



## TECHNICAL SUMMARY

### Questions?

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### Investigator:

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### LRRB PROJECT COST:

\$120,000



Pedestrians are generally more visible to drivers who are entering a roundabout than those exiting.



# Enhancing Pedestrian Experiences at Roundabouts

## What Was the Need?

In addition to enhancing the safety and efficiency of vehicular traffic and reducing crashes, well-designed roundabouts offer pedestrian benefits. Compared to other types of intersection crossings, vehicle speeds are generally slower around roundabouts, and wait times for crossing are shorter. Additionally, roundabouts are less expensive than signalized intersections and are more aesthetically pleasing.

Pedestrian impressions of roundabouts, however, are mixed and concerns about safety linger. Minnesota cities and counties receive public complaints about the difficulty pedestrians have navigating the geometry and crosswalks and managing unpredictable driver behavior. Most of these concerns are expressed in the planning and building stages of roundabouts rather than when they are operational.

Several national studies have focused on effective crossing treatments for roundabouts, such as rectangular rapid flashing beacons (RRFBs), which are activated by pedestrians to signal their presence to drivers, and other special crossing treatments. It is unclear, however, how these findings apply in Minnesota. The Local Road Research Board wanted to understand and improve pedestrians' experiences with roundabouts.

## What Was Our Goal?

The goal of this project was to understand pedestrian issues with roundabouts, identify strategies to enhance the pedestrian experience and develop guidance for local agencies creating new roundabouts and evaluating existing ones.

## What Did We Do?

Researchers reviewed past studies and strategies to control pedestrian crossings in roundabouts and the most cost-effective treatments that enhance accessibility and improve driver-yielding behavior, including both signalized and nonsignalized crosswalk options. An online survey was distributed to city and county traffic engineers and the project's Technical Advisory Panel, and follow-up emails or phone calls with 80 respondents led investigators to initially identify 15 locations with known or perceived issues and complaints.

The team spoke with respondents and other relevant agency officials about design specifications, safety records and pedestrian challenges at the chosen locations. During site visits, they examined roundabout geometry and speed limits. Video cameras were installed to observe pedestrian crossings at each leg—streets entering and exiting the roundabout—for two days.

Choosing eight roundabouts with the best video footage, investigators developed case studies to analyze pedestrian and driver behaviors and how they change with different variables such as approach speeds and crossing treatments. Business, residential and school zone areas were represented, and the test sites were geographically distributed. Different configurations, such as single- and multilane approaches, three legs and four legs, were included. Crossing treatments evaluated included in-roadway signs, RRFBs and colored crosswalks.

The video footage was further evaluated for the number and location of pedestrians crossing, any delays they experienced, the rate at which drivers yielded to them and other factors. Investigators

*While roundabouts improve traffic efficiency and reduce accidents, pedestrian safety concerns linger. A study of driver–pedestrian interactions at roundabouts produced guidance for local agencies to increase driver yielding and enhance the pedestrian experience.*

*“This study did a great job at quantifying driver yielding rates under different scenarios. Our roundabouts have an excellent safety record, and it’s important pedestrians understand that and feel safe at crossings.”*

—Joe Gustafson,  
Traffic Engineer,  
Washington County

*“In the design phase of a new roundabout, this guidance will help engineers undertake a broad analysis of the plan and determine which crossing treatments are appropriate given the configuration and site characteristics. Engineers can also use the results and guidance to determine relevant crossing treatments to improve pedestrian user experience at existing roundabouts.”*

—Ranjit Godavarthy,  
Associate Professor, North  
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Vehicle speeds for entering and traveling through a roundabout are an important safety design consideration. Unsurprisingly, lower driving speeds in this study contributed to higher rates of yielding to pedestrians.

also looked at pedestrian behavior, such as whether they pushed a button to activate an RRFB and if they hesitated, retreated or ran.

### What Did We Learn?

The case studies highlighted several conclusions about when drivers yield to pedestrians waiting or attempting to cross the street. Roundabouts with single-lane approaches had the highest rates of vehicles yielding to pedestrians, likely due to their simplicity and absence of driver distractions. Vehicles exiting roundabouts, however, had lower rates of yielding than drivers entering.

Significantly, drivers yielded at crossings controlled by RRFBs almost 100% of the time when pedestrians activated the beacons, though the yielding rate decreased when pedestrians didn’t activate them.

Combining results from previous research on Minnesota roundabouts and this study, researchers produced a guidance document covering design elements aimed at enhancing the pedestrian experience:

- Design criteria and dimensions should be considered for various nonvehicular users, including pedestrians, bicyclists and wheelchair users.
- Sidewalks should be wide enough to accommodate expected user volume, including those with bicycles, strollers or wheelchairs, and should be separated from the road with a landscape strip to discourage crossings outside of crosswalks.
- Splitter islands, separating entry and exit lanes on one side of a roundabout, should be of adequate width to accommodate all users.
- Pedestrian crossings where there are higher volumes of vehicles and pedestrians or the roundabout is more complex, such as with a multilane approach, should be signalized. RRFBs are an effective choice and although more costly than simple crosswalks, they are a fraction of signalized intersection costs.

### What’s Next?

While safety records of roundabouts in Minnesota remain excellent, local agencies can use the guidance produced in this project to inform existing roundabout evaluations and future designs. No further research is currently planned, however, future research could explore the correlation between yield and crash rates, investigate pedestrian perceptions and analyze the experience of visually impaired pedestrians.

*This Technical Summary pertains to Report 2023-01, “Pedestrian User Experience at Roundabouts,” published August 2022. More information is available at [mndot.gov/research](http://mndot.gov/research).*