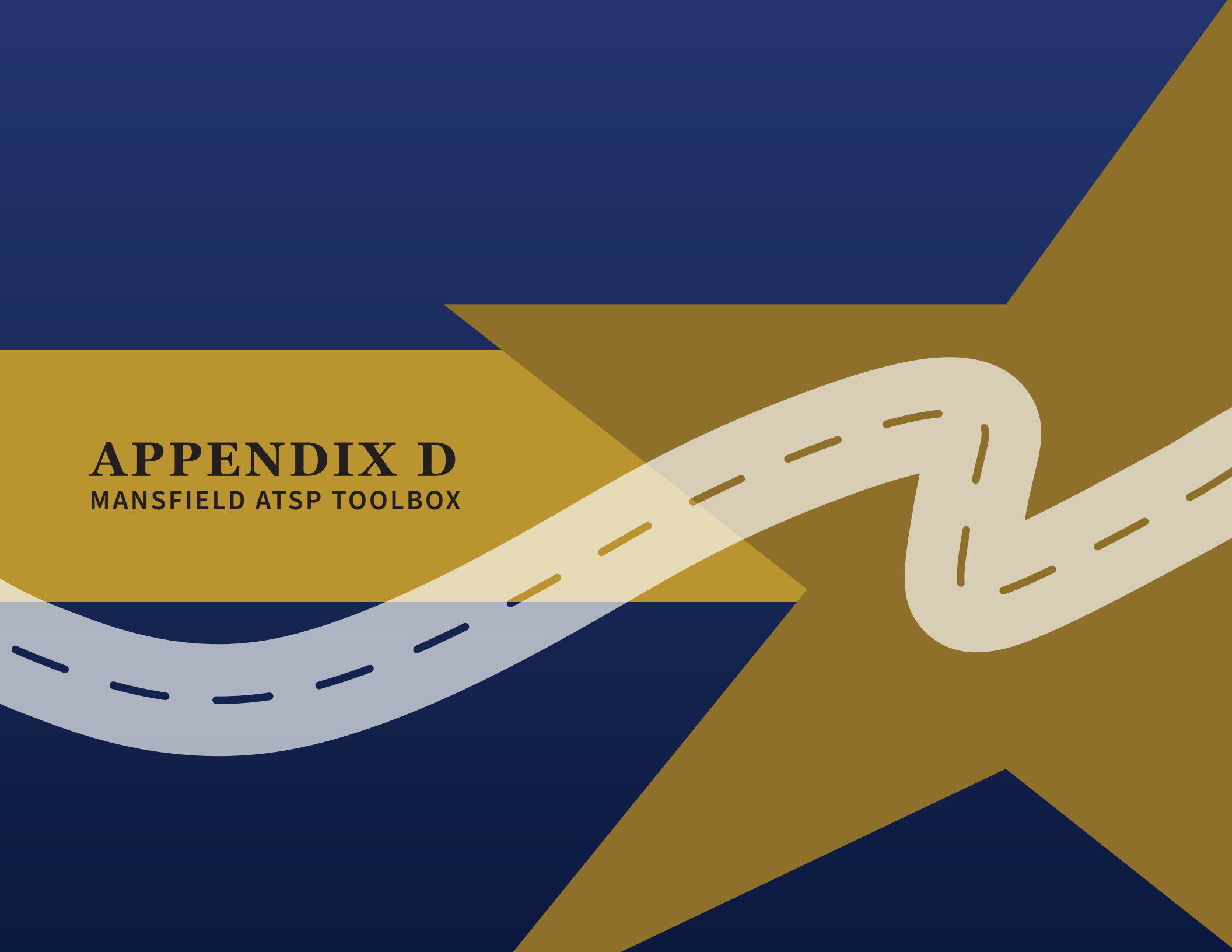


The background is a composition of large, overlapping geometric shapes in dark blue and mustard yellow. A stylized road with dashed lines runs across the lower half of the image, curving from the bottom left towards the right. The road is light blue with dark blue dashed lines, and the area above it is mustard yellow with dark blue dashed lines. The text is positioned on the left side, within the yellow area.

