedbikesafe.org/PEDSAFE/; Zegeer, C., R. Srinivasan, B. Lan, D. Carter, S. Smith, C. Sundstrom, N.J. Thirsk, J. Zegeer, C. Lyon, E. Ferguson, and R. Van Houten. (2017). NCHRP Report 841: Development of Crash Modification Factors for Uncontrolled Pedestrian Crossing Treatments. Transportation Research Board, Washington, D.C.; Thomas, Thirsk, and Zegeer. (2016). NCHRP Synthesis 498: Application of Pedestrian Crossing Treatments for Streets and Highways. Transportation Research Board, Washington, D.C.; and personal interviews with selected pedestrian safety practitioners.

**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 | ✓ | | ✓ | ✓ | ✓ |

* These countermeasures make up the STEP countermeasure "crosswalk visibility enhancements." Multiple countermeasures may be implemented at a location as part of crosswalk visibility enhancements.

## Countermeasure Toolbox

The following pages describe the seven effective and lower-cost countermeasures listed in this plan and can be deployed to improve pedestrian visibility, increasing motorist yielding rates, and reduce pedestrian crashes.

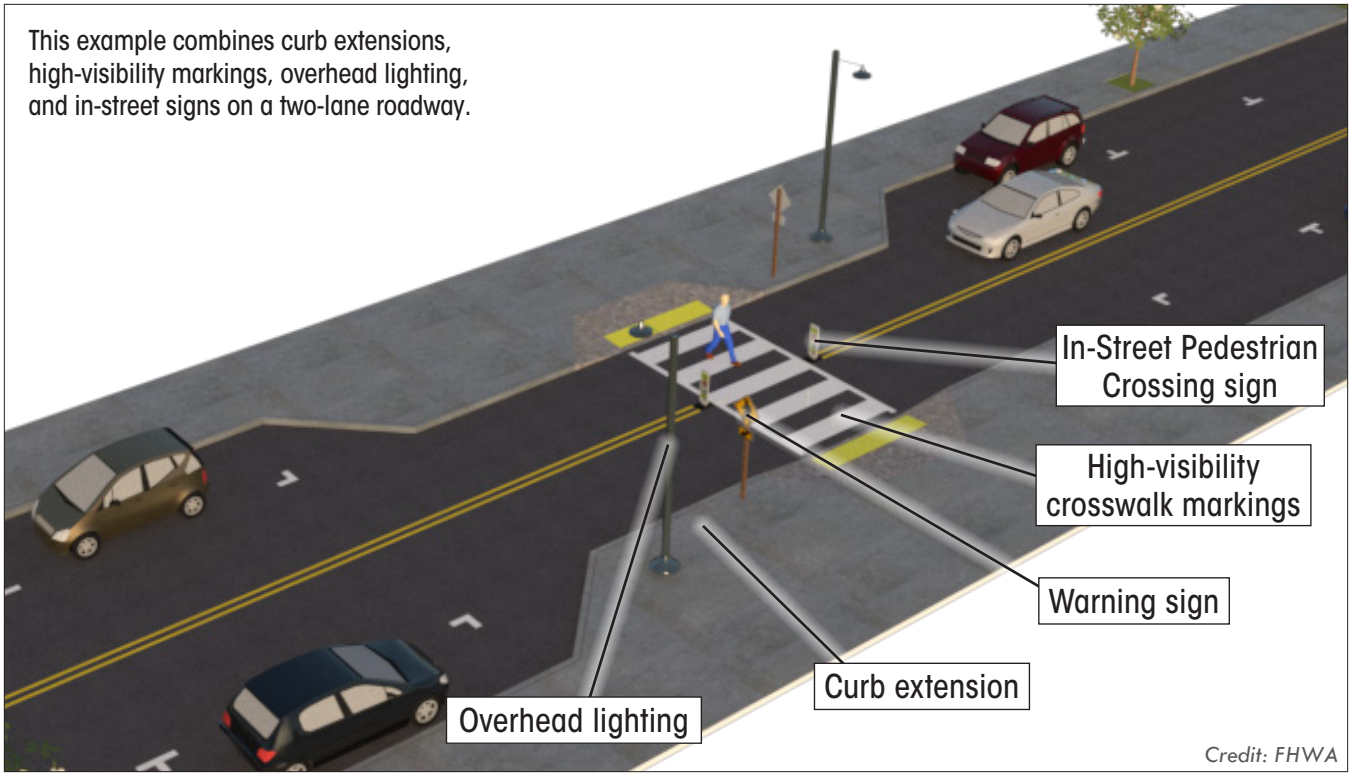
For more information about these countermeasures, please visit: https://safety.fhwa.dot.gov/ped_bike/step/resources/

## Crosswalk Visibility Enhancements

This group of countermeasures includes improved lighting, advance or in-street warning signage, pavement markings, and geometric design elements. Such features may be used in combination to indicate optimal or preferred locations for people to cross and to help reinforce the driver requirement to yield the right-of-way to pedestrians at crossing locations.

**Crosswalk visibility enhancements can reduce crashes by 23-48%**

This example combines curb extensions, high-visibility markings, overhead lighting, and in-street signs on a two-lane roadway.




*Credit: FHWA*

### Features

- High Visibility marking improves visibility of the crosswalk compared to the standard parallel lines.
- Parking restriction on the crosswalk approach improves sightlines for motorists and pedestrians.
- Advance stop or yield markings and signs reduce the risk of a multiple threat crash.
- Curb extension improves sight distance between drivers and pedestrians and narrows crossing distance.
- In street yield signs may improve driver yielding rates.

