

# ROUNDABOUTS: AN INFORMATIONAL GUIDE

**A**lthough roundabouts have been in widespread use in other countries for a number of years, it is only during the past few years that their application in the United States has received increased attention by both the public and transportation professionals. A lack of sufficient information on roundabout operation and design under local U.S. conditions is one of the reasons why these roundabout intersections have seen only sporadic implementation. This national guide bridges this gap by providing a comprehensive source of information on modern roundabouts, from small mini-roundabouts to large freeway interchange roundabouts.

To make the information widely accessible, the guide has been structured and written to address the needs of a wide range of readers, including the general public, policy-makers, transportation planners, operations and safety analysts, and conceptual and detailed designers. Not only does the guide provide general information and planning-level analysis techniques, but it also includes evaluation procedures for assessing operational and safety performance, as well as design guidelines. Input from transportation practitioners and researchers from around the world was used in developing the guide. This book covers the needs of all travel modes and provides design guidance for incorporating these needs into final plans.

## **SAFETY AND OPERATIONAL BENEFITS**

Many international studies have found that one of the most significant benefits of a roundabout installation is the improvement in overall safety performance. Specifically, in the United States, it has been found that single-lane roundabouts operate more safely than two-

THE DEFINITIVE SOURCE OF  
INFORMATION RELATED TO THE PLANNING,  
OPERATION, DESIGN, AND CONFIGURATION OF  
MODERN ROUNDABOUTS IN THE UNITED STATES.  
COMPREHENSIVE COVERAGE IS PROVIDED FOR ALL TRAVEL  
MODES THAT NEED TO BE CONSIDERED IN ROADWAY DESIGN.  
THE INFORMATION CONTAINED IN THIS GUIDE IS THE  
CULMINATION OF EXTENSIVE RESEARCH INTO BEST PRACTICES  
FROM AROUND THE WORLD, INTERPRETED IN THE LIGHT OF  
ACCEPTED U.S. DESIGN STANDARDS SUCH AS AASHTO'S GREEN  
BOOK AND THE MUTCD.



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

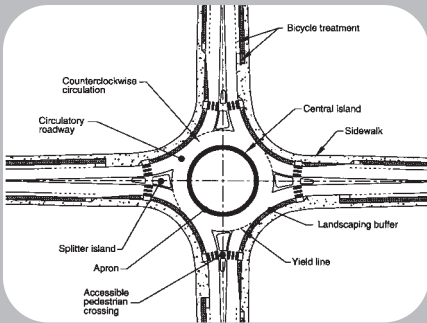
**Average annual crash frequencies at 11 U.S. intersections converted to roundabouts.**

Type of Roundabout	Percent Change			
	Sites	Total	Injury	PDO
Single-Lane	8	-51%	-73%	-32%
Multi-Lane	3	-29%	-31%	-10%
<b>Total</b>	<b>11</b>	<b>-37%</b>	<b>-51</b>	<b>-29%</b>

Source: Jacquemart, G. *Synthesis of Highway Practice 264: Modern Roundabout Practice in the United States*. National Cooperative Highway Research Program. Washington, D.C.: National Academy Press, 1998.

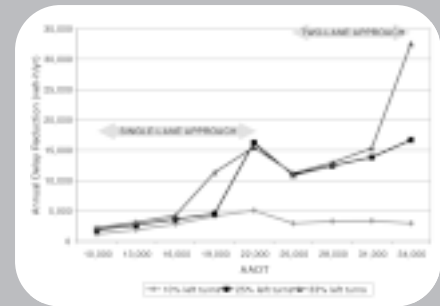
way stop-controlled intersections. The frequency of crashes might not always be lower at roundabouts, but the injury rates are reduced. Pedestrians and bicyclists require specific design treatments to improve their safety.

On a planning level, it can be assumed that roundabouts will provide higher capacity and lower delays than all-way stop control, but less than two-way stop control if the minor movements are not experiencing operational problems. A single-lane roundabout may be assumed to operate within its capacity at any intersection that does not exceed the peak-hour volume warranted for signals. A roundabout that operates within its capacity will generally produce lower delays than a signalized intersection operating with the same traffic volumes and right-of-way limitations.



