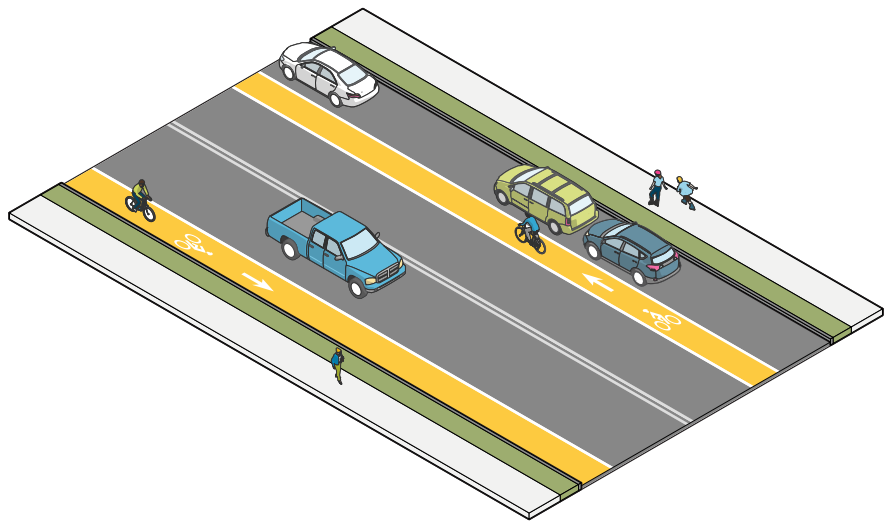


Conventional Bike Lane



Purpose

Provides a dedicated on-street space for bicyclists, outside of the motor vehicle travel lane.

Description

A dedicated space on a roadway for bicyclists to travel in the same direction as motor vehicle traffic. Conventional bike lanes are installed using striping, pavement markings, and signage identifying the dedicated space.

Primary Modes



Estimated Cost



Timeline



Safety Benefits

- Creates dedicated space for bicyclists separate from motor vehicles.
- Indicates the presence of bicyclists.
- Allows for safe passing of bicyclists by motorists.

Applicable Street Types

- Collector
- Local

Other Location Guidance

- Conventional bike lanes are appropriate where a separated bike facility is infeasible. In situations where this is not the case, a buffered or separated bike facility should be considered.
- Most appropriate on streets where motor vehicle volumes are between 3,000 and 9,000 vehicles per day.

Design Guidance and Considerations

- To maintain sight distances, particularly at driveways, may require a reduction in on-street parking.
- Provide sufficient width for bicyclists to avoid parked vehicles and potential “dooring”.
- Provide sufficient width for adequate passing space between motor vehicles and bicyclists.

- A conventional bike lane should be a minimum of 5 feet wide, 6 feet is preferable.
- Can be used on a one, or two-way street.

Expected Crash Reduction

58% reduction in bicyclist-motor vehicle crashes. (Abdel-Aty, 2014).

Systemic Safety Potential

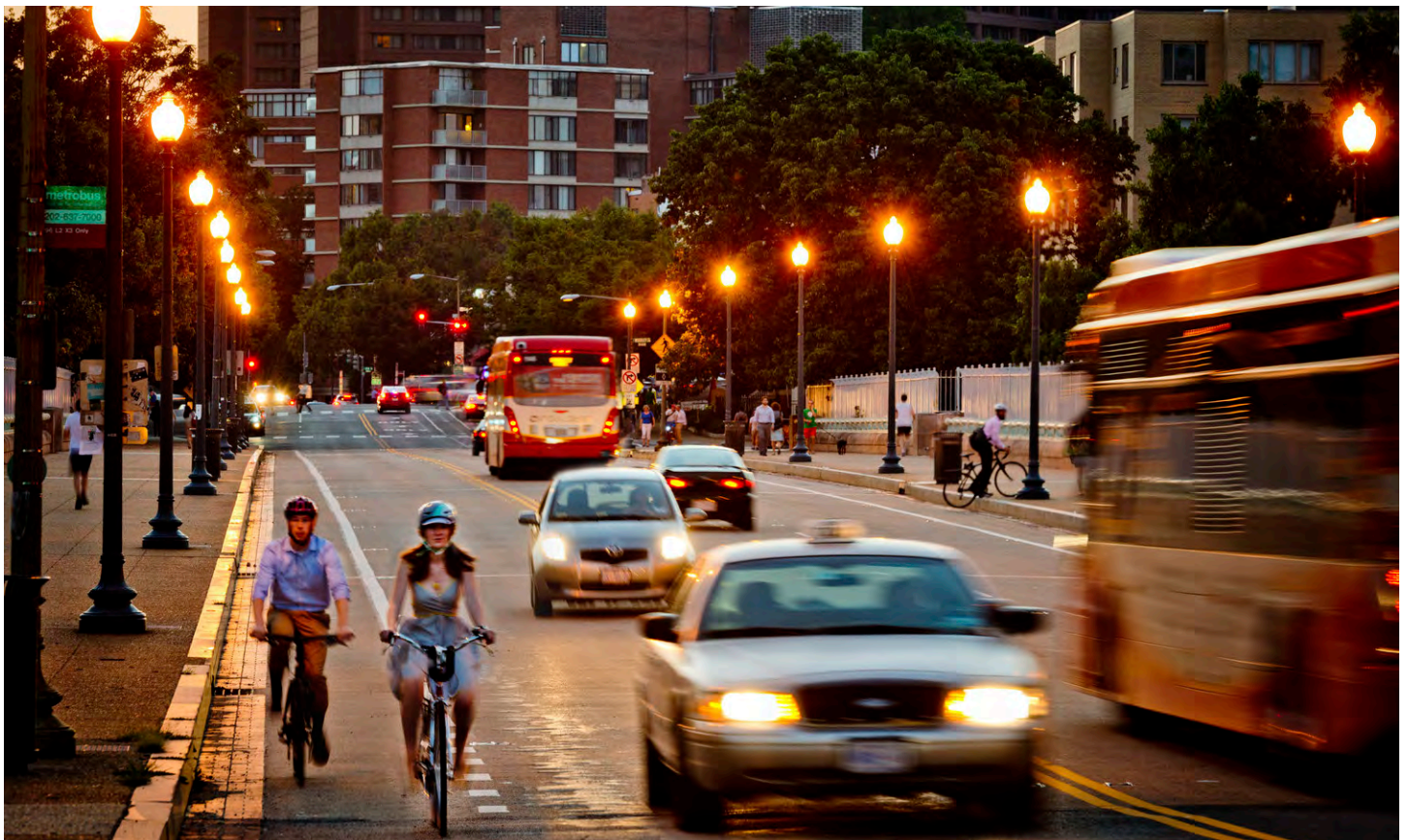
Typically appropriate as a spot treatment. In many areas, where motor vehicle volumes are high, additional separation from motor vehicles is appropriate. Where volumes are low, other traffic calming measures may be more appropriate.