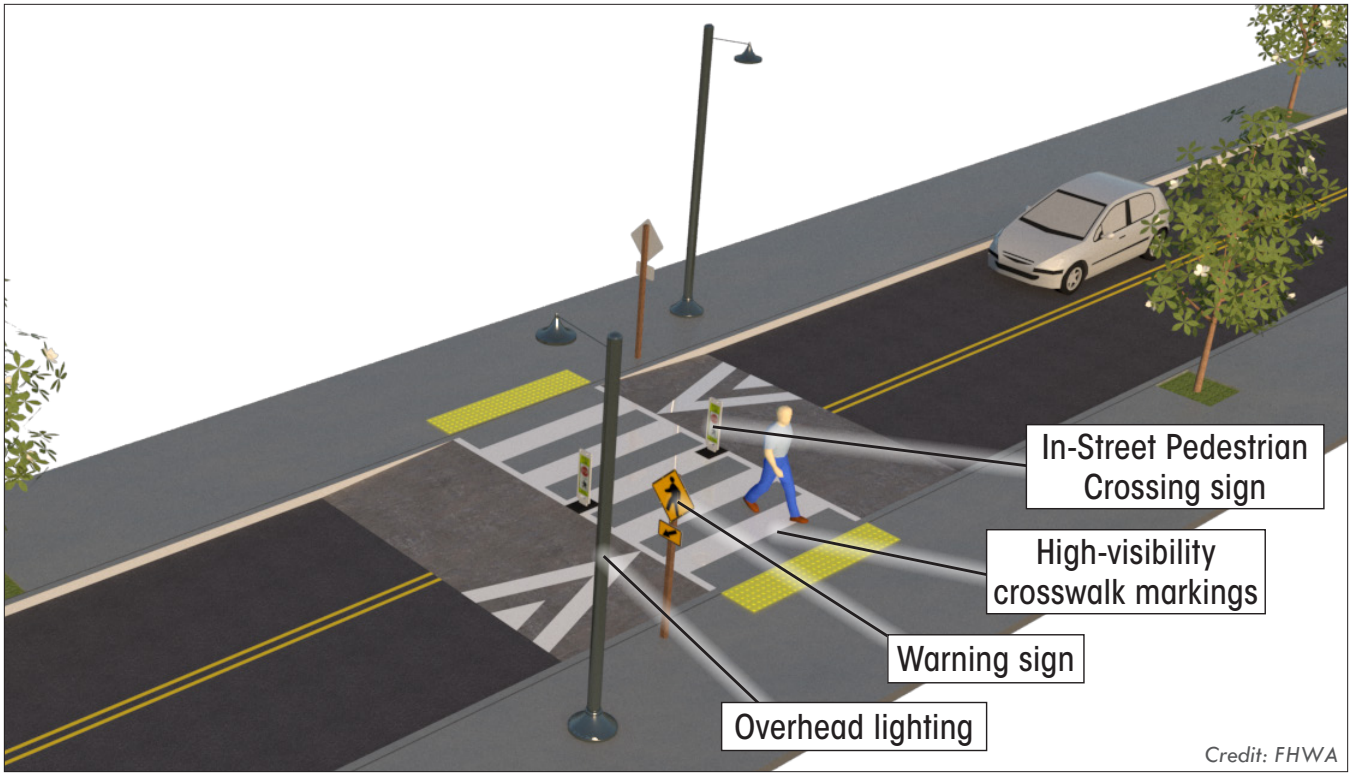
Crosswalk visibility enhancements including curb extensions and warning signs in downtown Neenah. *Credit: ECWRPC*

**Tech Sheet: https://safety.fhwa.dot.gov/ped_bike/step/docs/techSheet_VizEnhancemt2018.pdf**

## Raised Crosswalk

Raised crosswalks are ramped speed tables spanning the entire width of the roadway, often placed at midblock crossing locations. The crosswalk is demarcated with paint and/or special paving materials. These crosswalks act as traffic-calming measures that allow the pedestrian to cross at grade with the sidewalk.

**Raised crosswalks can reduce pedestrian crashes by 45%**




*Credit: FHWA*

### Features

Local and collector roads with high speeds pose a significant challenge for pedestrians crossing the roadway. A raised crosswalk can reduce vehicle speeds and enhance the pedestrian crossing environment.

» Elevated crossing makes the pedestrian more prominent in the driver's field of vision, and allows pedestrians to cross at grade with the sidewalk.

» Approach ramps may reduce vehicle speeds and improve motorist yielding.