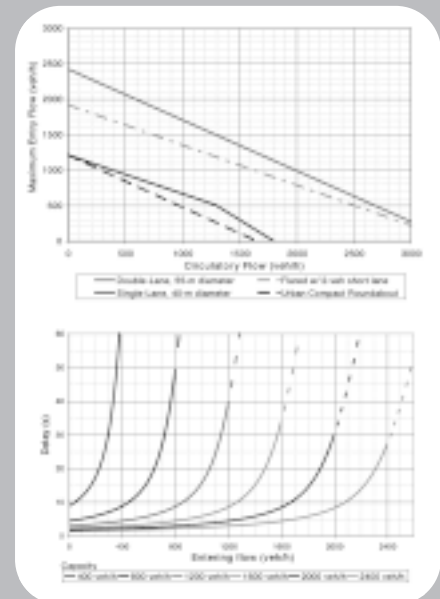
**Chapter 1, Introduction.**

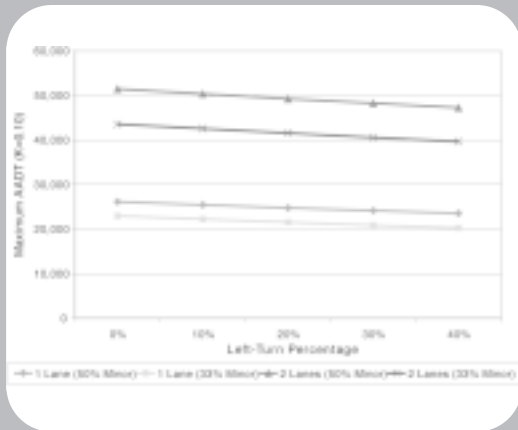
Defines the key features and dimensions of a roundabout and describes the various types of roundabouts. It clearly highlights the differences between roundabouts and other forms of traffic circles with the generous use of photographs to depict a variety of situations.



**Chapter 2, Policy Considerations.**

Provides a broad overview of roundabout performance characteristics, including safety, delay, environmental factors, traffic calming, aesthetics, and multimodal considerations, as well as the policy considerations that pertain to their use. Costs associated with roundabouts relative to other intersection forms, legal issues, and education and public involvement techniques are also discussed.





## WHEN TO RECOMMEND ROUNDABOUTS: PLANNING ANALYSIS

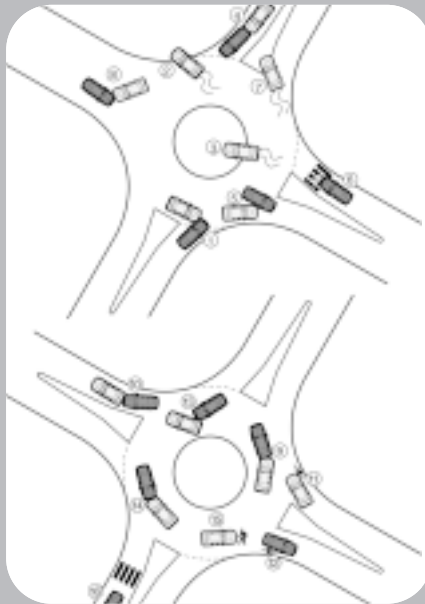
Roundabouts can be considered for a variety of reasons. The roundabout guide describes categories for selection that range from community enhancement and traffic calming, to safety improvements and operational benefits. The maximum daily service volume of a single-lane roundabout varies between 20,000 and 26,000 vehicles per day, depending on the left-turn percentages and the distribution of traffic between the major and minor roads. A double-lane roundabout may service 40,000 to 50,000 vehicles per day.

### Chapter 3, Planning.

Presents planning-level guidelines for identifying appropriate intersection control options. This chapter presents daily traffic volume-based procedures for evaluating roundabout feasibility at a given location.

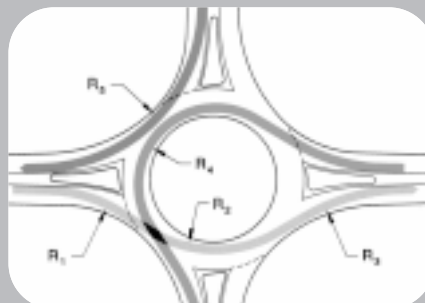
### Chapter 4, Operational Analysis.

Details methods for analyzing the operational performance (capacity, delay, and queuing) of each type of roundabout. This chapter describes traffic operations at roundabouts, lists the data required for evaluating roundabouts, shows how to estimate capacity, describes measures of effectiveness, and provides a brief overview of available software tools.