Additional Information

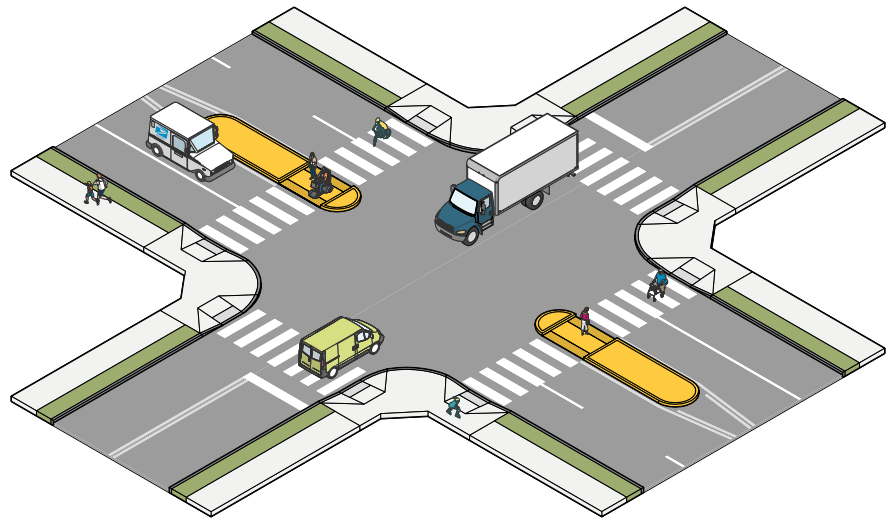
[BIKESAFE Bicycle Safety Guide and Countermeasure Selection System](#)

[FHWA Bikeway Selection Guide](#)

[NACTO Urban Bikeway Design Guide](#)



Crossing Island



Purpose

Improves safety and comfort of pedestrian crossings by providing a safer waiting area for pedestrians caught in the middle of a wide street when a signal changes, and may help to reduce motor vehicle speeds at pedestrian crossings.

Description

A pedestrian crossing island is typically a raised median with space for pedestrians to wait safely while crossing multi-lane, wide streets. It can be used on a variety of streets but is most often used on wider arterial roadways where multiple lanes create intimidating pedestrian crossings. In short-term applications, paint and bollards may be used to create a crossing island.

Primary Modes



Estimated Cost



Timeline



Safety Benefits

- May reduce motor vehicle speeds and turning speeds at pedestrian crossings.
- Increases visibility of pedestrians to motorists.
- Provides space for slower pedestrians to wait while crossing wide streets.
- Allows pedestrians to cross one direction of travel and fewer lanes at a time.

Applicable Street Types

- Arterial
- Collector

Other Location Guidance

- Appropriate at midblock or intersection crossings.
- Most useful at intersections of multi-lane roadways, or uncontrolled crossings.
- May also be applied at uncontrolled crossings where there is an insufficient gap in traffic for pedestrians to cross the full roadway.

Design Guidance and Considerations

- Crossing islands should be at least 6 feet wide, 8-10 feet is preferred.
- Ideally, refuge areas buffering a crossing island are at least 40 feet long to better protect pedestrians. This space may also allow for additional landscaping, including low plantings or trees with high canopies, and stormwater management opportunities.
- Cut-throughs or ramps are required for crossing islands. Their width should match the width of the crosswalk.

- Crossing islands at intersections should have a “nose” extending beyond the crosswalk to ensure drivers do not enter the median area.
- Mark with high-visibility crosswalk markings.
- At mid-block locations install advance stop lines.
- At mid-block locations MD MUTCD requires additional warnings signs.
- May be combined with curb extensions to limit on-street parking at crossings and reduce pedestrian crossing distance.

Expected Crash Reduction

32% reduction in pedestrian-involved crashes (Zegeer, 2017).

Systemic Safety Potential

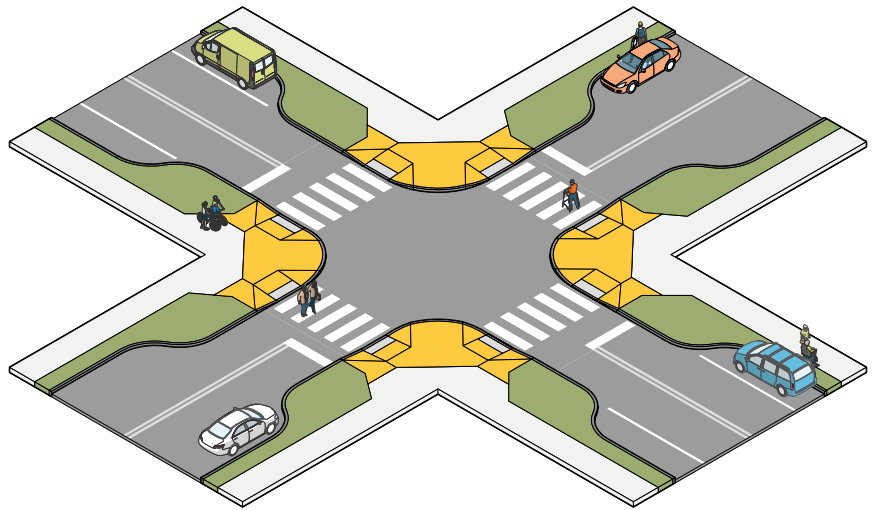
Can be applied systemically to mid-block crossing and intersections along multi-lane roadways.

Additional Information

[PEDSAFE Pedestrian Safety Guide and Countermeasures Selection System](#)
[NACTO Urban Street Design Guide](#)



Curb Extension/Bulb Out



Purpose

Increases visibility, reduces turning speed of motor vehicles, encourages pedestrians to cross at designated locations, shortens crossing distance, and increases sightlines by preventing vehicles from parking at corners.

Description

Curb extensions, also referred to as bulb-outs, create an extension of the sidewalk or curb into the parking lane to reduce the available street width. By both visually and physically narrowing the roadway, pedestrian and motorists have an increased ability to see one another. This also encourages motorists to travel slower at intersections with curb extensions that reduce the intersection turning radius. Curb extensions may also include improved landscaping and stormwater management features where appropriate.

Primary Modes



Estimated Cost



Timeline



Safety Benefits

- Reduce turning speeds of motor vehicles.
- Prevent parking in or close to a crosswalk.
- Increase pedestrian visibility.
- Shorten pedestrian crossing distance.

Applicable Street Types

- Local
- Collector

Other Location Guidance

- Curb extensions can be built in existing parking lanes or where a wide shoulder exists.
- Useful at entrances to lower speed areas.
- When used to reduce corner radii, can be used at most intersections where truck volumes are low.

Design Guidance and Considerations

- Should not extend more than 6 feet from the curb.
- Turning radii of larger vehicles needs to be considered when designing curb extensions.
- Radii should be designed for turning speed of 15 mph or less.
- A too small curb radius may cause motor vehicles to drive onto the curb or sidewalk.
- Design should facilitate adequate drainage.
- When also used as a bus bulb, curb extensions

could improve bus travel times by decreasing the amount of time buses spend merging into traffic. (See Floating Transit Islands in this toolkit.)

- May create additional space for street furniture such as bicycle parking, but care must be taken to not block motorists' view of pedestrians.

Expected Crash Reduction

Initial research findings have indicated that this treatment may be effective at increasing driver yielding and improving pedestrian safety (Johnson, 2005).

Curb radius reduction may reduce turning speeds, which may increase motor vehicle yielding to other street users and reduce severity of collisions that occur (Thomas, 2015).