**Often used with:**

» Crosswalk visibility enhancements

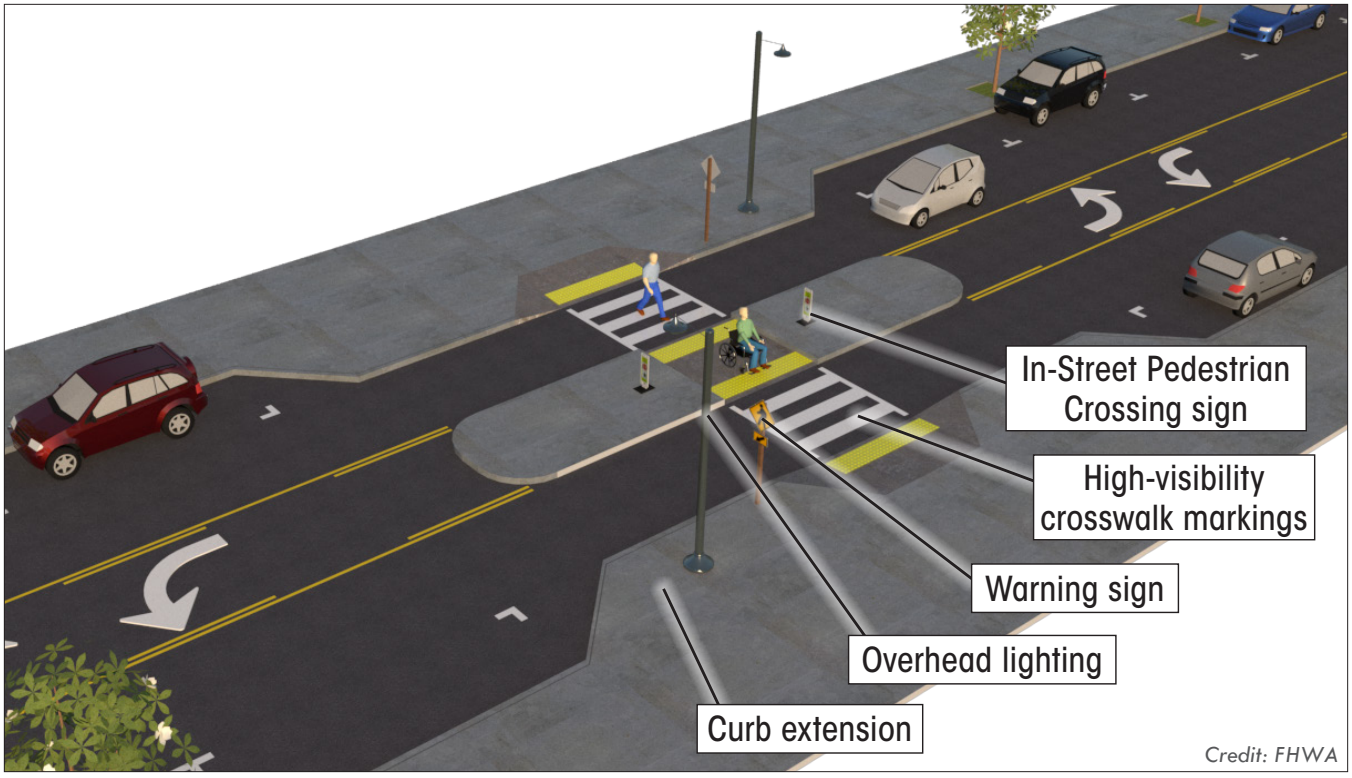
Example of a raised crosswalk in Appleton, WI.
*Credit: ECWRPC*

**Tech Sheet: https://safety.fhwa.dot.gov/ped_bike/step/docs/techSheet_RaisedCW2018.pdf**

## Pedestrian Refuge Island

A pedestrian refuge island is a median with a refuge area that is intended to help protect pedestrians who are crossing a street. A pedestrian refuge island at a midblock location or intersection allows pedestrians to focus on one direction of traffic at a time as they cross, and gives them a place to wait for an adequate gap in oncoming traffic before finishing the crossing.

**Pedestrian refuge islands can reduce pedestrian crashes by 32%**




*Credit: FHWA*

### Features

A pedestrian refuge island can improve safety and comfort by providing pedestrians with the option of waiting in the median area before beginning the next stage of the crossing.

» Median can enhance the visibility of the crossing and reduce speed of approaching vehicles.

» Refuge area provides a place to rest and reduces the amount of time a pedestrian is in the roadway.

**Often used with:**

» Crosswalk visibility enhancements

» Curb extensions (where road width allows)

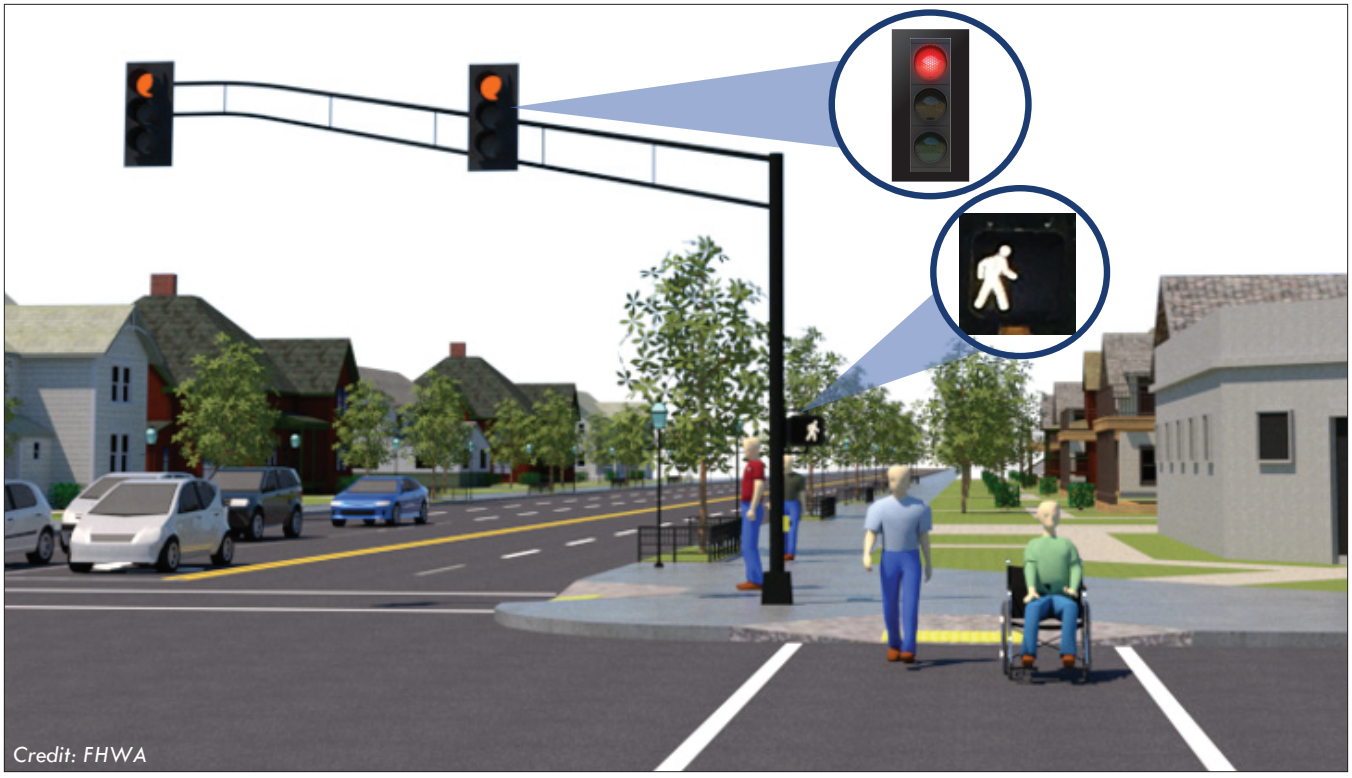
A median island at a mid-block shared use path crossing in downtown Madison. *Credit: Toole Design*