APPENDIX D

MANSFIELD ATSP TOOLBOX

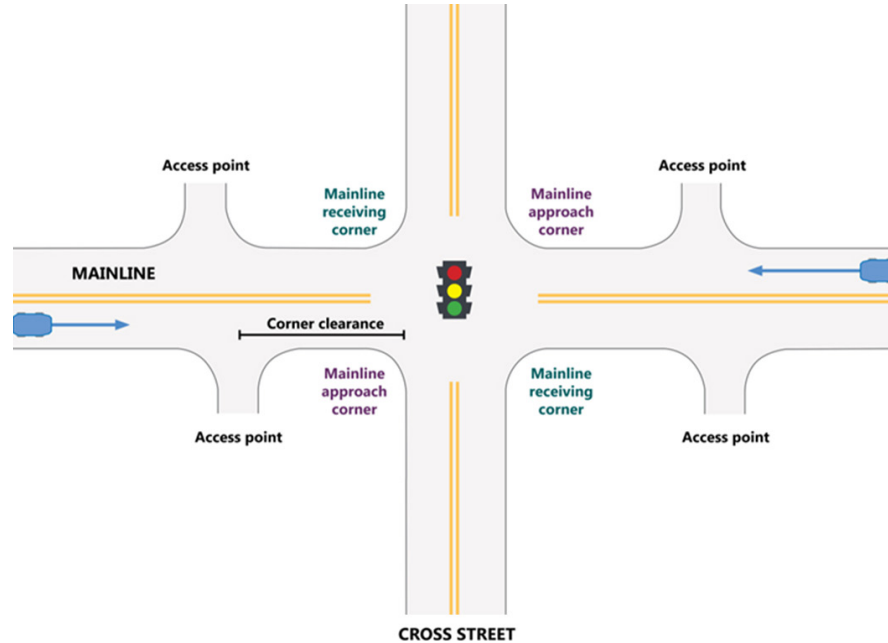


MANSFIELD ATSP TOOLBOX

TOOLBOX ITEM	TYPE	LANE DEPARTURES	INTERSECTION- RELATED	UNRESTRAINED PERSONS	IMPAIRED DRIVING	SPEED- RELATED	DISTRACTED DRIVING	BICYCLE & PEDESTRIAN
Corridor Access Management	Safety		●					
Dedicated Left- and Right-Turn Lanes at Intersections	Safety		●					
Enhanced Delineation for Horizontal Curves	Safety	●				●	●	
Longitudinal Rumble Strips and Stripes on Two-Lane Roads	Safety	●		●	●	●	●	
Median Barriers	Safety	●		●	●	●		
Reduced Left-Turn Conflict Intersections	Safety		●					
Retroreflective Backplates	Safety		●		●			
Roadway Reconfiguration	Safety	●	●	●		●		
Roundabouts	Safety		●			●		
Systemic Application of Multiple Low-Cost Countermeasures at Stop-Controlled Intersections	Safety		●	●		●	●	
Wider Edge Lines	Safety	●			●			
Yellow Change Intervals	Safety		●			●		
Multi-use Trails	Active Transportation							●
Pedestrian Amenities	Active Transportation							●
Shared Bicycle Routes	Active Transportation			●	●	●	●	●



TOOLBOX ITEM	TYPE	LANE DEPARTURES	INTERSECTION- RELATED	UNRESTRAINED PERSONS	IMPAIRED DRIVING	SPEED- RELATED	DISTRACTED DRIVING	BICYCLE & PEDESTRIAN
Sidepaths	Active Transportation							●
Two-Way Cycle Tracks	Active Transportation			●	●	●	●	●
Appropriate Speed Limits	Both			●		●		
Bicycle Boxes	Both		●				●	●
Bicycle Crossings / Conflict Markings	Both		●					●
Bicycle Signals	Both		●					●
Bike Lanes	Both			●	●	●	●	●
Crosswalk Visibility Enhancements	Both		●				●	●
Curb Extensions	Both		●			●		●
Intersection Daylighting	Both		●			●	●	●
Leading Pedestrian Interval	Both		●					●
Lighting	Both	●	●					●
20 MPH Speed Zones	Both			●		●		●
Medians and Pedestrian Refuge Islands	Both			●	●	●		●
Pedestrian Hybrid Beacons	Both					●	●	●
Rectangular Rapid Flashing Beacons (RRFB)	Both		●					●
Sidewalks	Both							●



Source: FHWA

CMF

0.93

CMF ID

442

CRASH TYPE

All

SAFETY EMPHASIS AREAS

High-Crash Intersection

Corridor Access Management



DESCRIPTION

» Access management refers to the design, application, and control of entry and exit points along a roadway, including intersections and driveways serving adjacent properties. Strategies may include intentional spacing of intersections, utilizing protected turn lanes, and minimizing conflict points along a corridor. Driveways located too close to an intersection can increase the number of intersection crashes. Therefore, closing, relocating, or condensing driveways can reduce fatal and injury crashes along arterials by 25–31%.



BENEFITS

- » Conflict points are reduced when consolidating driveways to reduce the overall number of turning movements.
- » Narrower driveways can slow drivers as they turn, allowing for better sight distance.
- » Right-in / right-out helps reduce potential conflicts at intersections by restricting left turning movements.

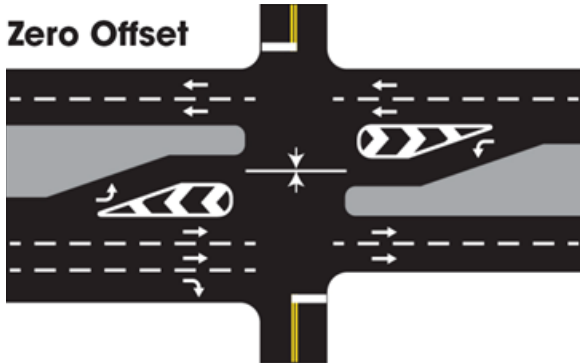


DESIGN CONSIDERATIONS

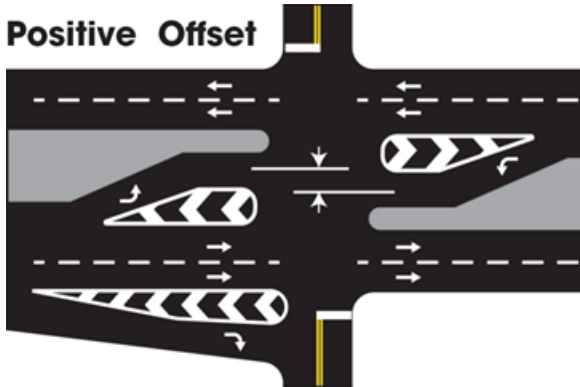
- » Consider turning volumes and alternate access points.
- » In high pedestrian areas, commercial driveways should include crosswalks.
- » Driveway widths should be the minimum needed for entering and exiting vehicles.
- » Sidewalks should be continuous across driveways.