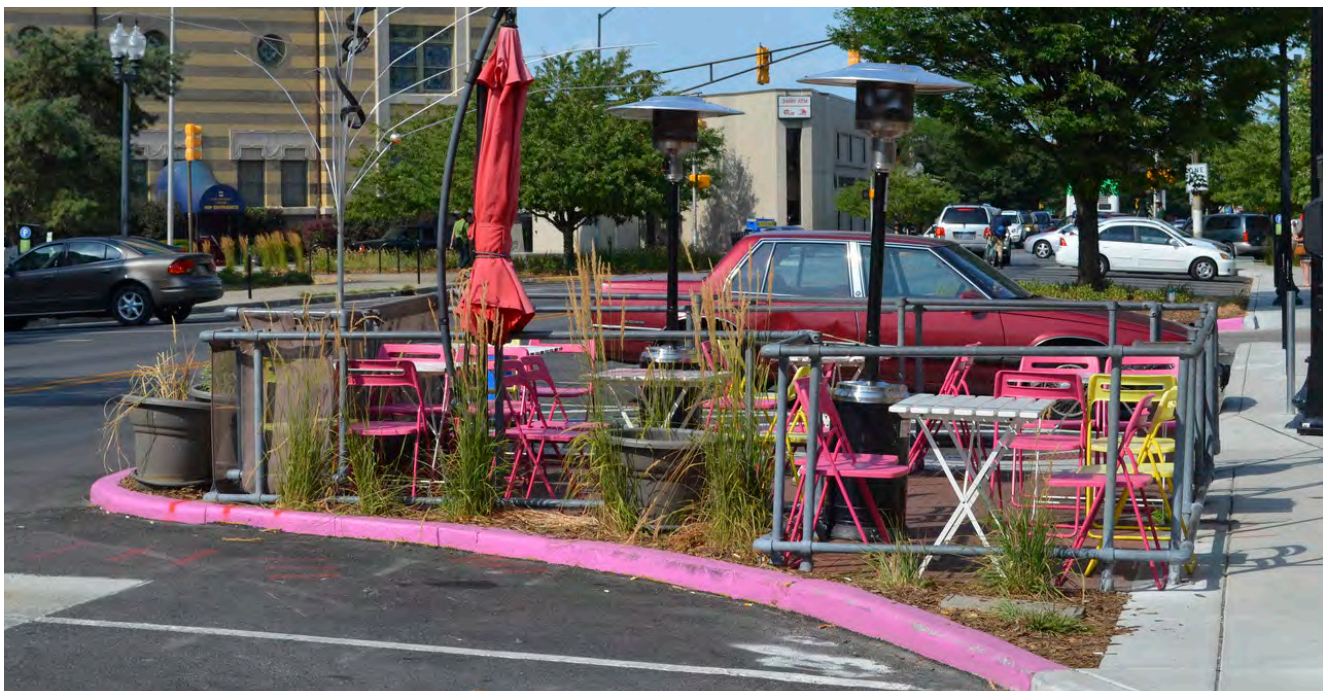
Systemic Safety Potential

This is a systemic recommendation that can address safety issues for users of all modes.

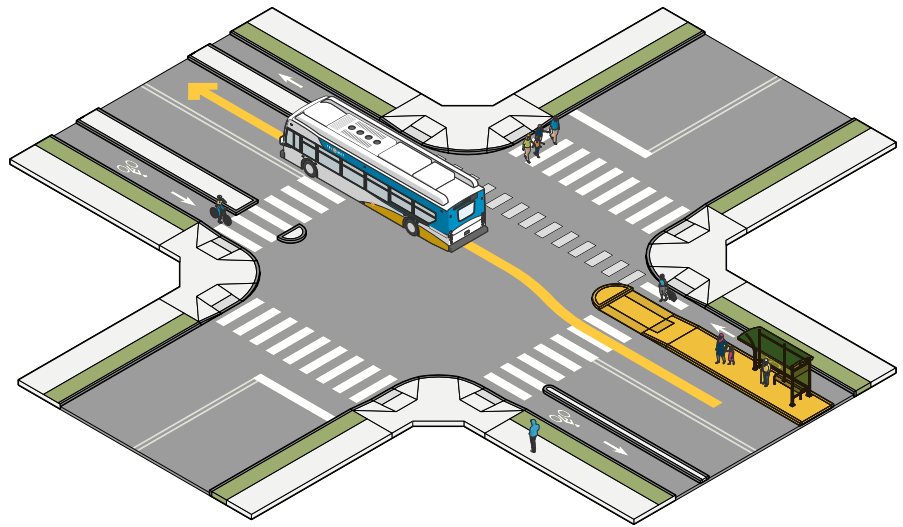
Additional Information

[PEDSAFE Pedestrian Safety Guide and Countermeasure Selection System](#)

[NACTO Urban Street Design Guide](#)



Floating Transit Island



Purpose

Eliminates conflicts between buses and bicyclists at transit stops by routing a bicycle lane behind a bus stop platform.

Description

Floating Transit Islands consist of a bus stop platform island extending into the street from the curb with a bicycle lane routed behind the stop on or adjacent to the curb, eliminating bus and bike conflicts at stations and reducing bus travel times.

Primary Modes



Estimated Cost



Timeline



Safety Benefits

- Reduces conflicts between bicyclists and buses at bus stops.
- Island stops maintain continuity of bike lanes.

Applicable Street Types

- Arterial
- Collector

Other Location Guidance

- Most applicable on streets with moderate to high transit frequency and ridership coupled with high pedestrian and bicyclist volume.

Design Guidance and Considerations

- Ensure visibility between bicyclists and pedestrians.
- Transit islands generally require less complex drainage considerations than bulb-out stations.
- At high-volume stops, people on bike may need to yield to pedestrians accessing the island station from the sidewalk. Pavement color, markings, and signage should reinforce this behavior.
- Generally a buffer of 2 feet is desirable, but narrow buffers are acceptable for a short distance in constrained areas. A minimum

12-inch buffer should be included between a transit shelter and the bike lane.

- A detectable edge must be included between the bike lane and sidewalk to allow pedestrians with low or no-vision to distinguish between the different spaces.
- Consider raised pedestrian crossings between transit islands and bike lanes to give pedestrians more evident priority.

Expected Crash Reduction

Crash reduction rates have not been determined.

Systemic Safety Potential

Can be implemented systemically along streets with bus stops and separated bike lanes. However, most likely suited as a spot treatment where bike and bus conflicts are a concern.

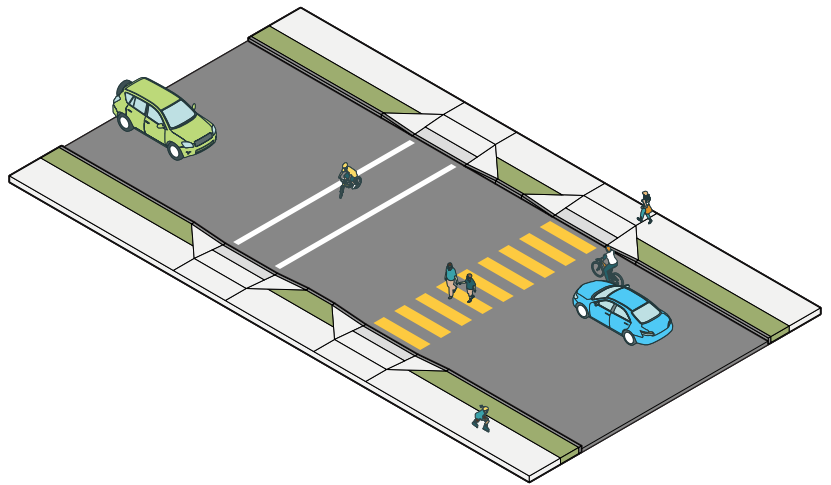
Additional Information

[NACTO Urban Street Design Guide](#)

[FHWA Achieving Multimodal Networks](#)



High-Visibility Crosswalk



Purpose

Provides guidance for pedestrians by indicating intended crossing locations and increases motorist awareness of crosswalks and presence of pedestrians.

Description

High-visibility crosswalks indicate desired locations for pedestrian crossings and indicate where motorists should yield to pedestrians crossing the street. High-visibility crosswalks are distinguishable from other crosswalk designs by use of longitudinal, ladder, or continental-style markings more readily visible to approaching motorists as opposed to parallel, or transverse, lines which are more difficult to distinguish from a distance.

Primary Modes



Estimated Cost



Timeline



Safety Benefits

- Increases visibility and motorist awareness of pedestrian presence.
- Reduces crashes between motorists, pedestrians, and bicyclists.
- Designates pedestrian right-of-way, may reduce pedestrian crossings outside marked areas.

