# Safety Benefits of Raised Medians and Pedestrian Refuge Areas

## FHWA Safety Program

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

Safe Roads for a Safer Future
*Investment in roadway safety saves lives*

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There's a signal up the block, but looking left — there's a gap in traffic. Looking right — there should be enough time to make it all the way. Midway across, she picks up the pace as some vehicles have changed lanes and are closer than she thought — now traffic is coming towards her from both directions.

Photo Credit: www.pedbikeimages.org/Libby Thomas

She is stuck in the middle of the road, keeping her feet on the yellow lines while waiting for traffic to pass so she can make it across the rest of the way. That's when it happens…a truck passing by clips her while she stands in the middle of the road. He slams on the brakes once he realizes what happened — but it is too late.

The resulting crash is all too common. It was also preventable by providing a median or pedestrian refuge area. Crossing roadways that do not have medians can be dangerous. In fact, the pedestrian crash risk for crossing the arterial without a median was 6.48 times higher than for crossing the arterial with a median.[1]

## Raised Medians and Pedestrian Refuge Areas

Pedestrian crashes account for about 12 percent of all traffic fatalities annually. Over 75 percent of these fatalities occur at non-intersection locations. On average, a pedestrian is killed in a motor vehicle crash every 120 minutes and one is injured every 8 minutes.[2] Many of these crashes are preventable. By providing raised medians and pedestrian refuge islands, we can bring these crash numbers down, prevent injuries, and save lives.

The *median* is the area between opposing lanes of traffic — a median can either be open (pavement markings only) or they can be channelized (raised medians or islands) to separate various road users.

**Photo Credit: Bruce Landis, Angled cut-through in Bainbridge, WA**

Providing raised medians or pedestrian refuge areas at pedestrian crossings at marked crosswalks has demonstrated a 46 percent reduction in pedestrian crashes. At unmarked crosswalk locations, pedestrian crashes have been reduced by 39 percent.[3] Installing raised pedestrian refuge islands on the approaches to unsignalized intersections has had the most impact reducing pedestrian crashes.

## Case Study: Sunken Gardens, St. Petersburg, Florida

**Improving Safety and Access to Local Establishments and a Popular Tourist Destination**

Photo Credit: Michael Frederick, City of St. Petersburg, FL

Sunken Gardens, in St. Petersburg, Florida, is a popular tourist destination. Across the street are a number of local dining establishments with no safe way for pedestrians to cross the street.

Photo Credit: Michael Frederick, City of St. Petersburg, FL

Sunken Gardens is located on the east side of 4th Street North (US 92). The road averages 31,500 vehicles per day with speeds averaging more than 10 mph above the legal limit. To aid pedestrians in crossing 4th Street, the City of St. Petersburg installed a raised pedestrian refuge area in front of Sunken Gardens.

The raised pedestrian refuge area made it possible to install a supplemental traffic control device — a Rectangular Rapid Flashing Beacon (RRFB). Installed on roadside poles, the RRFB remains dark until a pedestrian activates the system by pressing a push button. Once the system is activated, rapidly flashing amber beacon (rectangular strobe) lights provide a bright warning to motorists.[4] In the first week after the raised pedestrian refuge area and RRFB were installed, over 900 crossings were reported with over 85 percent of motorists yielding to pedestrians.

## Safety Benefits of Raised Medians and Pedestrian Refuge Areas:

Crossing the street can be a complex task for pedestrians. Pedestrians must estimate vehicle speeds, adjust their own walking speeds, determine adequacy of gaps, predict vehicle paths, and time their crossings appropriately. Drivers must see pedestrians, estimate vehicle and pedestrian speeds, determine the need for action, and react.

Raised medians and pedestrian refuge islands allow pedestrians to cross one direction of traffic at a time. This significantly reduces the complexity of the crossing.

Under nighttime conditions, the crossing task is even more complex for pedestrians. Pedestrians are watching car headlights and it is more difficult to correctly judge the speed of, and distance to, approaching motor vehicles when only headlights are visible. Valuable cues used by pedestrians to judge speed, e.g., change in the observed shape of the approaching car and relative location with respect to roadside objects, are more difficult to observe at night. Variations in motor vehicle travel speeds add to the complexity of judging adequate gaps in traffic.