**Tech Sheet: https://safety.fhwa.dot.gov/ped_bike/step/docs/techSheet_PedRefugeIsland2018.pdf**

## Leading Pedestrian Interval (LPI)

Leading Pedestrian Intervals (LPIs) are adjustments to signal timing to increase pedestrian safety at signalized intersections. An LPI gives pedestrians a typical 3- to 7-second head start before vehicles in the parallel direction are given the green signal indication. LPIs can help reduce conflicts between pedestrians and left- or right- turning vehicles.

**LPIs can reduce pedestrian crashes by 13%**



*Credit: FHWA*

### Features

LPIs reduce conflicts between pedestrians and vehicles. LPIs improve visibility of pedestrians in the crosswalk.

» Increase likelihood of driver yielding.

» Enhanced safety for slower moving pedestrians.

**Often used with:**

» Right Turn on Red RTOR) Restrictions

» Accessible Pedestrian Signals

» Parallel Vehicular Green Extension Interval

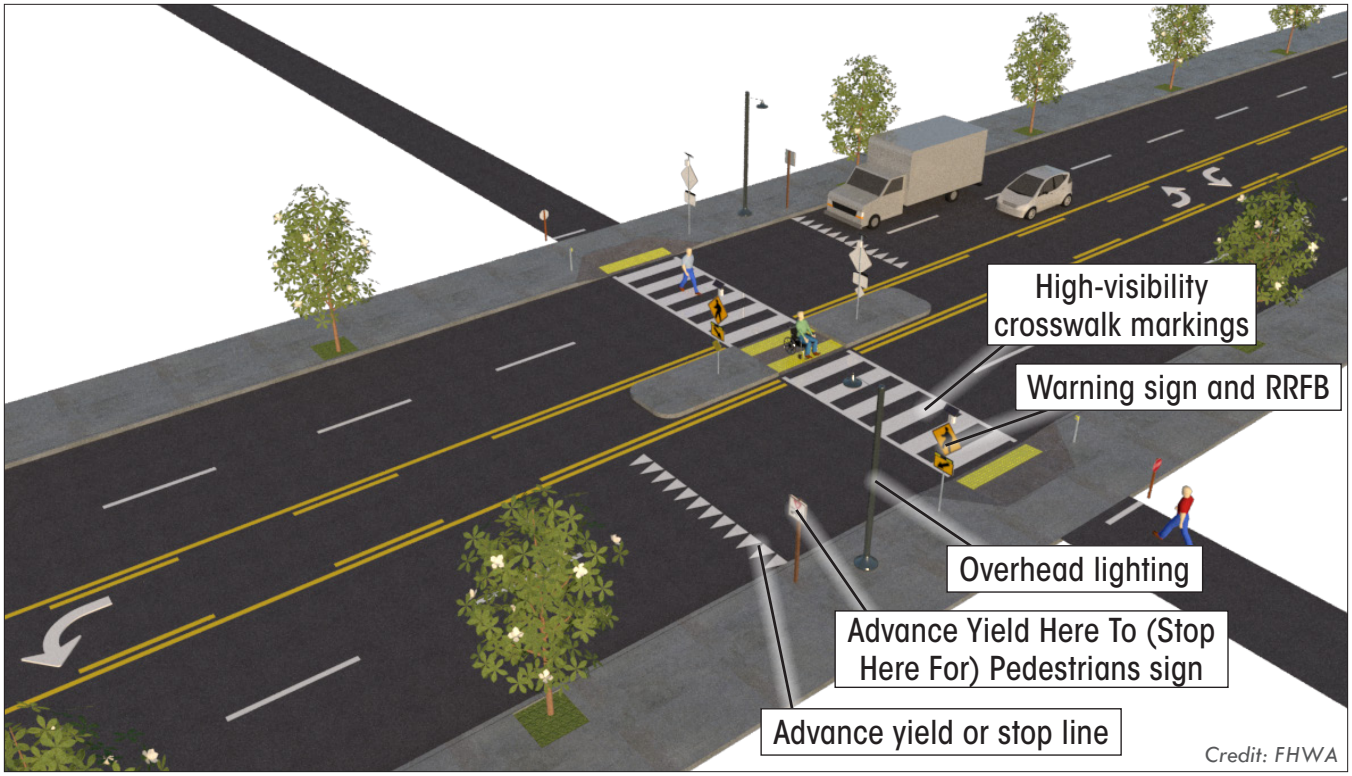
A LPI allowing pedestrians to enter the crosswalk before adjacent traffic receives a green signal. *Credit: Toole Design*

**Tech Sheet: https://safety.fhwa.dot.gov/ped_bike/step/resources/docs/fhwasa19040.pdf**

## Rectangular Rapid-Flashing Beacon (RRFB)

RRFBs are pedestrian-actuated conspicuity enhancements used in combination with a pedestrian, school, or trail crossing warning sign to improve safety at uncontrolled, marked crosswalks. The device includes two rectangular shaped yellow indications, each with an LED-array-based light source, that flash with high frequency when activated.

**RRFBs can reduce pedestrian crashes by 47%**




### Features

Multiple lanes of traffic create challenges for pedestrians crossing at unsignalized locations. RRFBs can make crosswalks and/or pedestrians more visible at marked crosswalks.

» Enhanced warning improves motorist yielding.