Applicable Street Types

- Arterial
- Collector
- Local

Other Location Guidance

- Location should be convenient for pedestrian access.
- Crosswalk markings must be placed to include the curb ramp so that users with mobility aids do not have to leave the crosswalk to access the ramp.

Design Guidance and Considerations

- Install with curb ramps.
- Parking should be restricted near crosswalks to create adequate sight distance for pedestrians and motorists.
- At signal controlled intersections, install a stop bar in advance of the crosswalk.

- Provide stop lines and appropriate signage in advance of uncontrolled midblock crossings.
- Crosswalks should be as wide or wider than connecting sidewalks

Expected Crash Reduction

48% reduction in vehicle-pedestrian crashes (Chen, et al., 2012).

Systemic Safety Potential

Applicable at all controlled crossings. Where crossings are uncontrolled high-visibility crosswalks should be applied in accordance with FHWA Guide for Improving Pedestrian Safety at Uncontrolled Crossing Locations.

Additional Information

[FHWA Guide for Improving Pedestrian Safety at Uncontrolled Crossing Locations](#)

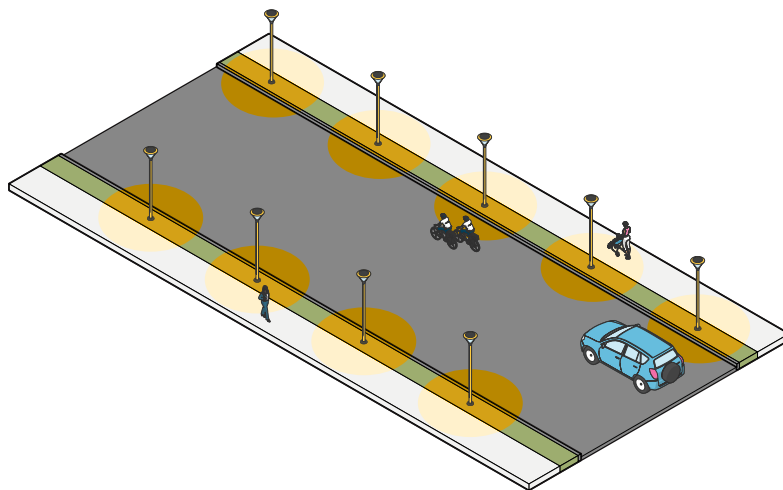
[NACTO Urban Street Design Guide](#)

[PEDSAFE Pedestrian Safety Guide and Countermeasure Selection System](#)

[Manual on Uniform Traffic Control Devices](#)



Lighting



Purpose

Enhances the environment by increasing comfort and safety for pedestrians and bicyclists and improving visibility for all road users.

Description

The installation of high-quality lighting enhances the environment of a corridor while also increasing comfort and safety for pedestrians and bicyclists. Lighting can be placed overhead or in pavement, depending on the needs of each individual corridor. Pedestrian-scale lighting is often seen in commercial districts as it enhances the environment at night, while also enhancing security.

Primary Modes



Estimated Cost



Timeline



Safety Benefits

- Increased visibility for all roadway users.
- Higher sense of personal security for pedestrians and bicyclists.

Applicable Street Types

- Arterial
- Collector
- Local

Other Location Guidance

- Lighting should be installed on both sides of the roadway.

Design Guidance and Considerations

- Lighting can vary based on the fixture, manufacturer, roadway width, utility service, and other project-related factors.
- Lights should be placed in advance of a midblock or intersection crosswalk in both directions to illuminate the pedestrian in the front and avoid a silhouette.
- Provide uniform lighting levels along an entire corridor.

Expected Crash Reduction

A study found a 42% reduction in nighttime injury pedestrian crashes at intersections with illumination (Elvik, et al., 2004.)

Systemic Safety Potential

This is a systemic corridor recommendation that improves road conditions for all roadway users.

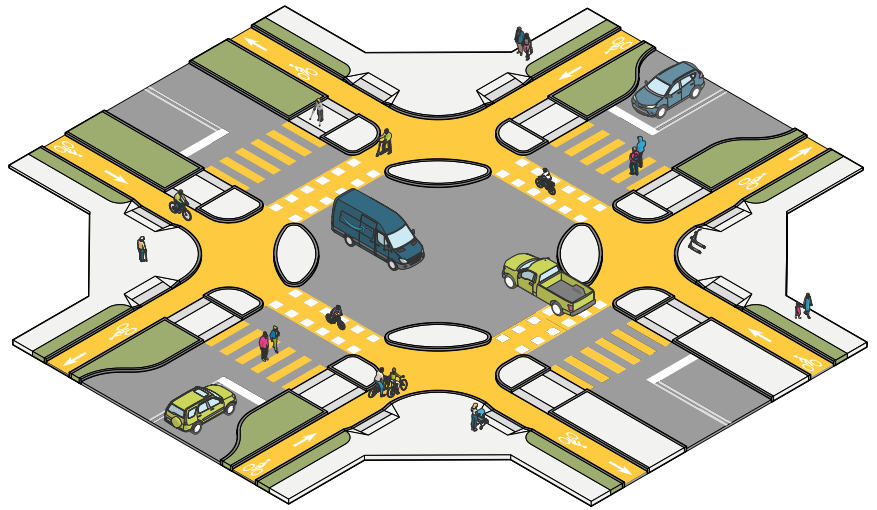
Additional Information

[PEDSAFE Pedestrian Safety Guide and Countermeasure Selection System](#)

[BIKESAFE Bicycle Safety Guide and Countermeasure Selection System](#)



Protected Intersection



Purpose

Physically separates bicyclists and motor vehicles at a given intersection, increasing safety for all street users.

Description

At a protected intersection, the bikeway is offset from the parallel motor vehicle traffic, allowing bicyclists to traverse the intersection or make turns without merging into mixed traffic. The offset allows for the bikeway to extend around the intersection, allowing bicyclists to have right of way of turning motor vehicles. This extension is typically done through a curb extension, giving bicyclists protected space while also narrowing the roadway and increasing visibility of bicyclists and pedestrians to turning vehicles. Protected intersections are often combined with signal phasing, which gives bicyclists and pedestrians a head start when the light turns green.

Primary Modes



Estimated Cost



Timeline



Safety Benefits

- Prevents conflict between motorists and bicyclists.
- Increases driver yielding.
- Shortens crossing distance for pedestrians and bicyclists.
- Increases visibility of bicyclists and pedestrians to turning motor vehicles.

Applicable Street Types

- Arterial
- Collector

Other Location Guidance

- Typically placed at locations that already have a buffered or separated bike facility.

Design Guidance and Considerations

- The bikeway should be setback a minimum of 10 feet, but 14-20 feet is preferred.
- The curb radii should be small enough so that cars are discouraged from turning any faster than 10 mph.
- An accessible pedestrian refuge island should be installed between the bikeway and vehicular travel lanes.
- Green pavement markings should be used at the corner of the intersection to discourage pedestrians from standing in the bikeway.

- Modified “Turning Vehicles Yield to Bikes and Pedestrians” signage is recommended at locations that permit right turns at the same time as bicyclist and pedestrian movements.

Expected Crash Reduction

Protected intersection design can reduce bicycle-related conflicts by up to 80% (Preston & Pulugurtha, 2021).

Systemic Safety Potential

This is a systemic safety treatment altering intersection design to provide separation of modes and prevent conflict points.