Zero Offset



Positive Offset



Source: FHWA

Dedicated Left- and Right-Turn Lanes at Intersections



DESCRIPTION

» Auxiliary turn lanes, either for left or right turns, provide physical separation between turning traffic that is slowing or stopped and adjacent through traffic at intersection approaches. Turn lanes are designed to allow for deceleration before a turn, as well as for the storage of vehicles waiting to complete a turn. Installing dedicated right-turn lanes can reduce crashes by 14–26%, while dedicated left-turn lanes can reduce crashes by 28–48% (FHWA). Additionally, incorporating offsets at left- and right-turn lanes can increase safety benefits by improving sight distance for approaching vehicles that conflict with the turning movement.

CMF

0.520 – 0.880
Offset: 0.644

CMF ID

260, 289, 285
Offset: 6096

CRASH TYPE

All; Offset: All Severe
Crashes (Fatal, Serious
Injury, Minor Injury)

SAFETY EMPHASIS AREAS

High-Crash Intersection





Source: Adobe Stock

Enhanced Delineation for Horizontal Curves



DESCRIPTION

» Enhanced delineation for horizontal curves involves various strategies before and within the curves to improve road safety. Pavement markings, such as center and edge lines, help drivers maintain their lane position, while in-lane curve warning markings signal an approaching curve on two-lane roads with solid center lines. Retroreflective stripes on signposts reflect light back to drivers, increasing visibility at night. Delineators, retroreflective devices on posts or roadside barriers, help drivers align themselves with the road. Chevron signs placed on the outside of curves indicate the road's direction. Enhanced visibility can be achieved by upgrading to larger, retroreflective signs and using dynamic curve warnings that detect vehicle speeds and alert drivers if they exceed the safe limit for a curve. Sequential dynamic chevrons, a type of advanced delineation, have been shown to reduce fatal and injury crashes by up to 60%, according to the FHWA. Collectively, these strategies enhance driver awareness and response, particularly in low visibility conditions or during inclement weather.

CMF

0.750 – 0.820

CMF ID

2439, 2431, 2432

CRASH TYPE

Run off road

SAFETY EMPHASIS AREAS

Distracted Driving
Lane Departures
Speed-Related





Source: Adobe Stock

Longitudinal Rumble Strips and Stripes on Two-Lane Roads



DESCRIPTION

» Longitudinal rumble strips are milled installations on the ground that alert drivers through vibration and sound. These rumble strips are placed on the shoulder, edge, or near/at the centerline of an undivided roadway. They are intended to warn drivers whose vehicles are crossing centerlines by creating noise and vibration. Longitudinal rumble strips can result in a 66% reduction in crashes.

CMF

0.66

CMF ID

138

CRASH TYPE

All

SAFETY EMPHASIS AREAS

Impaired Driving
Unrestrained Persons
Lane Departures

Speed-Related
Bicycle & Pedestrian





Source: Adobe Stock

Median Barriers



DESCRIPTION

» Median barriers are longitudinal barriers that separate opposing traffic on a divided highway, designed to redirect vehicles striking either side of the barriers. These barriers can be cable barriers, concrete barriers, or metal-beam guardrails. They significantly reduce head-on crashes and fatalities by physically separating the two sides of the road. According to data, median barriers installed on rural four-lane freeways lead to a 97% reduction in cross-median crashes.

CMF

0.29

CMF ID

2219

CRASH TYPE

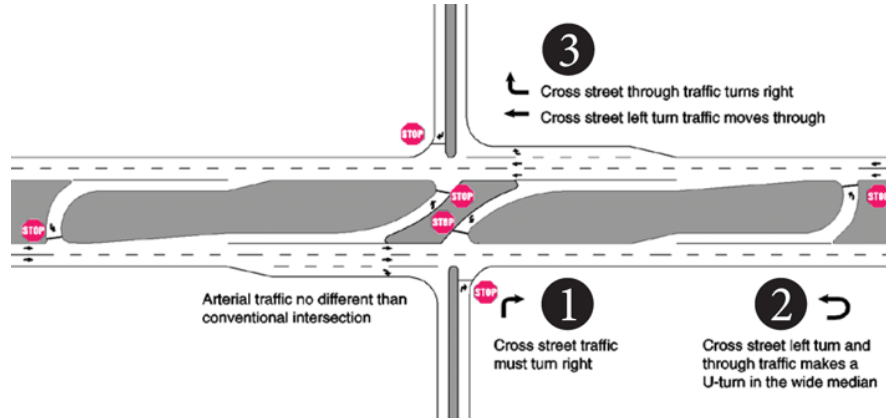
All

SAFETY EMPHASIS AREAS

Impaired Driving
Unrestrained Persons
Lane Departures

Speed-Related
Bicycle & Pedestrian





Source: FHWA

Reduced Left-Turn Conflict Intersections



DESCRIPTION

» Reduced left-turn conflict intersections (RCUT) are geometric designs that alter left-turn movements. These intersections simplify drivers' decision-making and minimize the potential for higher-severity crash types, such as head-on and angle collisions. Variations on the U-turn are typical in these intersections. One type, the RCUT intersection, has been shown to lead to a 54% reduction in fatal and injury crashes.

CMF

0.7029

CMF ID

10867

CRASH TYPE

All

SAFETY EMPHASIS AREAS

High-Crash Intersection





Source: Adobe Stock

Retroreflective Backplates



DESCRIPTION

» A retroreflective backplate is a backplate framed with a 1-to-3 inch yellow retroreflective border around traffic signals. This design improves the visibility of the signal by creating an illuminated border that provides greater contrast with the surrounding area. Retroreflective backplates enhance visibility in both daytime and nighttime conditions. The safety benefits of retroreflective backplates include a 15% reduction in total crashes.