**Often used with:**

» Crosswalk visibility enhancements

» Pedestrian refuge island

» Advance yield markings and signs

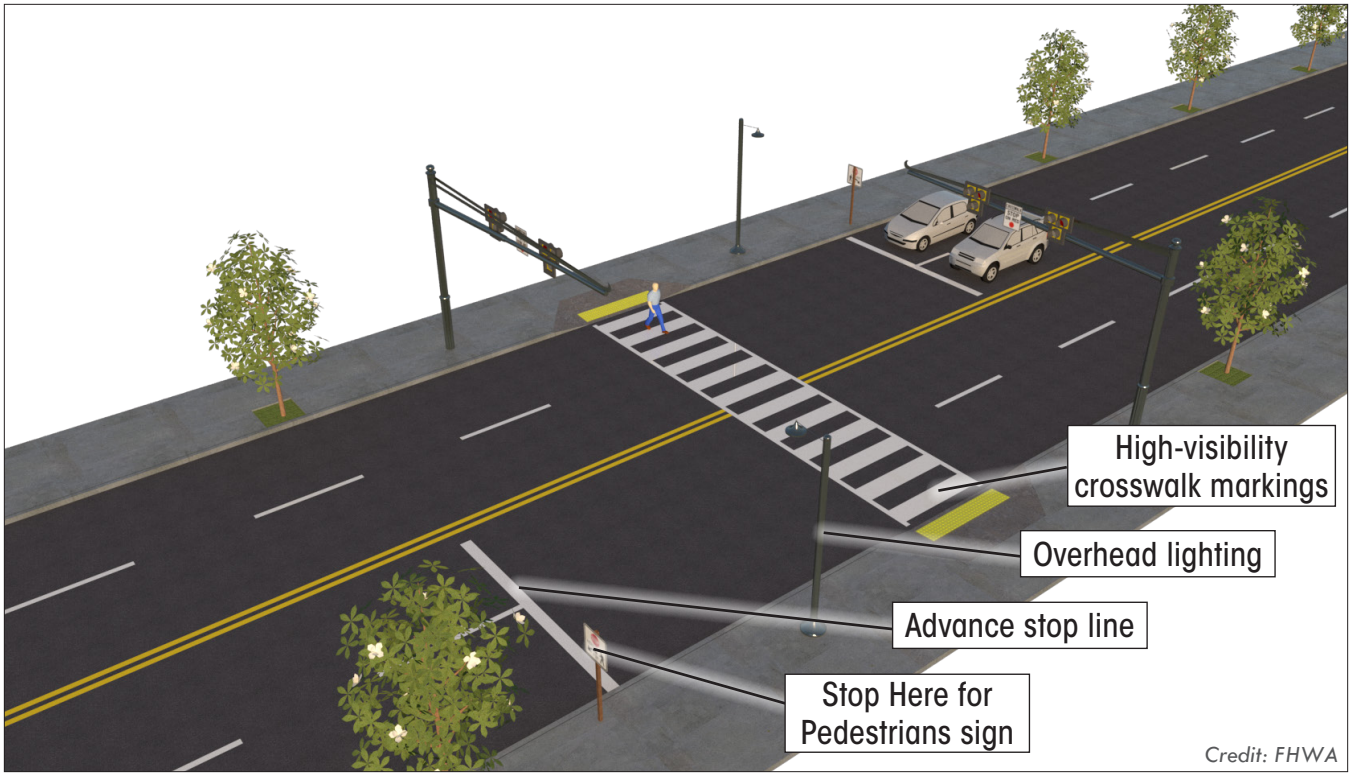
A RRFB and high visibility crosswalk markings at a crossing of the Mountain Bay State Trail in Shawano, WI. *Credit: ECWRPC*

**Tech Sheet: https://safety.fhwa.dot.gov/ped_bike/step/docs/techSheet_RRFB_2018.pdf**

## Pedestrian Hybrid Beacon (PHB)

A Pedestrian Hybrid Beacon head consists of two red lenses above a single yellow lens. Unlike a traffic signal, the PHB rests in dark until a pedestrian activates it via pushbutton or other form of detection. When activated, the beacon displays a sequence of flashing and solid lights that indicate the pedestrian walk interval and when it is safe for drivers to proceed.

**PHBs can reduce pedestrian crashes by 55%**




*Credit: FHWA*

### Features

High speeds and multiple lanes of traffic create challenges for pedestrians crossing at unsignalized locations. PHBs can warn and control traffic at unsignalized locations and assist pedestrians in crossing a street or highway at a marked crosswalk.

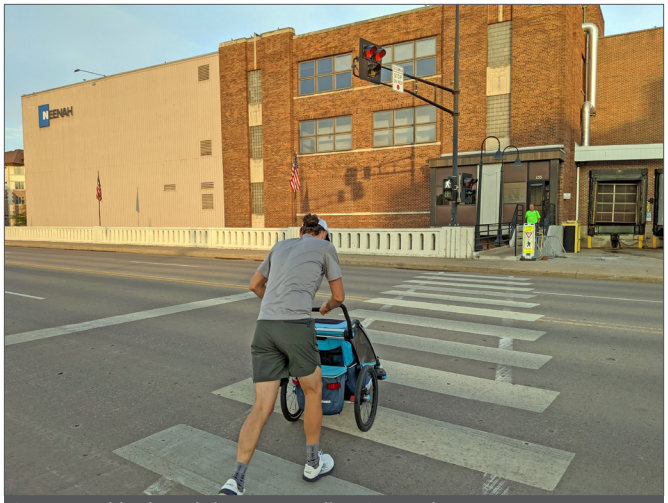
» Beacons stop all lanes of traffic, which can reduce pedestrian crashes.