Additional Information

[NACTO Don't Give Up at the Intersection](#)

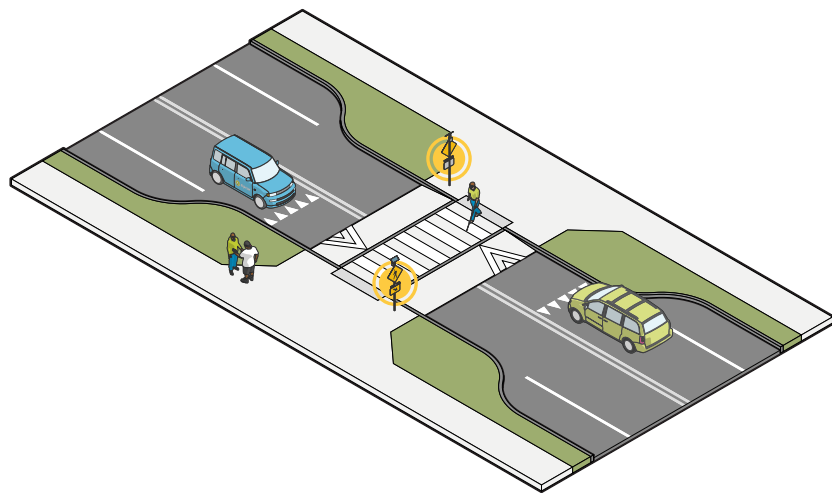
[FHWA Improving Intersections for Pedestrians and Bicyclists](#)

[DDOT Bicycle Facility Design Guide](#)

[VDOT Bicycle and Pedestrian Treatments](#)



Rectangular Rapid Flashing Beacon (RRFB)



Purpose

Used in combination with warning signage, rectangular rapid flashing beacons (RRFBs) provide a high-visibility warning to drivers when pedestrians are using a marked crosswalk.

Description

RRFBs are a pedestrian safety countermeasure that improve safety at uncontrolled, marked crossings. Different from a pedestrian hybrid beacon (PHB), RRFBs consists of two rectangular-shaped yellow indicators with an LED light source that flashes with high frequency when activated. RRFBs are often placed at locations with significant pedestrian safety issues but may also be located at a school or trail crossing.

Primary Modes



Estimated Cost



Timeline



Safety Benefits

- Increases rates of motorist yielding.

Applicable Street Types

- Arterial
- Collector
- Local

Other Location Guidance

- If a pedestrian refuge or other kind of median is present, an RRFB should be installed in the median.

Design Guidance and Considerations

- An RRFB should not be used without a pedestrian crossing sign.
- Advance warning signs or pavement markings can be used to supplement RRFBs.
- Solar-power panels may eliminate the need for a power source.
- RRFBs should only be used at locations with significant pedestrian safety issues. The overuse of RRFBs can diminish their effectiveness.

Expected Crash Reduction

RRFBs have been found to reduce pedestrian crashes by up to 47% (Zeeger et al., 2017).

Systemic Safety Potential

This is a spot recommendation that can address safety issues for users of all modes.

Additional Information

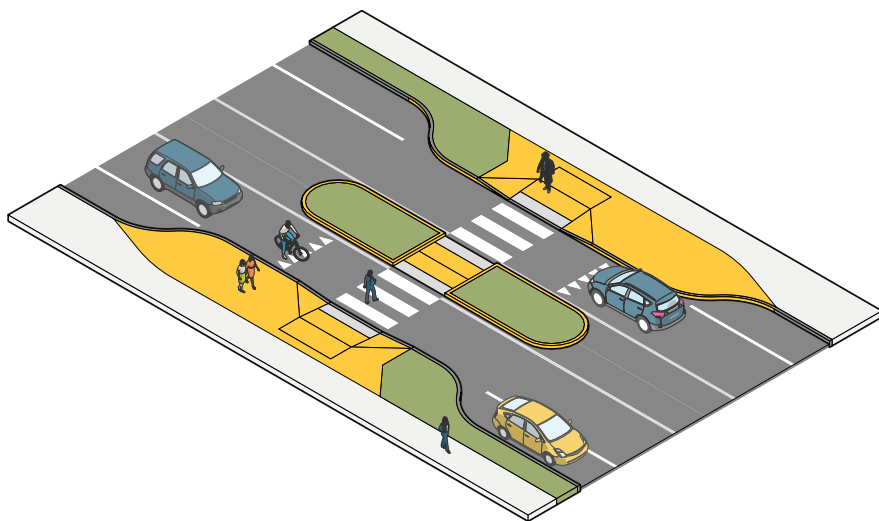
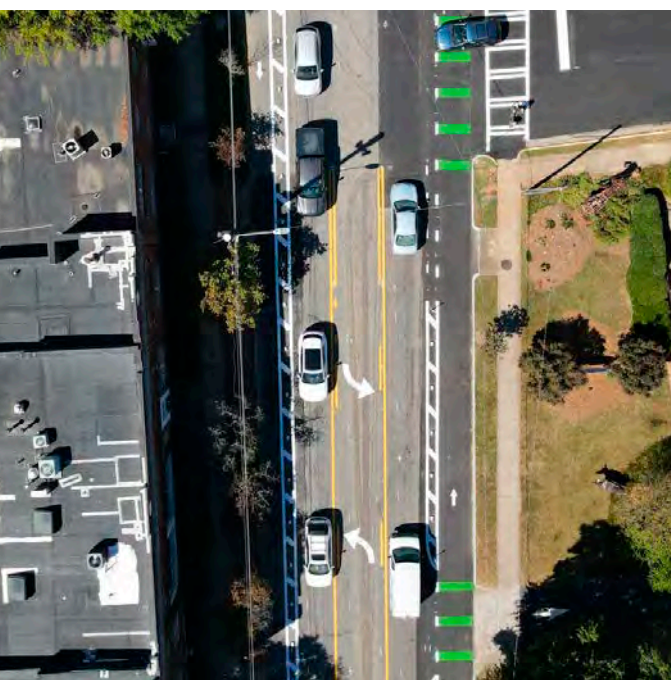
[FHWA Proven Safety Countermeasures](#)

[PEDSAFE Pedestrian Safety Guide and Countermeasure Selection System](#)

[Manual on Uniform Traffic Control Devices](#)



Road Diet/Lane Reduction



Purpose

Optimizes available roadway space to improve levels of safety and comfort for pedestrians and bicyclists.

Description

Road diets are the reallocation of space within a roadway to balance the needs of different users, often by converting a multi-lane roadway into two or three lanes for motor vehicles with spaces for bicyclists and pedestrians. The additional space created is typically combined with other elements such as bike lanes, transit lanes, widened sidewalks, pedestrian refuge islands, and/or curb extensions. Typically, road diets are utilized on undivided, four-lane roadways, which in turn are converted into two through lanes and a center turn lane. If the roadway turning volume is low enough, a center turn lane may be omitted.

Primary Modes



Estimated Cost



Timeline



Safety Benefits

- Reduces crossing distances for pedestrians.
- Reduces vehicle speeds.
- Improves sight distance for turning vehicles.
- Improves level of comfort for pedestrian and bicyclists.

Applicable Street Types

- Collector
- Local

Other Location Guidance

- Road diets are most successful on roadways with daily volumes of 8,000 to 20,000 motor vehicles.
- Road diets on roadways with motor vehicle volumes above 20,000 require further study.
- Side streets and alternative routes need to be considered when looking at the impact of the road diet.

Design Guidance and Considerations

- There are many factors to consider, including but not limited to motor vehicle speed and level of service, quality of service, existing motor vehicle volumes, peak hour and peak direction traffic flow, turning volumes, side street volume, and operation and volume of pedestrians, bicyclists, and transit vehicles.
- A three-lane road configuration should include one through lane in each direction and a two-way center left turn lane.