CMF

0.85

CMF ID

1410

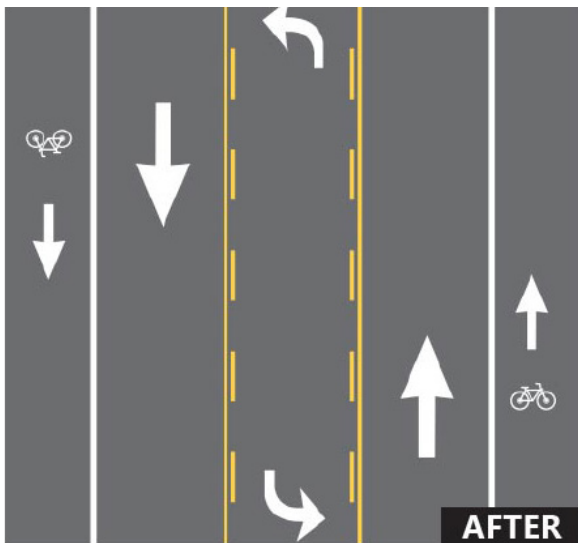
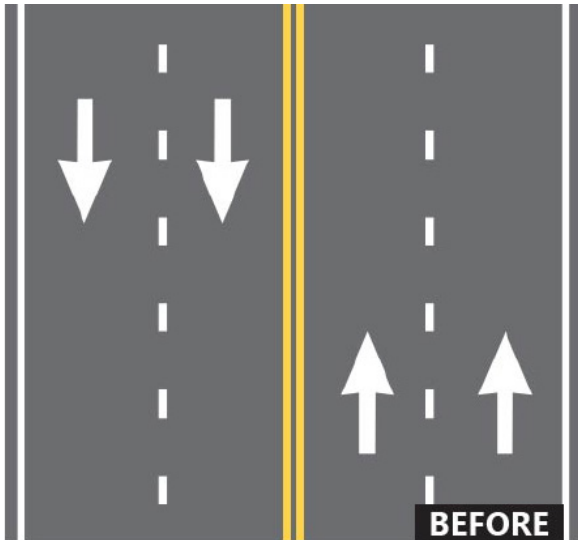
CRASH TYPE

All

SAFETY EMPHASIS AREAS

Impaired Driving
High-Crash Intersection





Source: FHWA

Roadway Reconfiguration



DESCRIPTION

» A roadway reconfiguration, sometimes referred to as road diets, usually involves converting an existing four-lane roadway into a three-lane roadway. Implementing roadway reconfiguration can improve safety, calm traffic, provide better mobility and access for all users, and enhance the quality of life in a community. Roadway reconfigurations can make roadway more complete by adding bike lanes or areas for pedestrians. In the context of a four-lane to three-lane reconfiguration, a road segment can experience up to a 47% reduction in total crashes.

CMF

0.812

CMF ID

5554

CRASH TYPE

All

SAFETY EMPHASIS AREAS

High-Crash Intersection
Unrestrained Persons
Lane Departures

Speed-Related
Bicycle & Pedestrian





Source: Adobe Stock

CMF

0.22

CMF ID

226

CRASH TYPE

All

SAFETY EMPHASIS AREAS

High-Crash Intersection

Roundabouts



DESCRIPTION

» A roundabout is a circular intersection where traffic flows continuously around a central island. Vehicles entering a roundabout must yield to traffic already circulating within the circle, promoting a smooth, efficient, and safe flow of traffic with fewer conflict points compared to traditional intersections. Roundabouts are designed to improve safety, reduce congestion, and enhance traffic flow. Converting a signalized intersection to a roundabout can result in a 78% reduction in fatal and injury crashes.



BENEFITS

- » Improves flow of traffic lengthen amount of time pedestrians are in intersections.
- » Improves safety by eliminating left turn crashes and reducing vehicle speeds.



DESIGN CONSIDERATIONS

- » Roundabouts work best where the traffic flows are balanced on all approaches.
- » Where there are high pedestrian volumes, Rapid Rectangular Flashing Beacons (RRFBs).
- » Larger crosswalk widths should be considered.
- » Traffic circles work best in primarily residential areas where daily vehicle volumes for all approaching legs of the intersection are less than 3,500, with speeds under 30 mph.
- » Crosswalks should be marked to clarify where pedestrians should cross.





Source: Adobe Stock

Systemic Application of Multiple Low-Cost Countermeasures at Stop-Controlled Intersections



DESCRIPTION

» This system approach to stop-controlled intersection safety involves deploying a package of multiple low-cost countermeasures, including enhanced signage and pavement markings at intersections. These various countermeasures increase driver awareness and recognition of intersections and potential conflicts. Implementing low-cost countermeasures at stop-controlled intersections can reduce fatal and injury crashes by 10% across all locations, types, and areas.

CMF

0.853

CMF ID

8870

CRASH TYPE

Nighttime

SAFETY EMPHASIS AREAS

Distracted Driving
High-Crash Intersection

Unrestrained Persons
Speed-Related





Source: Adobe Stock

Wider Edge Lines



DESCRIPTION

» Edge lines are pavement markings at the edge of travel lanes, designed to help drivers clearly identify the road alignment ahead. To improve safety, designers can increase the width of edge lines from the minimum normal width of four inches to a maximum normal width of six inches. Wider edge lines enhance the visibility of travel lane boundaries compared to traditional edge lines. They can reduce fatal and injury crashes on rural freeways by up to 22%.

CMF

0.635

CMF ID

4734

CRASH TYPE

All

SAFETY EMPHASIS AREAS

Impaired Driving
Lane Departures





Source: Adobe Stock

Yellow Change Intervals



DESCRIPTION

» The yellow clearance interval is the time the yellow indication signal is displayed following a green light signal. Red light running is a leading cause of crashes and fatalities at intersections. Properly timing the yellow signal allows drivers to stop safely without accelerating through the yellow-to-red light transition. A well-timed yellow clearance interval helps reduce crashes by signaling that the green phase has ended and the red phase is next, promoting appropriate speed management at signalized intersections. The safety benefits include a 36–50% reduction in red light running when timed appropriately.