**Often used with:**

» High visibility crosswalk markings

» Raised islands

» Advance yield signs and markings



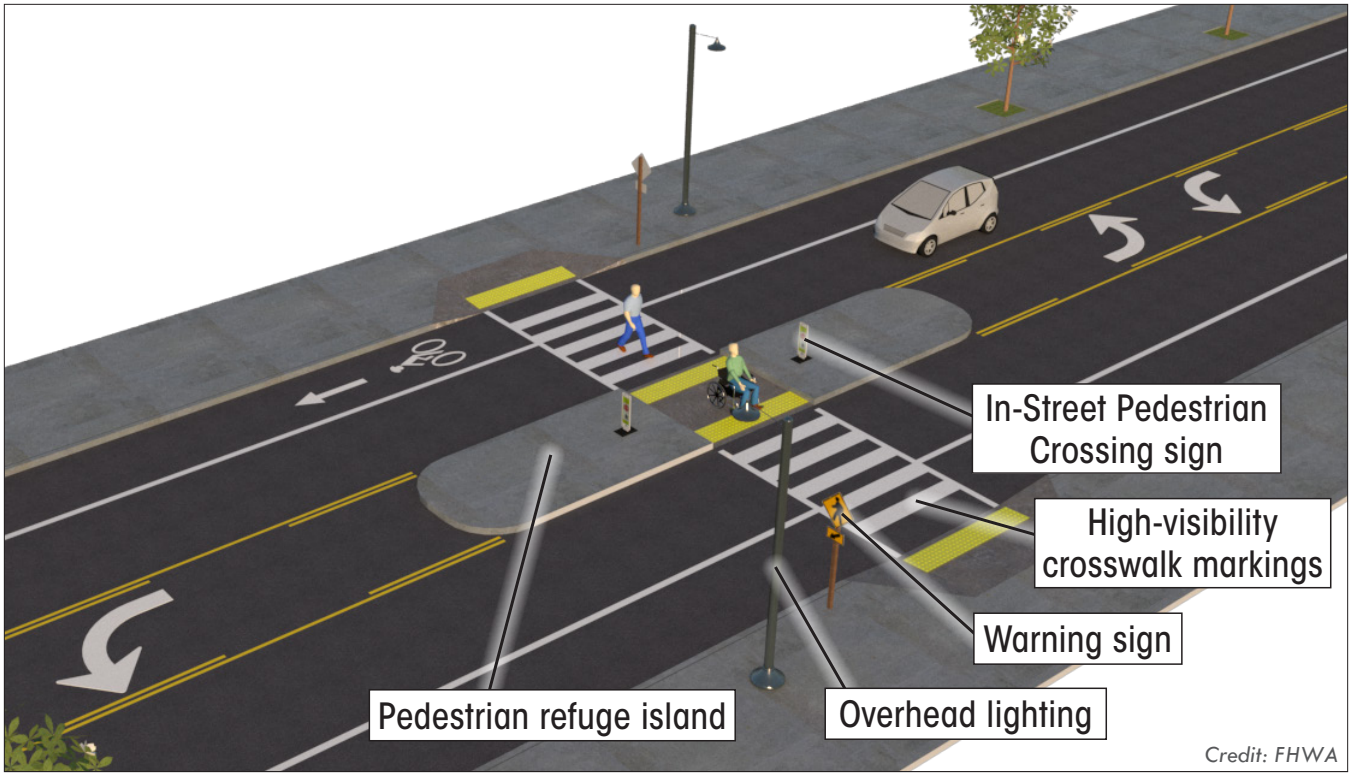
A PHB and high visibility crosswalk in Neenah.
*Credit: ECWRPC*

**Tech Sheet: https://safety.fhwa.dot.gov/ped_bike/step/resources/docs/fhwasa18064.pdf**

## Road Diet

A typical Road Diet converts an existing four-lane, undivided roadway to two through lanes and a center, two-way left turn lane. This design allows left-turning drivers to exit the traffic stream while waiting for a gap to complete their turn and frees up space that can be reallocated to other uses, including pedestrian refuge islands, crosswalk visibility enhancements, or bike lanes.

**Road Diets can reduce total crashes by 19-47%**




### Features

Multilane roads can take longer to cross and vehicle speeds may be high. Road Diets can decrease the lane crossing distance and reduce vehicle speeds.

- Reduced crossing distance and exposure
- Reduced vehicle speeds
- Promote Complete Streets
- Provide space for installing curb extensions and widening sidewalks
- Create space for bicycle, transit, and/or parking lanes

A road diet on Ahnaip Street in Menasha, WI allowed installation of bike lanes. *Credit: ECWRPC*

**Tech Sheet: https://safety.fhwa.dot.gov/ped_bike/step/docs/techSheet_RoadDiet2018.pdf**

# Appendix: CRF and CMF Summary Table

**Table 3. CRFs and CMFs by countermeasure.**

| 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 |

Source: Guide for Improving Pedestrian Safety at Uncontrolled Crossing Locations, p. 31.

[1] This category of countermeasure includes treatments which may improve the visibility between the motorist and the crossing pedestrian.

[2] Refers to pedestrian street crossing crashes, and does not include pedestrians walking along the road crashes or "unusual" crash types.

[3] The effects of high-visibility pavement markings (e.g., ladder, continental crosswalk markings) in the "after" period is compared to pedestrian crashes with parallel line markings in the "before" period.

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# Glossary

**AVERAGE ANNUAL DAILY TRAFFIC (AADT)**
The total volume of traffic passing a point or segment of a highway facility in both directions for one year divided by the number of days in the year.

**AVERAGE DAILY TRAFFIC (ADT)**
The average 24-hour volume of traffic passing a point or segment of a highway in both directions.

**COMPLETE STREETS**
Complete Streets are designed and operated to enable safe access for all users, including pedestrians, bicyclists, drivers, and transit riders of all ages and abilities. (Smart Growth America, National Complete Streets Coalition).

**CONTROLLED PEDESTRIAN CROSSING**
A pedestrian crossing where drivers are required to yield or stop by either a YIELD sign, STOP sign, traffic signal, or other traffic control device.