### Chapter 5, Safety.

Discusses the improvements in safety performance that roundabouts typically provide at intersections. Roundabout safety related to vehicles, bicycles, and pedestrians is discussed, and international roundabout safety experience is presented for comparison. In addition, crash prediction models are given for evaluating crashes at roundabouts.



### Chapter 6, Geometric Design.

The chapter presents the basic design philosophy of speed reduction and speed consistency to maximize the safety of a roundabout. This chapter presents specific roundabout geometric design principles, and then discusses each design element in detail, along with appropriate parameters to use for each type of roundabout.

# ROUNDBABOUTS: AN INFORMATIONAL GUIDE

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Additionally, the guide contains over 150 charts, diagrams, plans and photographs which illustrate the various features of roundabouts.

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- 6.4 Double-Lane Roundabouts
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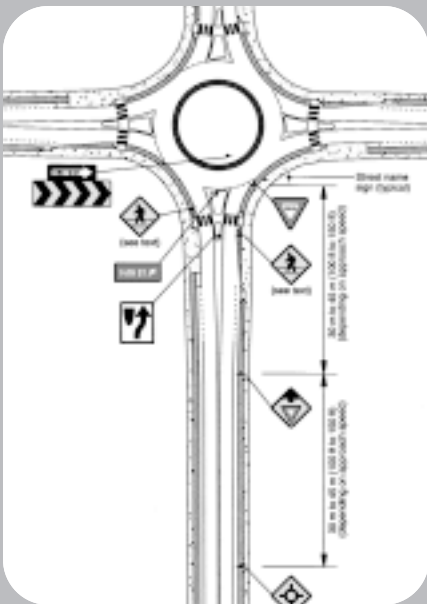
- 7.1 Signing
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**Chapter 7, Traffic Design and Landscaping.** Discusses a number of traffic design aspects that should be considered once the basic geometric design has been established. These details include signs, pavement markings, illumination, and landscaping. Chapter 7 also discusses issues regarding work-zone traffic control at roundabouts.

**Chapter 8, System Considerations.** Identifies specific issues and treatments that may arise within a systems context. The chapter discusses signal control at roundabouts and the issue of rail crossings through or near a roundabout. Roundabouts in series with other roundabouts are also discussed, including those at freeway interchanges and those in signalized arterial networks. Finally, Chapter 8 presents simulation models as supplementary operational tools capable of evaluating roundabout performance within an overall roadway system.



# Roundabout or Traffic Circle?

Since the distinctions between modern roundabouts and other kinds of circular intersections may not always be obvious, the negative aspects of older rotaries or traffic circles may be mistaken by the public with a roundabout. Therefore, the ability to carefully distinguish roundabouts from traffic circles is important in terms of public understanding.

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## Traffic Control



Yield control is used on all entries. The circulatory roadway has no control.



Some traffic circles use stop control, or no control, on one or more entries.

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## Priority to Circulating Vehicles



Circulating vehicles have the right of way.



Some traffic circles require circulating traffic to yield to entering traffic.

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## Pedestrian Access



Pedestrian access is allowed only across the legs of the roundabout, behind the yield line.



Some traffic circles allow pedestrian access to the central island.

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## Direction of Circulation



All vehicles circulate counter-clockwise and pass to the right of the central island.



Some neighborhood traffic circles allow left-turning vehicles to pass to the left of the central island.

The important difference between roundabouts and other forms of traffic circles is the reduction of absolute and relative speeds between users.

Roundabouts require conformance to common practices to ensure safe, optimal operation. A scattered approach to design can lead to inconsistencies at a national level that are consequential in terms of driver expectation and safety.

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- Kittelson & Associates, Inc.
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In addition the document benefited from extensive review by representatives of French and British practices as well as AASHTO, MUTCD, and representatives of the Americans With Disabilities Act.

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*Roundabouts: An Informational Guide* (FHWA-RD-00-067) will be available on the internet at the Turner-Fairbank Highway Research Center website: <http://www.tfhrc.gov>.

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A report may be obtained from the FHWA Report Center. Fax requests to (301) 577-1421 or e-mail requests to [report.center@fhwa.dot.gov](mailto:report.center@fhwa.dot.gov). Requests for the report will be logged and copies mailed when the document is published. The Report Center may be reached by phone at (301) 577-0818.