CMF

0.92

CMF ID

380

CRASH TYPE

All

SAFETY EMPHASIS AREAS

High-Crash Intersection
Speed-Related





Source: Adobe Stock

Multi-use Trails



DESCRIPTION

- » Multi-use trails offer a low-stress facility, separate from motor vehicles, for cyclists, pedestrians, and other active users.



BENEFITS

- » Provides an all ages and abilities facility and may promote functional, recreational, and tourism-based transportation benefits.



DESIGN CONSIDERATIONS

- » 10 foot minimum width is recommended, 12–14 feet for heavy use areas.
- » On heavy use trails, may be beneficial to add a center stripe to encourage safe delineation between users.



Source: Adobe Stock

Pedestrian Amenities



DESCRIPTION

- » Pedestrian amenities including street furnishings, landscaped area, parklets, wayfinding and lighting are all important features of a safe, equitable community. These amenities can include benches, bicycle racks, bollards, art, trash cans, trees, greenery, public space additions, signage, lighting, and more.



BENEFITS

- » Help establish a unique corridor identity and boost economic vitality.
- » Trees improve safety, as they create a physical barrier between vehicles and sidewalks.
- » Creates an opportunity for improved aesthetics, increased comfort and foot-traffic, nearby business performance, and street safety.
- » Increases people's confidence, safety and comfort



DESIGN CONSIDERATIONS

- » The design and placement should take aesthetics, visual identity, function, pedestrian mobility, and road safety into account.
- » Should not block the pedestrian path.
- » Parklets should have vertical elements that make them visible to traffic, such as flexible posts or bollards
- » Prioritize pedestrian lighting in dark areas and high-priority locations, such as schools, community centers, hospitals, parks, transit stops, and commercial centers.





Source: Adobe Stock

Shared Bicycle Routes



DESCRIPTION

- » Shared lanes and routes are bicycle facilities where cyclists may legally share the road with motorized vehicles. Shared lanes offer a lower level of comfort for users as they do not provide any separation from motorists.



BENEFITS

- » Encourages people riding bicycles to position themselves safely within the travel lane.
- » Alerts motor vehicle drivers to the potential presence of people riding bicycles and encourages safe passing.



DESIGN CONSIDERATIONS

- » Most applicable on roadways with very low traffic volumes and speeds around or below 20 mph.
- » Pavement markings on the roadway are needed to identify the shared nature.
- » Facility should be accompanied by traffic calming treatments to maintain lower vehicle speeds and volumes.



Source: pedbikeimages.org | Matthew Rufo

Sidepaths



DESCRIPTION

- » Sidepaths are separated facilities located adjacent and parallel to roadways, offering two-way travel for both cyclists and pedestrians.



BENEFITS

- » Provides an environment more tailored to users of all ages and abilities than on-street bicycle lanes or paved shoulders.



DESIGN CONSIDERATIONS

- » The minimum design width is 10 feet with a recommended 2 feet clearance from sign posts or vertical elements.
- » A minimum 5 feet separation from the roadway is recommended.
- » Most applicable adjacent to high speed and/or high volume roadways (traffic volumes over 4,000, unless speeds are over 40 mph, then also appropriate on lower volume roadways).





Source: Adobe Stock

Two-Way Cycle Tracks



DESCRIPTION

- » A separated bicycle lane exclusively for cyclists that allows two-way travel on one side of the street, physically delineated from traffic by a vertical element.



BENEFITS

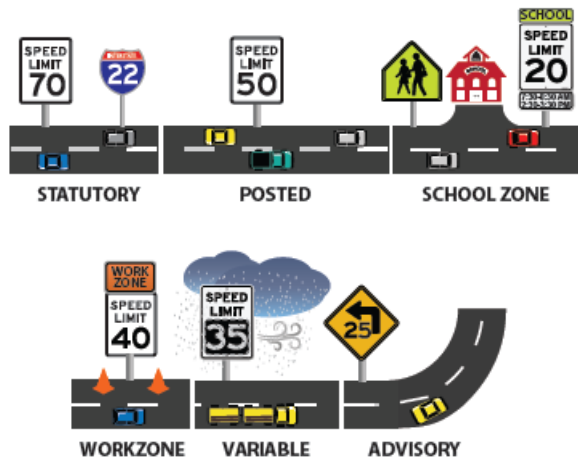
- » Improves connectivity when applied on one way streets.
- » May also be applied where there isn't enough room on both sides of the street for individual, one-way facilities.
- » Offers additional safety benefits for people riding bicycles on streets that are high stress due to high vehicle volumes, fast speeds or high parking turnover.
- » Appeals to those of all ages and abilities as a higher comfort facility than a conventional bicycle lane.



DESIGN CONSIDERATIONS

- » Best applied in locations with few driveway openings.
- » A minimum of 8 feet is needed for a two-way cycle track (4 feet lanes in each direction); 12 feet where bicycle volumes are high. A 3 foot buffer is desirable.
- » Most applicable on roads with traffic volumes of 3,000 and above, or those roadways with a speed limit of 25 mph or above, even if traffic volumes are lower than 3,000





Source: FHWA

Appropriate Speed Limits



DESCRIPTION

» Agencies with the authority to set speed limits can establish reduced speed zones based on various roadway factors. Roadway safety experts agree that speed control is one of the most important methods for reducing fatal and serious injury crashes. A driver traveling at 30 miles per hour who hits a pedestrian has a 20% chance of killing or seriously injuring them. By reducing the speed limit by just 10 miles, at 20 miles per hour, that percentage drops to 8%.

