TERRA Transportation Engineering and Road Research Alliance
Partnering for Roadway Innovation
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The Optimal Fit: Accommodating Trucks in Roundabouts

Roundabouts are increasing in use throughout the country as an intersection control option, in part because of research that has demonstrated safety improvements and other benefits such as lower operations and maintenance costs, efficient land use, aesthetics, environmental advantages, and traffic calming.

Trucks and other large vehicles, however, have faced unique challenges when navigating roundabouts. Those challenges, along with the increased use of roundabouts, have led to a desire to learn more about the impact on trucks that enter roundabouts.

Photo Courtesy of RTE

Collaborative Study

To gain a better understanding and to help guide roundabout design, the Wisconsin Department of Transportation (WisDOT) and the Minnesota Department of Transportation (MnDOT) sponsored the Roundabout Truck Study. The study looked at current design practices, gathered feedback from the trucking industry, and developed guidance and recommendations for accommodating trucks at multilane roundabouts.

The study team consisted of WisDOT and MnDOT staff and consultants DLZ National, Roundabouts and Traffic Engineering, and Short Elliot Hendrickson. A Technical Advisory Committee included representatives from local agencies, the trucking industry, MnDOT, WisDOT, and the University of Wisconsin TOPS Lab.

Current Practices

The study's first phase focused on evaluating and describing current design practices for accommodation of legal-size trucks at multilane roundabouts.

Based on research, the study team compiled a long list of potential candidate intersections for the study, selected 18 multilane roundabouts, and, based on the data, defined three case types to describe the prevailing methods of multilane roundabout design:

- Case 1 roundabouts, which require trucks to encroach into adjacent lanes as they approach and traverse the intersection.
- Case 2 roundabouts, which accommodate trucks in-lane as they approach and enter the roundabout, but may require trucks to encroach into adjacent lanes while they circulate and exit the intersection.
- Case 3 roundabouts, which accommodate trucks in-lane as they approach and traverse the entire intersection.

The study team identified the most common design characteristics for each case type, and roundabout design specialists analyzed the limitations and advantages of each case type. In addition, surveys were sent to trucking industry representatives.

Phase 1 findings include the following:

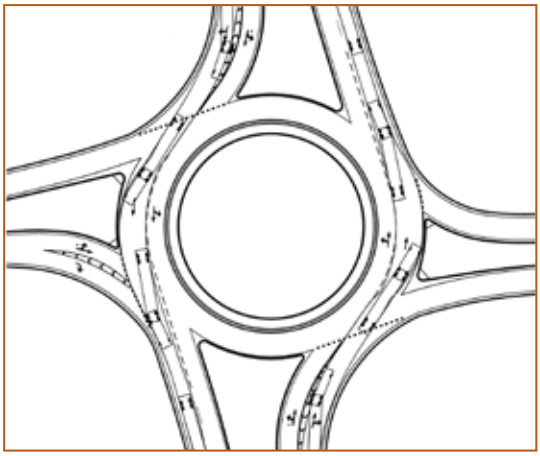
- Each case type exhibits specific geometric characteristics with differences in entry radii, entry radius length, and entry widths.
- Case 2 and Case 3 can be designed to be fully compliant with the direction in existing guidance documents from the Federal Highway Administration, WisDOT, and MnDOT, and are consistent with established design principles.
- No strong correlation existed between design vehicle volumes or total peak hour volumes and roundabout case type.
- Case 1 roundabouts in the study exhibited slightly more truck-related crashes. They also cause delays at entry because of the necessary truck encroachment.
- Trucking industry representatives expressed concerns that the actions of passenger car drivers may cause conflicts, mentioned that the majority of truck drivers prefer to stay in lane at roundabouts, and recommended wider lanes and/or better signs.

The study's second phase involved video data collection at the selected study roundabouts to observe truck operations. Footage revealed that trucks operate mostly as expected in the various design case types.

Recommended Design Parameters for Two-Lane Roundabouts

Item	Case 1	Case 2	Case 3
Inscribed circle diameter	150' to 190'	160' to 210'	180' to 220'
Inner circulatory lane width	11' to 13'	11' to 13'	13' to 15'
Outer circulatory lane width	13' to 15'	13' to 15'	15' to 18'
Entry width	28' to 32'	32' to 34'	32' to 34'
Entry radius	65' or greater	65' or greater	65' or greater
Exit widths	28' to 32'	28' to 32'	28' to 32' *

* where larger radius or tangential exit used



Case 3 roundabout design

Design Guidance

Phase 3 provided design guidance for accommodating trucks at primarily two-lane roundabouts. Key findings:

- Designers should consider implementing a Case 3 design where practical and feasible. A well-designed Case 3 roundabout that meets applicable geometric design requirements provides safe and efficient operations and optimal truck accommodation.
- Certain specific locations should warrant an additional consideration of Case 3 design, including locations where designated oversize/overweight (OS/OW) routes exist, at multilane approaches on arterial routes and at interchange ramps, near truck stops, and in industrial/warehouse districts.
- If factors make a Case 3 design undesirable, then a Case 2 design should be considered as a second choice, and in cases were truck volumes are low and/or where a Case 3 or Case 2 design has undesirable impacts, a Case 1 roundabout can be considered.

Implementation

The study points to consideration of Case 3 design for roundabouts as an option to improve accommodation for trucks. Case 3 offers trucks entry, navigation, and exit in their own lane. Of the 18 intersections in the study, the majority—nine total—were Case 2 roundabouts, five were Case 1, and three were Case 3. A relatively new concept, Case 3 requires a larger diameter, which may increase the need for additional right of way. However, the actual diameters among the three cases do not differ much: 150 to 190 feet for Case 1, 160 to 210 feet for Case 2, and 180 to 220 feet for Case 3.

WisDOT has incorporated the study results into its design guidelines, which were completed in March 2013. If 100 or more large trucks (classified as 3S2, or 18 wheelers) daily enter an intersection under consideration for a roundabout, the guidelines call for construction of a Case 3 roundabout, if at all possible. If right-of-way or other considerations—such as the impact on nearby buildings or utilities—are factors, designers are asked to look at Case 2 next and then Case 1.

For More Information

For more information about the research in this fact sheet, please contact:

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Resources

The material in this fact sheet is based on the following reports:

- *Joint Roundabout Truck Study* (6.3 MB PDF, June 2012)
- *Wisconsin roundabout design guidelines* (5.9 MB PDF, March 2013)

Links to these resources and more information about roundabouts research by TERRA members is on the web at www.TerraRoadAlliance.org.

About TERRA

The Transportation Engineering and Road Research Alliance, or TERRA, brings together government, industry, and academia in a dynamic partnership to advance innovations in road engineering and construction, including issues related to cold climates. More about TERRA is online at www.TerraRoadAlliance.org.

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