



Enhancing Safety for Pedestrians and Bicyclists at Roundabouts

Compared to traditional intersections, roundabouts have been proven to decrease serious crashes. However, because drivers yield rather than stop upon entering roundabouts and at crosswalks, public concerns about pedestrian and bicyclist safety remain. Research and field evaluations into driver yielding and speed behaviors generated insights to guide local transportation agencies and MnDOT to further enhance pedestrian safety at roundabouts.

What Was the Need?

Roundabouts have been a successful traffic safety alternative to other intersection types, decreasing potential driver conflict points and severe crashes. To keep traffic flowing, drivers yield rather than stop when entering the roundabout, which has raised questions about the safety of pedestrians and bicyclists. Even if crosswalks are present, the absence of stop signs or traffic lights poses unique challenges for nonmotorized road users.

While [previous MnDOT research](#) showed a 70% decrease in fatal and serious crashes for pedestrians and bicyclists, pedestrian impressions of roundabouts are mixed and

some safety concerns remain. MnDOT and local transportation agencies sought to better understand driver behavior toward pedestrians and bicyclists to design and manage safe roundabouts for all road users.

What Did We Do?

To evaluate factors that impact driver behavior at roundabouts when pedestrians and bicyclists are present, researchers worked with the project's Technical Advisory Panel to choose Minnesota roundabout locations for observing pedestrian and bicyclist crossings. The selected sites included a mix of multi- and single-lane roundabouts in both urban and suburban contexts. Other factors

“This work highlighted the need to be very discerning when considering multiple-lane roundabouts as rates of driver yielding to pedestrians were slightly lower than at single-lane roundabouts. Overall, compared to other intersection types, roundabouts are still very safe for all road users.”

—MARK WAGNER, ASSISTANT STATE TRAFFIC SAFETY ENGINEER, MnDOT OFFICE OF TRAFFIC ENGINEERING

included varied traffic volumes, speed limits and the presence of traffic control technologies such as rectangular rapid flashing beacons (RRFBs).

Researchers staged 100 crossings at each of 16 roundabouts over two summers during good weather and off-peak times. Half of the staged crossings involved pedestrians and half involved bicyclists. Half of the crossings were observed at the roundabout entries and half at the exits. Three roundabouts had RRFBs, and multiple geometric variables were recorded at each site. Naturalistic crossings were also included, for a total of more than 2,800 observed vehicle–pedestrian interactions.

In addition to collecting video data on vehicles and crossing locations, lane positions and whether an RRFB was present and activated, researchers observed two main variables: driver yielding behavior toward a pedestrian or bicyclist attempting to cross, and driver speed changes (measured by handheld lidar) both in the presence and absence of pedestrians or bicyclists.

What Did We Learn?

A statistical analysis of the collected data showed that overall, 80% of drivers yielded for pedestrians and bicyclists crossing at roundabout entries while only 40% yielded at the

roundabout exits. The significantly lower yielding rate at exits was likely due to drivers not realizing that they should be yielding, accelerating as they left the roundabout, hesitating to impede circulating traffic and the lack of storage for queued vehicles at crosswalks on exit sides.

Several additional variables were associated with higher yielding rates:

- Smaller, single-lane roundabouts where driver speeds may be slower, and drivers do not have to consider other drivers in adjacent, same-direction lanes.
- More conspicuous pedestrians and bicyclists, such as crossings off a median island, walking rather than riding a bicycle across and improved pedestrian visibility for drivers turning right.
- The presence of RRFBs, whether or not they were activated, which may be due to their being installed in locations where drivers are accustomed to high pedestrian use.

The analysis of driver speeds revealed faster speeds at larger roundabouts and where no pedestrians or bicyclists were visible. Drivers generally started braking more rapidly within 450 feet of a crosswalk but accelerated as they exited the roundabouts.

What's Next?

Local agencies and MnDOT will continue efforts to ensure and enhance safety for all road users at roundabouts. A [current MnDOT project](#) to better understand the traffic calming impacts of roundabouts on vehicle speeds compared to other intersection types is already underway.

Several additional issues highlighted in this project could be further explored, such as evaluating a variety of pedestrian signage at roundabouts and speed calming measures for roundabout exit lanes. Also, because most of the observed pedestrian crossings in this research were staged, future observations of naturalistic crossings could support the objective evaluation that the impacts of pedestrian behaviors have on crossing at roundabouts.

About This Project

REPORT 2025-27

“Improving Safety for People Walking and Biking at Roundabouts.”
Find it at mdl.mndot.gov.

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