CMF

0.95

CMF ID

6885

CRASH TYPE

All

SAFETY EMPHASIS AREAS

Unrestrained Persons
Speed-Related
Bicycle & Pedestrian





Source: pedbikeimages.org | Toole Design Group

Bike Boxes



DESCRIPTION

» A bicycle box is a space at the front of a lane at an intersection that allows cyclists to position themselves safely ahead of vehicles when stopped at a red light. Two-stage turn queue boxes help cyclists safely navigate multi-lane signalized intersections, facilitating left turns from right-side bicycle facilities or vice versa.



BENEFITS

- » Increase the visibility of people riding bicycles at intersections while also giving them priority in traffic flow.
- » Reduce the amount of delay for people riding bicycles by giving them a head start to travel through the intersection.
- » Two-stage turn queue boxes reduces turning conflicts between people riding bicycles and people driving vehicles.



DESIGN CONSIDERATIONS

- » Bicycle boxes are typically 10–16 feet long
- » Queue boxes are most applicable at intersections with high numbers of people riding bicycles, particularly those with frequent left turns by people riding bicycles and right turns by people driving cars.



Source: pedbikeimages.org | Alessandro Figueroa

Bicycle Crossings / Conflict Markings



DESCRIPTION

- » Colored markings are installed to facilitate safe and direct travel through intersections. They are placed at locations of potential conflict between cyclists and drivers to enhance visibility.



BENEFITS

- » Can reduce motorist/cyclist conflicts and raises awareness about potential conflict zones, including through intersections, at driveways, and at cross streets.
- » Promotes motorist yielding behavior and helps to minimize conflicts.



DESIGN CONSIDERATIONS

- » Conflict markings typically are dashed when bicycle lanes are painted and solid when bicycle lanes are unpainted.
- » Markings should match the width of the receiving bicycle lane.





Source: pedbikeimages.org | Toole Design Group

Bicycle Signals



DESCRIPTION

- » Bicycle signals are devices installed at signalized intersections to indicate bicycle signal phases and implement bicycle-specific timing strategies.



BENEFITS

- » Separates bicycles from conflicting motor vehicle, streetcar, light rail, or pedestrian movements.
- » Provides priority to bicycle movements at intersections.
- » Potential to improve operations and reduce conflicts for all modes.



DESIGN CONSIDERATIONS

- » Should only be used in combination with an existing conventional traffic signal.





Source: Adobe Stock

CMF

0.468

CMF ID

11296

CRASH TYPE

Vehicle/Bicycle

SAFETY EMPHASIS AREAS

Unrestrained Persons
Impaired Driving
Speed-Related
Distracted Driving
Bicycle & Pedestrian

Bike Lanes



DESCRIPTION

» A bike lane is a designated area of the roadway reserved for bicycles, typically marked with pavement markings and signage. Bike lanes provide a specific space for bicyclists, enhancing safety by minimizing interactions with vehicles and encouraging more people to choose bicycling as their mode of transportation. There are various types of bike lanes that can be installed. The FHWA's Bikeway Selection Guide and the Incorporating On-Road Bicycle Network into Resurfacing Projects documents help agencies determine the most beneficial facility based on roadway and land use context. In urban settings, bike lanes can reduce crashes by up to 49% for total crashes on 4-lane undivided collectors and local roads or 30% for total crashes on 2-lane undivided collectors and local roads (FHWA).



BENEFITS

- » Creates a designated space for bicycle travel and increases separation from motorists.
- » People riding bicycles can continue riding at a comfortable speed, even as vehicular traffic slows down in adjacent lanes.
- » Buffered bicycle lanes provide additional passing space between people riding bicycles.



DESIGN CONSIDERATIONS

- » Recommended on streets where the speed limit is 25–40 mph and traffic volumes are less than 9,000.
- » Recommended to be 6 feet or greater in width.
- » A solid white line (typically 6–8 inches wide) delineates the separation between the bicycle and vehicle lane.
- » Bike lane symbols and signage indicate the lane's purpose and discourage illegal parking.
- » When placed adjacent to parking, increase the buffer width or add additional buffer to reduce the risk of door zone conflict.
- » The buffer itself may consist solely of two white lanes or include crosshatching between them.





Source: Adobe Stock

CMF

0.732

CMF ID

8967

CRASH TYPE

All

SAFETY EMPHASIS AREAS

Intersection Related
Distracted Driving
Bicycle & Pedestrian

Crosswalk Visibility Enhancements



DESCRIPTION

» This includes High Visibility Crosswalks, Raised Crosswalks, Mid-Block Crosswalks and Raised Intersections. High Visibility Crosswalks are highly reflective crosswalk markings are installed in patterns (e.g., bar pairs, continental, ladder) that are more visible to both drivers and pedestrians from a greater distance compared to traditional transverse line crosswalks. Raised Crosswalks are ramped speed tables spanning the entire width of the roadway act both as a traffic calming measure and allow pedestrians to cross at the same grade as the sidewalk. Mid-block crossings install a safe crossing mid-block between intersections encourages people to cross the street at a predictable location. Medians or safety islands create a 2-stage crossing for pedestrians, making it easier and safer. Raised intersections reduce vehicle speeds and increase pedestrian visibility.



BENEFITS

- » Can reduce vehicle speed.
- » Increases pedestrian visibility as they enter crosswalks.
- » Raised crosswalks and intersections being at-grade with the connecting sidewalks also improves functionality and accessibility.



DESIGN CONSIDERATIONS

- » Crosswalks do not need to be marked unless they are not at grade with the sidewalk, however, ADA-compliant ramps and detector strips are still required.
- » Near schools or high pedestrian areas, ladder crosswalks are preferred.
- » For multi-lane roadway mid-block crossings where vehicle volumes are more than 10,000, a marked crosswalk alone is typically not sufficient and traffic control is necessary.





