



OFFICE OF SAFETY
Proven Safety
Countermeasures



Safety Benefits:

**Median with
Marked Crosswalk**

46%
reduction in
pedestrian crashes.²

**Pedestrian Refuge
Island**

56%
reduction in
pedestrian crashes.²

For more information on this and other FHWA Proven Safety Countermeasures, please visit <https://safety.fhwa.dot.gov/provencountermeasures/> and https://safety.fhwa.dot.gov/ped_bike/step/docs/techSheet_PedRefugeland2018.pdf.

**Medians and
Pedestrian Refuge Islands in Urban
and Suburban Areas**

A **median** is the area between opposing lanes of traffic, excluding turn lanes. Medians in urban and suburban areas can be defined by pavement markings, raised medians, or islands to separate motorized and non-motorized road users.

A **pedestrian refuge island** (or crossing area) is a median with a refuge area that is intended to help protect pedestrians who are crossing a road.

Pedestrian crashes account for approximately 17 percent of all traffic fatalities annually, and 74 percent of these occur at non-intersection locations.¹ For pedestrians to safely cross a roadway, they must estimate vehicle speeds, determine acceptable gaps in traffic based on their walking speed, and predict vehicle paths. Installing a median or pedestrian refuge island can help improve safety by allowing pedestrians to cross one direction of traffic at a time.

Transportation agencies should consider medians or pedestrian refuge islands in curbed sections of urban and suburban multilane



Example of a road with a median and pedestrian refuge islands. Source: City of Charlotte, NC

roadways, particularly in areas with a significant mix of pedestrian and vehicle traffic, traffic volumes over 9,000 vehicles per day, and travel speeds 35 mph or greater. Medians/refuge islands should be at least 4-ft wide, but preferably 8 ft for pedestrian comfort. Some example locations that may benefit from medians or pedestrian refuge islands include:

- Mid-block crossings.
- Approaches to multilane intersections.
- Areas near transit stops or other pedestrian-focused sites.

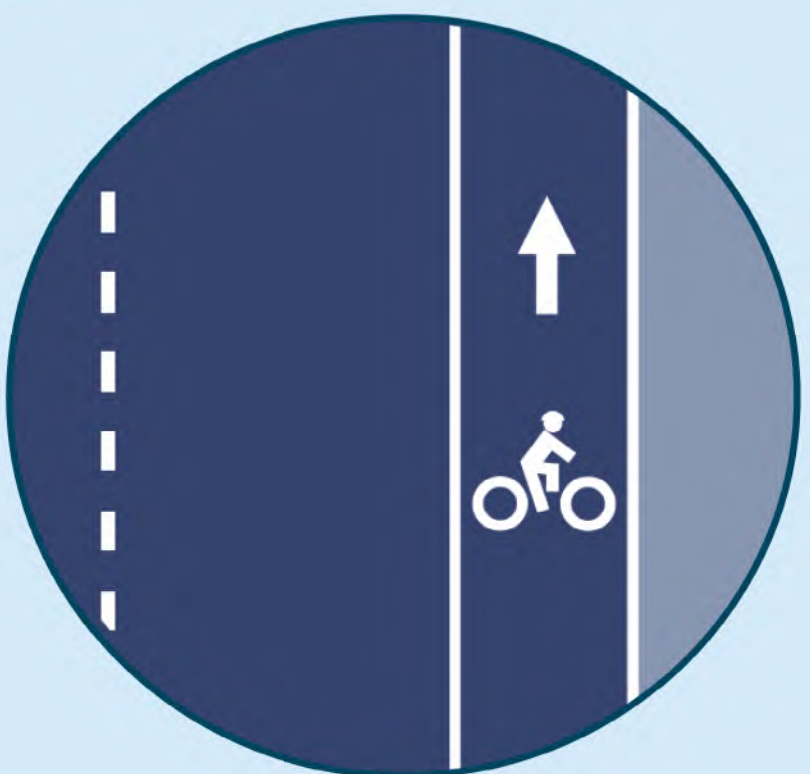


Median and pedestrian refuge island near a roundabout. Source: www.pedbikemages.org / Dan Burden

¹ National Center for Statistics and Analysis. (2020, March). Pedestrians: 2018 data (Traffic Safety Facts, Report No. DOT HS 812 850). National Highway Traffic Safety Administration
² Desktop Reference for Crash Reduction Factors, FHWA-SA-08-011, September 2008, Table 11.