- Road diets can be supplemented with painted, textured, or raised center islands.
- Road diets bring significant change to street configurations, so it may be beneficial to conduct public outreach before moving forward.
- A conversion to a three-lane road can be compatible with a single-lane roundabout.

Expected Crash Reduction

The conversion of a four-lane to three-lane road diet has been found to have up to a 47% reduction in total crashes in suburban areas (Pawlovich, et al., 2006) and 29% in urban areas (FHWA, 2008).

Systemic Safety Potential

This is a systemic corridor recommendation that improves road conditions for all roadway users.

Additional Information

[AARP Livable Communities](#)

[BIKESAFE Bicycle Safety Guide and Countermeasure Selection System](#)

[PEDSAFE Pedestrian Safety Guide and Countermeasure Selection System](#)

[FHWA Bikeway Selection Guide](#)

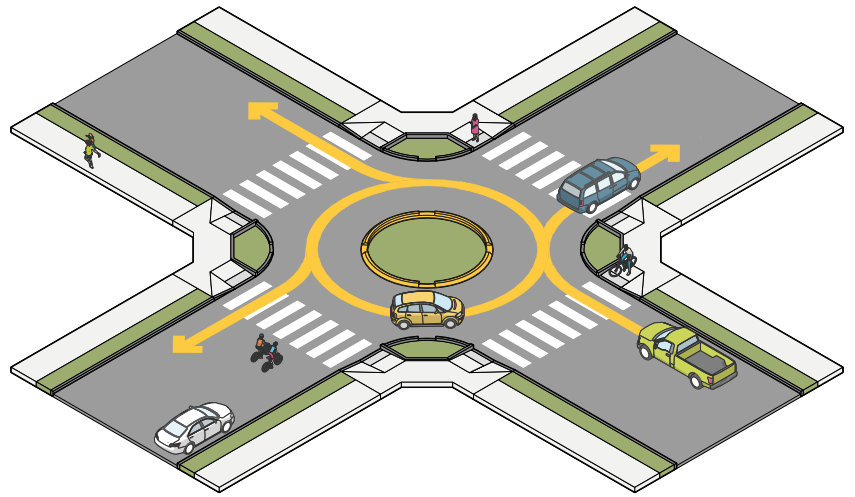


Before



After

Roundabout/Traffic Circle



Purpose

Eliminates left turning movements and intersection collisions by requiring all traffic to exit to the right of the circle.

Description

Built with a raised circular island, roundabouts are located at the intersection of two or more streets and take the place of a traditional intersection. Traffic entering the roundabout yields to traffic in the roundabout and there are no left-turn movements. Roundabouts allow for traffic to flow and merge through the roundabout without stopping, reducing conflicts and facilitating increased motor vehicle yielding to pedestrian and bicyclists.

Primary Modes



Estimated Cost



Timeline



Safety Benefits

- Reduces vehicular speeds.
- Facilitates motor vehicle yielding to pedestrians and bicyclists.
- Eliminates angle collisions.

Applicable Street Types

- Collector
- Local

Other Location Guidance

- Roundabouts are not appropriate at intersections near active, at-grade railroad crossings.
- Roundabouts should not be placed on high-speed roadways.

Design Guidance and Considerations

- Some general considerations include pedestrian and bicycle volumes, number of travel lanes, impacts on pedestrian routes, and available right-of-way.
- Where there are higher pedestrian volumes, it may be beneficial to install signal controls and wider crosswalks.
- Roundabouts should be designed for an entry speed of 15-18 mph on each leg.
- On a low speed and volume street, such as a local neighborhood street, consider installing mini roundabouts, or neighborhood traffic circles.

- Accessible pedestrian signals are required in accordance with the Public Right-of-Way Accessibility Guidelines (PROWAG).

Expected Crash Reduction

When installing a roundabout at a two-way stop-controlled intersection, there was found to be an 82% reduction in fatal and serious injury crashes. The installation of a roundabout at a signalized intersection has been found to reduce fatal and serious injury crashes by 78% (FHWA Proven Safety Countermeasures).

Systemic Safety Potential

This is a systemic corridor recommendation that improves road conditions for all roadway users.

Additional Information

[BIKESAFE Bicycle Safety Guide and Countermeasure Selection System](#)

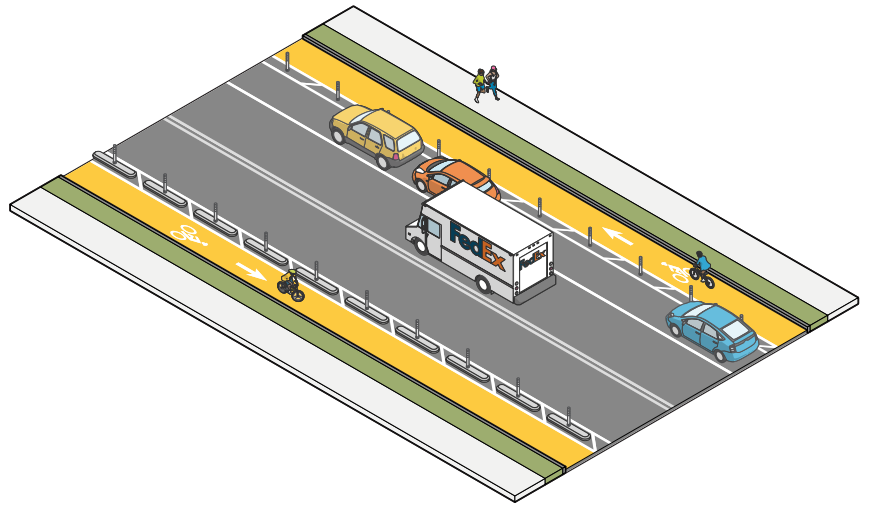
[PEDSAFE Pedestrian Safety Guide and Countermeasure Selection System](#)

[NACTO Urban Street Design Guide](#)

[FHWA Proven Safety Countermeasures](#)



Separated Bike Lane



Purpose

Provides a dedicated bicycle facility for users of a range of abilities through increased separation from motor vehicle traffic.

Description

A separated bicycle lane, sometimes called a cycle track or protected bike lane, runs along a roadway separated from motor vehicle traffic and pedestrians. This is done through a vertical element, such as parked cars, bollards, landscape buffer, or curb. Separated bike lanes can be one-way or two-way and may be raised or at street-level.

Primary Modes



Estimated Cost



Timeline



Safety Benefits

- Increases separation between motor vehicles and bicyclists.
- Provides space for bicyclists to pass without encroaching into motor vehicle travel lanes.

Applicable Street Types

- Arterial
- Collector
- Local

Other Location Guidance

- One-way separated bicycle lanes operating in the same direction as motor vehicle traffic are preferred over two-way cycle tracks on multi-lane roadways.

Design Guidance and Considerations

- At intersections and driveways, ensure that there is appropriate signage and marking to improve awareness of the facility throughout the conflict zones.
- Maintenance should be considered in the design of a separated facility; there should be sufficient width for street sweeping and snow removal.

Expected Crash Reduction

An FHWA study found a 50% reduction in crashes where flexible delineator posts were used to separate a bike lane versus a conventional bike lane (FHWA, 2023).

Systemic Safety Potential

This is a systemic corridor recommendation that improves road conditions for all roadway users.