Source: pedbikeimages.org | Dan Burden

Curb Extensions



DESCRIPTION

- » Curb extensions, also known as bulb outs, extend the curb line at intersections using paint and flexible delineators or concrete construction to visually and physically narrow the intersection.



BENEFITS

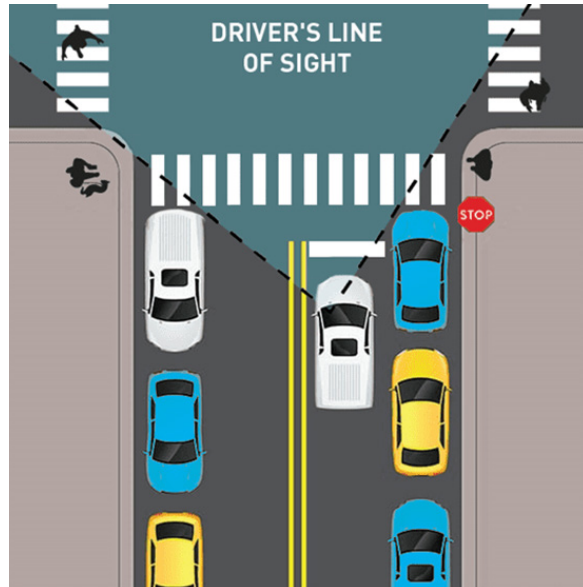
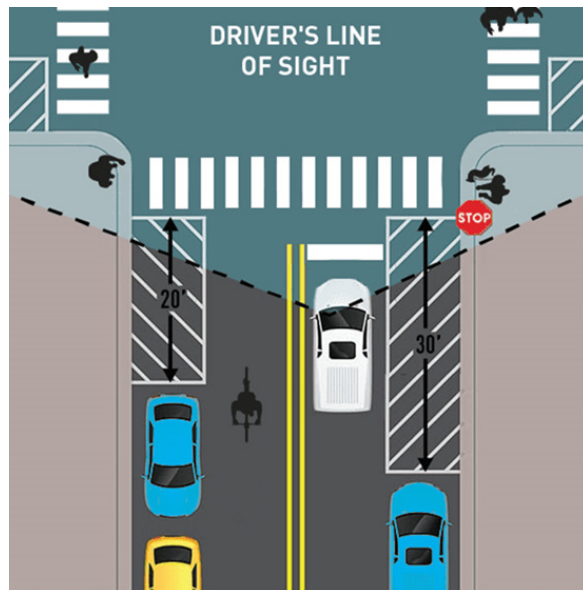
- » Reduces pedestrian crossing distance.
- » Narrows the travel way for vehicles, potentially lowering vehicle speeds.
- » Offers opportunities for community placemaking by providing space for public art within the extended area.



DESIGN CONSIDERATIONS

- » The right-turn wheel path of the design vehicle is crucial in determining the size and shape of the curb extension.
- » Can be constructed with low-cost materials such as paint, flex posts, and rubber speed cushions.



**Before Daylighting****After Daylighting**

Intersection Daylighting



DESCRIPTION

- » Removing vehicle parking within 20–25 feet of intersections improves visibility for drivers, making it easier to see pedestrians crossing.



BENEFITS

- » Enhances visibility of pedestrians, cyclists, and drivers in approaching vehicles.
- » Can create space for curb extensions or bike racks.



DESIGN CONSIDERATIONS

- » Sight line standards for intersections should be based on target speeds, rather than 85th-percentile design speeds.
- » Daylight intersections by removing parking within 20–25 feet of the intersection.
- » Position street trees 3 feet from the curb return and 5 feet from the nearest stop sign.
- » Ensure major intersections are well-lit to maintain pedestrian visibility.

Source: SDOT





Source: Kimley-Horn

CMF

0.87

CMF ID

9918

CRASH TYPE

Vehicle/Pedestrian

SAFETY EMPHASIS AREAS

High-Crash Intersection
Bicycle & Pedestrian

Leading Pedestrian Interval



DESCRIPTION

» A leading pedestrian interval (LPI) gives pedestrians a head start of three to seven seconds to begin crossing the street before vehicles receive a green light. This increases pedestrian visibility by establishing their presence in the crosswalk before vehicles can turn right or left, thereby reducing conflicts between vehicles and pedestrians. An LPI also assists pedestrians who may need more time to cross the street. Implementing an LPI can result in a 10% reduction in pedestrian-vehicle crashes at intersections.



BENEFITS

- » Enhances the visibility of pedestrians in the intersection and reinforces their right-of-way over turning vehicles.
- » Has been shown to reduce pedestrian-vehicle crashes as much as 60%.



DESIGN CONSIDERATIONS

- » Clearance time is generally based on a pedestrian walking speed of one meter per second applied to the total crossing distance.
- » Providing frequent refuge or time the walk signal to allow for a slower walking speed.





Source: Adobe Stock

Lighting



DESCRIPTION

» Adequate lighting is essential to enhance roadway safety for all users. Lighting not only improves safety but also provides personal security benefits for non-vehicle users traveling along and across the roadways. Increased lighting can be implemented at intersections or along corridors. Lighting fixtures can take any forms from LED lights seen on interstates to more decorative ones.

CMF

0.68

CMF ID

7776

CRASH TYPE

All

SAFETY EMPHASIS AREAS

High-Crash Intersection

Lane Departure

Bicycle & Pedestrian





Source: Adobe Stock

20 MPH Speed Zones



DESCRIPTION

- » Implementing a 20 mph speed limit on low-traffic streets where drivers are likely to encounter pedestrians and cyclists.