**CRASH MODIFICATION FACTOR (CMF)**
A multiplicative factor used to compute the expected number of crashes after implementing a given countermeasure. If available, calibrated or locally developed state estimates may provide a better estimate of effects for the state. (Crash Modification Factors Clearinghouse).

**CRASH REDUCTION FACTOR (CRF)**
The percentage crash reduction that might be expected after implementing a given countermeasure at a specific site.

**CURB EXTENSIONS**
A roadway edge treatment where a curb line is bulbed out toward the middle of the roadway to narrow the width of the street. Curb extensions are sometimes called "neckdowns."

**HIGHWAY SAFETY IMPROVEMENT PROGRAM (HSIP)**
A Federal-aid program with the purpose to achieve a significant reduction in traffic fatalities and serious injuries on all public roads, including non-state-owned roads and roads on tribal land. The HSIP requires a data-driven, strategic approach to improving highway safety on all public roads with a focus on performance. (FHWA).

**HIGH VISIBILITY CROSSWALK**
A pedestrian crossing location marked by patterns such as zebra, ladder, or continental markings as described by the MUTCD.

**LEADING PEDESTRIAN INTERVAL (LPI)**
Traffic signal timing that gives pedestrians the opportunity to enter an intersection 3-7 seconds before conflicting vehicles are given a green indication.

**MARKED CROSSWALK**
A pedestrian crossing that is delineated by white crosswalk pavement markings.

**PARKING RESTRICTION**
Prohibition of parking through a defined area and during an established time period, typically established through the removal of parking space markings and the installation of "parking prohibition" pavement markings, curb paint, and/or signs.

### PEDESTRIAN HYBRID BEACON (PHB)

A special type of hybrid beacon used to warn and control traffic at an unsignalized location to assist pedestrians in crossing a street or highway at a marked crosswalk. PHBs have a face that consists of two red lenses above a single yellow lens. Unlike a traffic signal, the PHB rests in dark until a pedestrian activates it via pushbutton or other form of detection.

### RAISED CROSSWALK

Raised crosswalks are ramped speed tables spanning the entire width of the roadway, often placed at midblock crossing locations.

### RECTANGULAR RAPID-FLASHING BEACON (RRFB)

A pedestrian-actuated conspicuity enhancement used in combination with a pedestrian, school, or trail crossing warning sign to improve safety at uncontrolled, marked crosswalks. The device includes two rectangular shaped yellow indications, each with an LED-array-based light source, that flash with high frequency when activated.

### REFUGE ISLAND

A median with a refuge area that is intended to help protect pedestrians who are crossing the road. This countermeasure is sometimes referred to as a crossing island or pedestrian island.

### ROAD DIET

A roadway reconfiguration resulting in a reduction in the number of travel lanes. The space gained by eliminating lanes is typically used for other uses and travel modes.

### ROAD SAFETY AUDIT (RSA)

A formal examination of an existing or future road or intersection by a multidisciplinary team. It qualitatively estimates and reports on potential road safety issues and identifies opportunities for improvements in safety for all road users.

### TOWARD ZERO DEATHS (TZD)

TZD is a traffic safety framework that seeks to eliminate highway fatalities by engaging diverse safety partners and technology to address traffic safety culture. (See also: Vision Zero.)

### UNCONTROLLED PEDESTRIAN CROSSING

An established pedestrian crossing that does not include a traffic signal, beacon, or Yield/Stop sign to require that motor vehicles yield/stop before entering the crosswalk.

### VISION ZERO (VZ)

Similar to TZD, Vision Zero is a vision to eliminate traffic fatalities and serious injuries within the transportation system. VZ employs comprehensive strategies to address roadway design, traffic behavior, and law enforcement.

# Resources

### EDC Guide for Improving Pedestrian Safety at Uncontrolled Crossing Locations (2018)

This guide assists state or local transportation or traffic safety departments that are considering developing a policy or guide to support the installation of countermeasures at uncontrolled pedestrian crossing locations. This document provides guidance to agencies, including best practices for each step involved in selecting countermeasures. By focusing on uncontrolled crossing locations, agencies can address a significant national safety problem and improve quality of life for pedestrians of all ages and abilities. Agencies may use this guide to develop a customized policy or to supplement existing local decision-making guidelines.

### FHWA How to Develop a Pedestrian and Bicycle Safety Action Plan (2017)

The purpose of this guide is to assist agencies in developing and implementing a safety action plan to improve conditions for bicycling and walking. The plan lays out a vision for improving safety, examining existing conditions, and using a data-driven approach to match safety programs and improvements with demonstrated safety concerns. This guide will help agencies enhance their existing safety programs and activities, including identifying safety concerns and selecting optimal solutions. It will also serve as a reference for improving pedestrian and bicycle safety through a multidisciplinary and collaborative approach to safety, including street designs and countermeasures, policies, and behavioral programs.

### NCHRP Report 803: Pedestrian and Bicycle Transportation Along Existing Roads—ActiveTrans Priority Tool Guidebook (2015)

This resource includes an interactive tool and guidance to help agencies prioritize pedestrian and bicycle improvements, including safety projects, either as standalone or incidental to a roadway project.

### FHWA Achieving Multimodal Networks: Applying Design Flexibility and Reducing Conflicts (2016)

This resource focuses on flexibility and options for the design of pedestrian and bicycle networks designed to minimize crash conflicts, including case studies to illustrate various design treatments.

### FHWA State SHSP Resources

The FHWA Office of Safety posts a link to each state's current SHSP. This website also lists noteworthy practices. Many SHSP plans provide an emphasis on pedestrians and contain goals for reducing traffic fatalities and injuries.

### FHWA HSIP Resources

The HSIP includes the projects selected for implementation, an evaluation of past projects, and an annual status report. Projects can include pedestrian safety improvement programs and projects. For example, the 2016 Oregon HSIP Annual Report details how the its All Roads Transportation Safety Program sets aside funding to address systemic pedestrian crash locations.