Additional Information

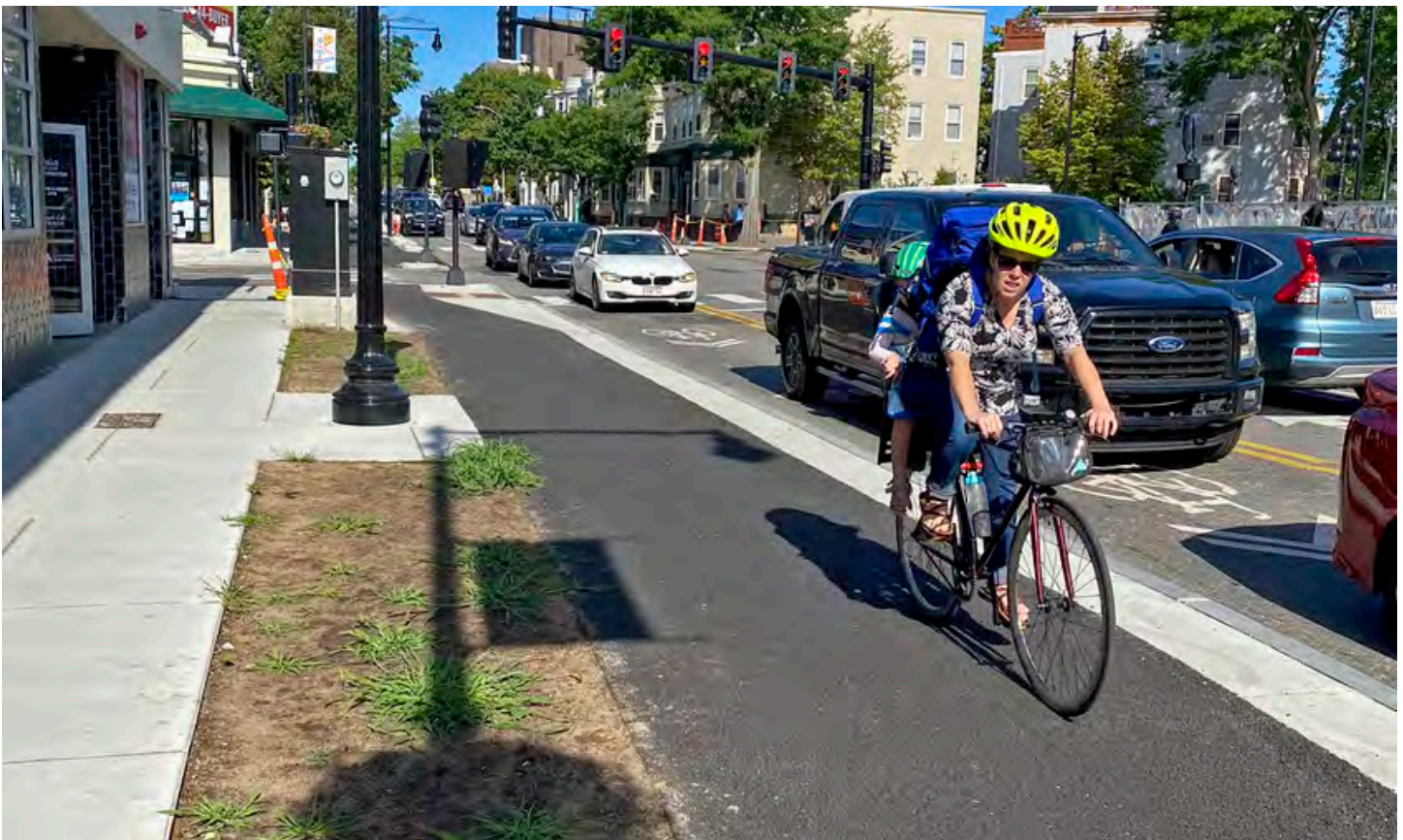
[BIKESAFE Bicycle Safety Guide and Countermeasure Selection System](#)

[FHWA Bikeway Selection Guide](#)

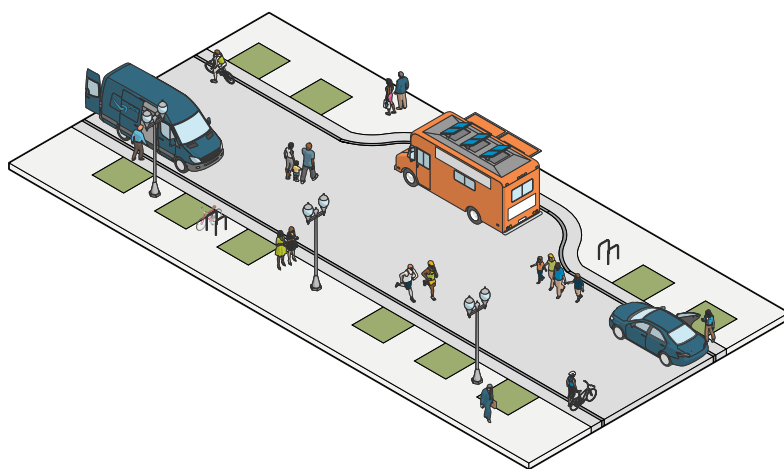
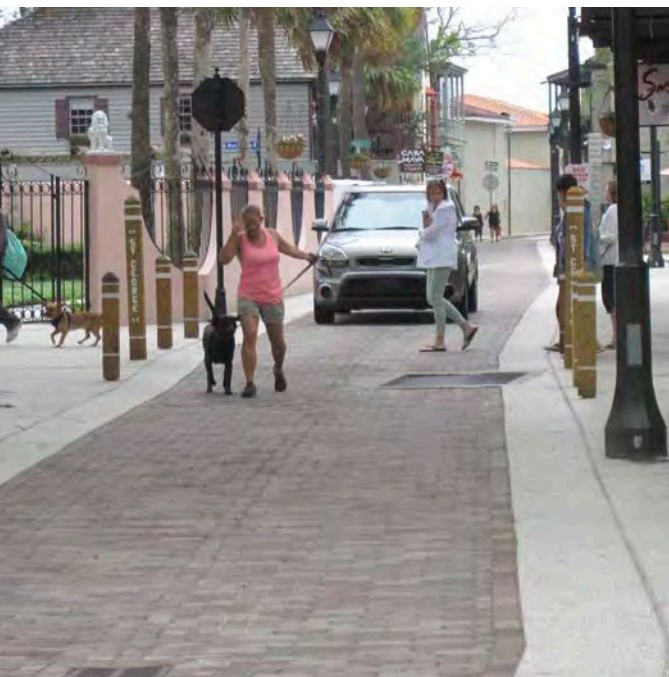
[NACTO Urban Bikeway Design Guide](#)

[Safety Efficacy Confidence Levels for Pedestrian & Bicycle Treatments](#)

[FHWA Achieving Multimodal Networks](#)



Shared Street



Purpose

Increases bicyclist and pedestrian comfort by slowing motorist speed through design features prioritizing pedestrians and bicyclists and emphasizing that cars are guests in the space.

Description

A hallmark feature of shared streets is the absence of a vertical curb which creates a continuous, shared space between vehicles and pedestrians. This design allows pedestrians and bicyclists to use the entire street and cross at any location, with motorists yielding the right-of-way. Other design elements, such as narrow entry points, overall narrow street width, and pavement texture or markings help to ensure low motor vehicle speeds.

Primary Modes



Estimated Cost



Timeline



Safety Benefits

- Lower motor vehicle speeds reduce severity of collisions.
- Curbless design encourages cautious behavior by all users.
- Slow speeds and pedestrian/bicycle centered design discourages motor vehicle traffic.

Applicable Street Types

- Local

Other Location Guidance

- Suited for streets where emphasizing and promoting pedestrian activity and livability is desirable.
- Best suited to streets with minimal motor vehicle traffic volumes.

Design Guidance and Considerations

- Generally inappropriate on streets with through travel.
- Generally, streets with more than 100 vehicles per hour are inappropriate. Where necessary, volumes may be reduced through other traffic calming elements as part of a conversion a street to a shared environment.
- Shared street signage should be used at entrances to a shared street.
- Vehicle speeds must be kept very low to ensure safety.

