Traffic Engineering Handbook

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6. Roundabouts

Conventional at-grade intersections are associated with a high number of conflict points between crossing and turning vehicles and other road users. Roundabouts, a form of intersection, significantly reduce the number of conflict points from 32—at a standard right-angle intersection with four legs—to eight. As with conventional intersections, roundabouts impose a number of information-processing task requirements for users. Drivers entering a roundabout need to select the lane appropriate for their desired destination; slow to an appropriate speed; yield to pedestrians and bicyclists; select an appropriate gap in circulating traffic; and stay in their lane through the exit. The geometry of the roundabout forces drivers to reduce speed and physically eliminates right-angle and head-on collisions. Crash studies conducted in the United States indicate that when signalized urban intersections are replaced with modern roundabouts *where drivers may not be familiar with roundabouts*, all crashes (property damage only, injury and fatal) are reduced by 35 percent and injury crashes are reduced by 76 percent from the previous values.[1]

Although U.S. research on pedestrians and bicyclists at roundabouts is limited, findings suggest that pedestrian and bicyclist safety at roundabouts is generally good, with few reported crashes and low incidence of conflicts.[2] This may be attributable to the design of the roundabout, which allows pedestrians to cross one direction of traffic at a location generally at least one vehicle length away from the circulatory roadway, as shown in Figure 7-18. O'Brien et al. indicate that at roundabouts, a moderate to high reduction in both vehicle-vehicle and vehicle-pedestrian collisions occurs compared to other types of intersections.[3] Single-lane roundabout designs are associated with greater safety than multilane roundabouts, due in part to less confusion among drivers about which lane to use. Research has found that pedestrians with vision impairments may not have equivalent access at roundabouts as do sighted pedestrians. Various treatments are being researched to solve this problem, including some forms of signalization of the crosswalk.[4]

One challenge with the use of roundabouts in the United States is that drivers may be unaware of the rules of use (for example, who has the right of way). In 1999, a review of the contents of 33 manuals revealed that less than one-third of these gave directions for the use of traffic circles and none addressed roundabouts.[5] Presently, roundabouts are addressed in the drivers' manuals of at least 35 states.

Additional information on the design of roundabouts can be found in Chapter 7 of this handbook and in FHWA's *Roundabouts: An Informational Guide.*[6]

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[1] Rodegerdts, L., M. Blogg, E. Wemple, E. Myers, M. Kyte, M. Dixon, G. List, A. Flannery, R. Troutbeck, W. Brilon, N. Wu, B. Persaud, C. Lyon, D. Harkey, D. Carter. *Roundabouts in the United States*. Report 572. National Cooperative Highway Research Program. Transportation Research Board. Washington, DC 2007.
[2] Ibid.
[3] O'Brien and Brindle 1999. (Old Reference #195)
[4] See 1 and United States Access Board. Public Rights-of-Way Accessibility Guidelines (DRAFT). 2005.
[5] Sarkar, S., D. Burden and M. Wallwork. "Are Drivers Well Informed about Non-Conventional Traffic Controls at 196. Intersections?" Paper presented at the Annual Meeting of the Transportation Research Board, Washington, DC, 1999. (Old Reference #196)
[6] Federal Highway Administration. *Roundabouts: An Informational Guide.* 2000.

- Page 114, Table 4-7: Weaving Areas Measure of Effectiveness for *Highway Capacity Manual* Level of Service reads "Speed (mph)", while pages 122-124 seem to indicate that density is the determinant of LOS for freeway weaving segments. This same apparent discrepancy exists in the HCM between Exhibit 3-1 on page 3-2 and chapter 24. The HCM Errata and Interpretations subcommittee of AHB40 has been contacted about this.
- Page 118, Table 4-8: the FFS should be 65 mph not 55 mph.
- On page 120, formula (4-25), the term for recreational vehicles should read "$P_R(B_R - 1)$" not "$P_R(B_{R-1})$."
- On page 227, Table 7-11, the minimum calculated curve radius for a design speed of 80 mph and superelevation e = 6.0% should read "3047.6 ft" not "2047.6 ft"
- On page 105, Example 4-6, the formula for maximum flow should read "$q_{capacity} = \frac{upk_j}{4}$" and not "$q_{capacity} = \frac{upk_j}{2}$"
- On page 399, in the definition of the Protected/permissive (exclusive/permitted) mode should read "…displayed, *and* after yielding to oncoming traffic and/or pedestrians when a circular green signal indication is displayed for through traffic." [The word *and* is currently in the wrong place.]
- On page 239, the bottom of Table 7-20 should refer to Figure 7-11 and not Figure 7-9.
- On page 74, Section 14. *Transit Vehicle Operations,* units should be in miles/hour/second.
- On page 208, "See Table 6-12 for some software packages that implement MCMC methods" should reference Table 6-14.
- In subsequent printings of the book the copyright year was erroneously listed as 2010. The actual copyright year on the publication is 2009. This has been corrected for the fourth printing of the book.