### State HSP Documents

NHTSA posts the states' current HSP outlining non-infrastructure strategies for improving roadway safety. A state HSP is likely to contain a pedestrian fatality and injury reduction goal, an associated performance measure, and describe non-infrastructure initiatives like enforcement and education programs. For example, Colorado DOT's 2017 HSP (called the 2017 Integrated Safety Plan) supports the Denver Police Department's "Decoy Pedestrian Program" to enforce driver yielding compliance at high-crash pedestrian crossings.

### Manual on Uniform Traffic Control Devices (MUTCD)

This manual provides transportation engineers and planners with detailed guidance for the design and application of traffic control devices, including signage, roadway markings, and intersection controls. Refer to the specific sections of the MUTCD listed in the countermeasure descriptions and consult state-level supplements for additional information.

### PEDSAFE: Pedestrian Crash Typing

PEDSAFE provides definitions for 12 key pedestrian crash types identified by the software package, the Pedestrian and Bicycle Crash Analysis Tool (PBCAT). PBCAT is still used by many agencies but may not be compatible with some current operating systems.

### NHTSA Pedestrian Safety Information

NHTSA publishes annual reports summarizing the latest pedestrian fatality statistics. These statistics are based on FARS and the reports describe pedestrian fatality trends per different socioeconomic groups and for each state.

### Walkability Checklist

This tool can be used by community leaders during a walkability audit to evaluate pedestrian infrastructure and traffic behavior.

### FHWA Model Road Safety Audit Policy (2014)

This resource outlines the steps typically taken to conduct an RSA and the roles of the stakeholders. Identifying safety issues is an element of the RSA that is accompanied by suggestions on how to enhance the specific road's safety.

### Vision Zero Network

This collaborative website posts case studies and tracks cities who are implementing Vision Zero plans or goals. The Vision Zero Network website also notes best practices by agencies who are working to eliminate traffic fatalities and serious injuries. Vision Zero goals are accompanied by policies, strategies, and target dates. For example, Columbia, Missouri's Vision Zero Action Plan contains an outreach campaign to educate pedestrians and drivers on new and potentially confusing infrastructure improvements like pedestrian hybrid beacons and enhanced pedestrian crosswalks.

### Countermeasure Selection System

This online tool includes links to research studies, crash reduction statistics, and case studies for nearly 70 pedestrian safety countermeasures. Its Countermeasure Selection Tool provides countermeasure recommendations for uncontrolled crossing locations based upon variables such as AADT, vehicle speed, and number of lanes.

### Highway Safety Manual

This manual provides detailed guidance for the collection, analysis, and evaluation of roadway crash data, as well as related CMFs and treatment selection guidance.

### FHWA Road Diet Desk Reference (2015)

This resource includes sample policy, case studies, and design guidance for agencies and decision-makers considering Road Diets. The benefits of Road Diets include reducing vehicle speeds, reducing number of lanes to cross, and allocating space for pedestrian refuge islands.

### FHWA Design Resource Index

This resource directs practitioners to the specific location of information about pedestrian and bicycle treatments or countermeasures, across various design guidelines published by organizations such as AASHTO, the Institute of Transportation Engineers, and National Association of City Transportation Officials.

### TCRP REPORT 112/NCHRP REPORT 562: Improving Pedestrian Safety at Unsignalized Crossings (2006)

This document recommends treatments to improve safety for pedestrians crossing high-volume, high-speed roadways at unsignalized intersections, with particular focus on roadways served by public transportation.

### AASHTO Guide for the Planning, Design, and Operation of Pedestrian Facilities, 1st Edition (2004)

This guide provides recommendations for the planning, design, and operation of accommodations for pedestrians on public rights-of-way. This guide also discusses the impact of land use and site design on pedestrian safety and connectivity.

### FHWA Federal-aid Program Administration

This website includes links to guidance for local and state governments administering federally-funded projects, such as those funded by HSIP or STBG.

### Pedestrian RSA Guidelines and Prompt Lists (2007)

This resource complements practices for RSAs with additional guidance and a field manual for a pedestrian-focused RSA. An RSA team will use the knowledge of a diverse team, analysis of crash data, and a site visit to identify pedestrian safety issues.

### Pedestrian RSA Case Studies (2009)

This website provides links to several examples of RSAs focused on identifying pedestrian safety risks and improvement strategies. For example, the City of Tucson, Arizona conducted an RSA of roadways with PHBs to improve the countermeasure's visibility and usability.

### FHWA Pedestrian and Bicycle Funding Opportunities Summary (2016)

This resource includes a matrix comparing eligibility of various federal transportation funding programs for different types of bicycle and pedestrian projects.

### FHWA Guidebook for Developing Pedestrian and Bicycle Performance Measures (2016)

This resource identifies a wide variety of potential metrics for setting goals, prioritizing projects and evaluating outcomes of bicycle and pedestrian plans, including plans for pedestrian safety improvements. Performance measures may include pedestrian levels of service or pedestrian fatality rates.

### NCHRP Report 841: Development of Crash Modification Factors for Uncontrolled Pedestrian Crossing Treatments (2017)

This report describes the safety benefits and CMFs for four types of pedestrian crossing treatments—rectangular rapid flashing beacons, PHBs, pedestrian refuge islands, and advance crosswalk signs and pavement markings.

### NCHRP Synthesis 498: Application of Pedestrian Crossing Treatments for Streets and Highways (2016)

This is a compilation of existing practices regarding the selection and implementation of pedestrian crossing improvements, as well as a literature review of research on more than 25 pedestrian crossing treatments.

### NHTSA "A Primer for Highway Safety Professionals" (2016)

This resource outlines a comprehensive approach to improving safety for bicyclists and pedestrians and offers a summary of the most frequently used engineering, enforcement, and education safety measures. The resource identifies how certain treatments may be placed in relation to other treatments, such as the coordinated installation of a pedestrian refuge island and lighting.

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