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Safety Benefits:

**Bicycle Lane Additions can
reduce crashes up to:**

49%
for total crashes
on urban 4-lane undivided
collectors and local roads.⁶

30%
for total crashes on urban
2-lane undivided
collectors and local roads.⁶



Separated bicycle lane in Washington, DC. Source: Alex Baca, Washington Area Bicyclist Association

Separated bicycle lanes may provide further safety benefits. FHWA is anticipating completion of research in Fall 2022.

For more information on this and other FHWA Proven Safety Countermeasures, please visit <https://safety.fhwa.dot.gov/provencountermeasures/> and https://safety.fhwa.dot.gov/ped_bike/tools_solve/docs/fhwas18077.pdf.

Bicycle Lanes

Most fatal and serious injury bicyclist crashes occur at non-intersection locations. Nearly one-third of these crashes involve overtaking motorists¹; the speed and size differential between vehicles and bicycles can lead to severe injury. To make bicycling safer and more comfortable for most types of bicyclists, State and local agencies should consider installing bicycle lanes. These dedicated facilities for the use of bicyclists along the roadway can take several forms. Providing bicycle facilities can mitigate or prevent interactions, conflicts, and crashes between bicyclists and motor vehicles, and create a network of safer roadways for bicycling. Bicycle Lanes align with the Safe System Approach principle of recognizing human vulnerability—where separating users in space can enhance safety for all road users.

Applications

FHWA's [Bikeway Selection Guide](#) and [Incorporating On-Road Bicycle Networks into Resurfacing Projects](#) assist agencies in determining which facilities provide the most benefit in various contexts. Bicycle lanes can be included on new roadways or created on existing roads by reallocating space in the right-of-way.

In addition to the paint stripe used for a typical bicycle lane, a lateral offset with painted buffer can help to further separate bicyclists from vehicle traffic. State and local agencies may also consider physical separation of the bicycle lane from motorized traffic lanes through the use of vertical elements like posts, curbs, or vegetation.² Based on international experience and implementation in the United States, there is potential for further safety benefits associated with separated bicycle lanes. FHWA is conducting research on separated bicycle lanes, which includes the development of crash modification factors, to be completed in 2022 to address significant interest on this topic.

¹ Thomas et al. Bicyclist Crash Types on National, State, and Local Levels: A New Look. Transportation Research Record 673(6), 664-676, (2019).
² [Separated Bike Lane Planning and Design Guide](#). FHWA-HEP-15-025, (2015).
³ Park and Abdel-Aty, "Evaluation of safety effectiveness of multiple cross sectional features on urban arterials", Accident Analysis and Prevention, Vol. 92, pp. 245-255, (2016).
⁴ FHWA Tech Advisory [Shoulder and Edge Line Rumble Strips](#), (2011).
⁵ Sandt et al. [Pursuing Equity in Pedestrian and Bicycle Planning](#). FHWA, (2016).
⁶ Avelar et al. Development of Crash Modification Factors for Bicycle Lane Additions While Reducing Lane and Shoulder Widths. FHWA, (2021).

Considerations

- City and State policies may require minimum bicycle lane widths, although these can differ by agency and functional classification of the road.
- Bicycle lane design should vary according to roadway characteristics (e.g., motor vehicle volumes and speed) in order to maximize the facility's suitability for riders of all ages and abilities and should consider the travel needs of low-income populations likely to use bicycles. The [Bikeway Selection Guide](#) is a useful resource.
- While some in the public may oppose travel lane narrowing if they believe it will slow traffic or increase congestion, studies have found that roadways did not experience an increase in injuries or congestion when travel lane widths were decreased to add a bicycle lane.³
- Studies and experience in US cities show that bicycle lanes increase ridership and may help jurisdictions better manage roadway capacity without increased risk.
- In rural areas, rumble strips can negatively impact bicyclists' ability to ride if not properly installed. Agencies should consider the dimensions, placement, and offset of rumble strips when adding a bicycle lane.⁴
- Strategies, practices, and processes can be used by agencies to enhance their ability to address equity in bicycle planning and design.⁵