Photo Credit: Michael Ronkin

Raised medians and refuge islands provide a space to install improved lighting at pedestrian crossing locations. Improved lighting has been shown to reduce the nighttime pedestrian fatalities at crossings by 78 percent.[5]

Raised medians and refuge islands also reduce the amount of delay incurred by pedestrians waiting for a gap in traffic to cross. Shorter delays translate into fewer pedestrians taking risks by crossing through "holes" in the traffic stream. On a four-lane roadway with 5,000 ADT, medians can reduce pedestrians' delay waiting for a gap by 79 percent (from 41 seconds to 9 seconds).[6]

Photo Credit: Michael Ronkin

## "Holes" or Gaps

Most pedestrians do not cross in gaps; they cross in a perceived series of gaps, or a "hole." A gap occurs when a walker can step into the roadway and reach a place of safety before any car crosses the pedestrian path. A "hole," on the other hand, occurs when there is still traffic in the middle or far lanes in front of the pedestrian when the pedestrian enters the street, or when a car passes behind the pedestrian before he or she completes the crossing. As long as motorists behave as the pedestrian expects, a crossing in a "hole" in traffic may be made without incident. If conditions change — for example, if a car changes lanes — the expected "hole" begins to close and a "second threat" type crash can occur.[1]

Medians and refuge islands reduce the potential for the second threat crash by minimizing the traffic flows a pedestrian must predict.

## Safe Multimodal Connections

Medians are especially important at transit stops. Transit stops are frequently located along busy arterials at uncontrolled crossing locations. Providing medians can make these crossings safer and more appealing to existing and potential transit users.

## Additional Benefits of Raised Medians

Raised medians provide additional benefits above and beyond reducing pedestrian crashes.

Raised medians:

- Have been found to reduce motor vehicle crashes by 15 percent.[5]
- Decrease delays (>30 percent) for motorists.[7]
- Have resulted in increase in capacity (>30 percent) of roadways.[7]
- Have been shown to reduce vehicle speeds on the roadway.[8]
- Provide space for landscaping within the right-of-way.
- Provide space to install additional roadway lighting, further improving the safety of the roadway.
- Provide space to provide supplemental signage on multi-lane roadways.
- Can be less expensive to build and maintain than paved medians.[9]

## Getting Pedestrians Safely Across the Street:

The Federal Highway Administration (FHWA) strongly encourages the use of raised medians (or refuge areas) in curbed sections of multi-lane roadways in urban and suburban areas, particularly in areas where there are mixtures of a significant number of pedestrians, high volumes of traffic (more than 12,000 vehicles per day) and intermediate or high travel speeds.[3]


Photo Credit: Mike Cynecki

FHWA guidance further states that medians/refuge islands should be at least 4 feet wide (preferably 8 feet wide for accommodation of pedestrian comfort and safety) and of adequate length to allow the anticipated number of pedestrians to stand and wait for gaps in traffic before crossing the second half of the street.[3]

On refuges 6 feet or wider that serve designated pedestrian crossings, detectable warning strips complying with the requirements of the Americans with Disabilities Act must be installed.[10]

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[1] Wilson, Petritsch, *Quantifying Countermeasure Effectiveness* — Orlando, FL, PBIC, November 2008.

[2] NHTSA, Traffic Safety Facts 2008 Pedestrians, NHTSA, Washington, DC, 2009.

[3] Lindley, J., *Guidance Memorandum on Consideration and Implementation of Proven Safety Countermeasures* FHWA, Washington DC, July 2008.

[4] Spot Devices. *Rectangular Rapid Flashing Pedestrian Safety System.* Retrieved February 18, 2010 from: http://www.spotdevices.com/system-rrfb.html

[5] FHWA, *Desktop Reference for Crash Reduction Factors,* FHWA, Washington, DC, September 2007.

[6] *NCHRP Report 616, Multimodal Level of Service Analysis for Urban Streets,* TRB, Washington DC, 2008.

[7] TRB Access Management Manual, TRB, Washington, DC, August 2004.

[8] King, M. *Pedestrian Safety through a Raised Median and Redesigned Intersections,* TRR 1445, TRB, Washington, DC, 2004.

[9] FDOT, Florida Pedestrian Planning and Design Handbook, FDOT, Tallahassee, FL, 1996.

[10] US Access Board, Draft Guidelines for public Rights-of-way, Section R305.4, U.S. Access Board, Washington, D.C., 2005.

## For More Information:

For more information, visit http://safety.fhwa.dot.gov/ped_bike

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FHWA-SA-10-020