- Design must meet ADA standards.
- Emergency access and loading activities must also be considered.

Expected Crash Reduction

American data is limited, but Dutch streets converted to shared streets saw a 40% reduction in crashes (FHWA, 2016).

Systemic Safety Potential

Generally applicable only as a spot treatment.

Additional Information

[PEDSAFE Pedestrian Safety Guide and Countermeasure Selection System](#)

[NACTO Urban Street Design Guide](#)

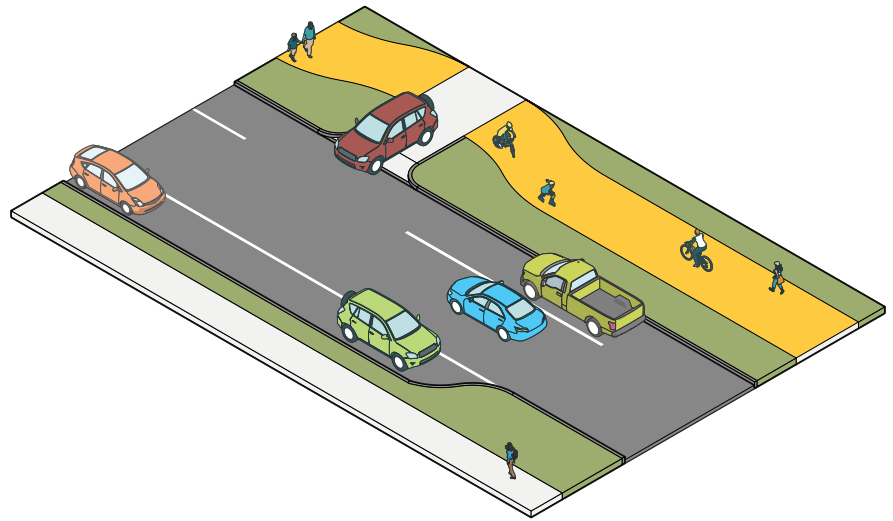
[FHWA Achieving Multimodal Networks](#)

[Accessible Shared Streets](#)

[Montgomery County Complete Streets Design Guidelines](#)



Sidepath/Multi-Use Path



Purpose

Separates bicycle and pedestrian traffic from motor vehicles in a dedicated space outside the curb of the street.

Description

A dedicated path for bicyclists and pedestrians separated from motor vehicle traffic within the public right-of-way. Typically, sidepaths are adjacent to an existing roadway. Paths can also be implemented independently of an existing roadway along other rights-of-way.

Primary Modes



Estimated Cost



Timeline



Safety Benefits

- Eliminates potential conflicts with motorists except at driveways and intersections.
- Accommodates two-way pedestrian and bicyclist flow.

Applicable Street Types

- Arterial
- Collector

Other Location Guidance

- Most useful on wide, multi-lane streets with speeds above 30 mph, or significant motor vehicle volume.

Design Guidance and Considerations

- In areas with high traffic, separating bicycle and pedestrian traffic is advisable.
- Paths should be designed to allow for safe side-by-side riding and passing, typically at least 10 feet wide.
- Good design at the outset of sidepath planning helps ensure a comfortable facility for the widest variety of users.
- Lighting should be considered for increased nighttime use.

- Objects and obstructions near a path should be removed.
- Special consideration should be given to intersections where a path crosses a roadway.

Expected Crash Reduction

Greater than 85% reduction in the risk of injury when compared to riding in the street (Chen, 2012).

Systemic Safety Potential

This is a systemic corridor recommendation that improves road conditions for all roadway users.

Additional Information

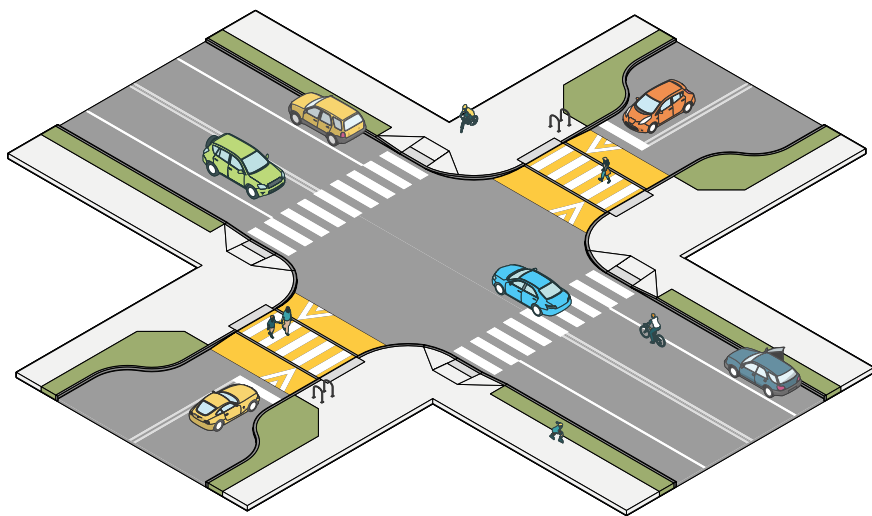
[BIKESAFE Bicycle Safety Guide and Countermeasure Selection System](#)

[FHWA Bikeway Selection Guide](#)

[FHWA Shared Use Path Level of Service Calculator](#)



Speed Cushion/Raised Crossing



Purpose

Effective and reliable at reducing motor vehicle traffic speed. Increases visibility of pedestrians and motorist yielding when deployed as a raised crossing increasing safety of crossing.

Description

A collection of vertical traffic control measures of varying size which generally consist of raised paved areas typically 3-4 inches high at their center and extending across the entire width of a street. Approaching motorists reduce speed to comfortably and safely navigate the raised pavement area which reinforces pedestrian-friendly speeds. Speed humps and cushions can be combined with a high-visibility crosswalk to create a raised crossing where the crosswalk is added to the top of a speed cushion, increasing visibility of pedestrians crossing the roadway.

Primary Modes



Estimated Cost



Timeline



Safety Benefits

- Reduces overall motor vehicle speeds.
- May reduce frequency and severity of crashes involving motor vehicles.

Applicable Street Types

- Collector
- Local

Other Location Guidance

- Typically used on streets with lower speeds and volumes.
- Inappropriate for use on sharp curves.
- With addition of raised crossing, often used at mid-block crossings, but may also be used at intersections or by raising entire intersection.

Design Guidance and Considerations

- Vehicle noise may increase, particularly on routes with regular truck traffic.
- Drainage must be considered.
- Emergency vehicle and transit routes should be considered and coordinated with operators to minimize impacts.
- In areas with frequent driveways, reduce the size of the speed cushion to avoid placing in front of a driveway. If not possible, another tool should be considered.
- Should be accompanied by a warning sign for drivers (MD MUTCD W17-1).
- Speed reduction is increased the closer speed cushions are placed together.

- Can be painted or paved to alert motorists and improve visual aesthetics.
- With addition of raised crossing, crossing should be marked with high-visibility crosswalk markings.

Expected Crash Reduction

Research suggests vertical traffic calming devices such as speed humps, tables, and cushions reduce crash severity. With addition of raised crossing:

- 45 percent reduction in pedestrian crashes (Elvik & Vaa, 2004).
- 51 percent for bicycle-motor vehicle crashes on entrance or exits to streets and driveways (Schepers, 2011).

Systemic Safety Potential

Typically used as a spot treatment.

Additional Information

[FHWA Guide for Improving Pedestrian Safety at Uncontrolled Crossing Locations](#)

[PEDSAFE Pedestrian Safety Guide and Countermeasures Selection System](#)

[Maryland Manual on Uniform Traffic Control Devices](#)

[FHWA Achieving Multimodal Networks](#)