BENEFITS

- » Supports Vision Zero initiatives by reducing the risk of serious injury or fatal crashes.
- » A driver traveling at 20 miles per hour has only a 5% chance of causing serious injury or death to a pedestrian in the event of a collision.



DESIGN CONSIDERATIONS

- » Posted speed limits are often aligned with the legislative statutory speed limit.
- » Local jurisdictions have the authority to set non-statutory speed limits or designate reduced speed zones.
- » Non-statutory speed limits must be based on an engineering study conducted according to the Manual on Uniform Traffic Control Devices (MUTCD) guidelines and engineering judgment.





Source: pedbikeimages.org | Dan Burden

CMF

0.58

CMF ID

10985

CRASH TYPE

All

SAFETY EMPHASIS AREAS

Impaired Driving
Unrestrained Persons
Speed-Related
Bicycle & Pedestrian

Medians and Pedestrian Refuge Islands



DESCRIPTION

» Medians in urban and suburban areas can be defined by pavement markings, raised areas, or islands to separate motorized and non-motorized road users. They may also serve as a refuge for pedestrians. According to the FHWA, medians with marked crosswalks can result in a 46% reduction in pedestrian crashes. Pedestrian refuge islands within medians provide a safe place for pedestrians to pause when crossing busy roads and can reduce pedestrian crashes by 56%. These combined features enhance overall safety and accessibility for pedestrians.



BENEFITS

- » Median refuge islands improve safety for both uncontrolled and controlled crossings.
- » At uncontrolled crossings, pedestrians can utilize a median refuge island to cross in two stages when traffic gaps would otherwise be insufficient.
- » Allows pedestrians to go at a slower pace when crossing



DESIGN CONSIDERATIONS

- » Consider needs of design vehicle (passenger car, bus, or truck), as well as Americans with Disabilities Act (ADA) requirements for the refuge space (4 to 8 feet recommended).
- » Can be constructed with low-cost materials such as paint, flex posts, and rubber speed cushions.





Source: Adobe Stock

CMF

0.453

CMF ID

9020

CRASH TYPE

Vehicle/Pedestrian

SAFETY EMPHASIS AREAS

Distracted Driving
Speed-Related
Bicycle & Pedestrian

Pedestrian Hybrid Beacons



DESCRIPTION

» A Pedestrian Hybrid Beacon (PHB) is a traffic control device designed to help pedestrians safely cross higher-speed roadways at midblock crossings and uncontrolled intersections. The traffic device remains dark until activated by a user wanting to cross. Once activated, the signal cycles to yellow and the red during the walk phase.



BENEFITS

- » PHBs help pedestrians cross high volume and high speed roadways where insufficient gaps in traffic may exist.
- » Can reduce pedestrian crashes by 55%.



DESIGN CONSIDERATIONS

- » PHBs are a candidate treatment for roads with three or more lanes that generally have traffic volumes above 9,000.
- » Strongly recommended for all midblock and intersection crossings where the roadway speed limits are equal to or greater than 40 mph.
- » Intended for installation at midblock locations, but can be installed at intersections.





Source: Kimley-Horn

CMF

0.31

CMF ID

11158

CRASH TYPE

Vehicle/Pedestrian

SAFETY EMPHASIS AREAS

High-Crash Intersection
Bicycle & Pedestrian

Rectangular Rapid Flashing Beacons (RRFB)



DESCRIPTION

» A rectangular rapid flashing beacon (RRFB) is a pedestrian-activated traffic control device installed at crosswalks to enhance visibility and alert drivers to the presence of pedestrians. When activated, the RRFB emits a rapid, alternating pattern of flashing lights, alerting oncoming drivers to yield to pedestrians crossing the street. According to the FHWA, RRFBs can achieve motorist yielding rates as high as 98% at marked crosswalks, regardless of speed limits, crossing distances, and the number of travel lanes.



BENEFITS

» Enhanced visibility for active users while crossing.
» RRFBs have shown to improve yielding rates of people driving by up to 98%.



DESIGN CONSIDERATIONS

» Effective at multi-lane crossings with speed limits less than 40 mph and roadways with traffic volumes up to 15,000, depending on the number of lanes and posted speed.
» Placed on both ends of a crosswalk. If the crosswalk contains a pedestrian refuge island, an RRFB should be placed to the right of the crosswalk and on the median.
» RRFBs can draw power from standalone solar panel units, but may also be wired.





Source: Adobe Stock

CMF

0.598

CMF ID

11246

CRASH TYPE

Vehicle/Pedestrian

SAFETY EMPHASIS AREAS

Bicycle & Pedestrian

Sidewalks



DESCRIPTION

» Sidewalks are designated pathways alongside roads or streets intended for pedestrian use. They provide a safe, separate space for pedestrians, away from vehicle traffic. Sidewalks enhance pedestrian safety by reducing the risk of collisions with vehicles, promoting walking as a mode of transportation, and offering accessible routes for people of all ages and abilities. According to the FHWA, sidewalks can contribute to an 89% reduction in crashes involving pedestrians walking along active roadways.



BENEFITS

- » Enhanced pedestrian comfort, increased walking, especially in mixed-use areas
- » Support local communities and increase economic vitality
- » Increase safety by providing buffered space for pedestrians
- » Pedestrian Walkways can be constructed with low-cost materials (paint, flex posts, and rubber speed cushions)



DESIGN CONSIDERATIONS

- » 7 feet is a preferred width in high pedestrian activity areas.
- » Roadway width
- » Traffic volumes and speeds
- » Drainage needs
- » Impacts to on-street parking
- » Slopes
- » Location and number of driveways



