RSN 98-05

July 16, 1998

RESEARCH
Oregon Department of Transportation

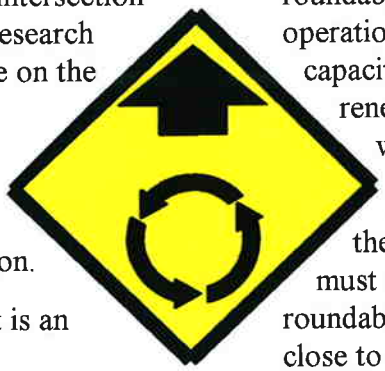
Should ODOT Go Roundabout?

Intersection Control by Going in Circles

Research Notes

OREGON DEPARTMENT OF TRANSPORTATION

Roundabouts have been used in foreign countries for decades, with several recently built in Florida, Maryland, Vermont and Colorado. The Oregon Department of Transportation (ODOT) is considering roundabouts as an alternative design for intersection control. An ODOT research report is now available on the design and usage of roundabouts. The report also evaluates the feasibility of roundabouts for Oregon.



A modern roundabout is an intersection which accommodates traffic flow in one direction around a central island. It is not a traffic circle. The table below identifies some of the differences.

The roundabout concept was first invented in the early 1900's. During the 1950's many roundabouts failed, due mainly to traffic locking and increasing accident rates. Many were replaced by traffic signals. In 1966, the off-side priority rule (an entering vehicle gives way to vehicles in the roundabout) and the yield at entry operation enhanced roundabout capacity and safety, provoking renewed interest in roundabouts worldwide.

For a successful roundabout, the appropriate siting criteria must be used. For instance, a roundabout should not be located close to a signalized intersection where a backup queue from the signalized intersection to the roundabout is possible.

Roundabouts can be classified based on their sizes and applications, as normal, mini or small, double,

	Modern Roundabout	Traffic Circle
Control at Entry	Yield sign for entering vehicles.	Stop, signal, or give priority to entering vehicles.
Operational Characteristics	Vehicles in the roundabout have priority over entering vehicles.	Allow weaving areas to resolve conflicted movement.
Deflection	Use deflection to control low speed operation through roundabout.	Large traffic circles may provide straight path for movement with higher speed.
Parking	No parking allowed on the circulating roadway.	Some larger traffic circles permit parking within the circulating roadway.
Pedestrian Crossing	No pedestrian activities take place on the central island.	Some traffic circles provide for pedestrian crossing to, & activities on, central island.
Turning Movement	All vehicles circulate around the central island.	Mini-traffic circles, left-turning vehicles expected to pass left of central island.
Splitter Island	Required.	Optional.

Advantages and Disadvantages of Roundabouts

signalized, interchange, or ring junction. Three types of roundabouts are proposed for consideration in Oregon; mini or small roundabouts, normal roundabouts, and roundabout interchanges. Below are some advantages and disadvantages of roundabouts.

	Advantages	Disadvantages
Safety	• Fewer conflict points than uncontrolled intersection. • Lower speeds yield less severe and fewer accidents.	• Accidents may increase for an initial period. • Signalized intersections can preempt control.
Capacity	• Traffic *yields* rather than *stops,* often resulting in the acceptance of smaller gaps. • For isolated intersections, roundabouts give higher capacity/lane than signalized intersections.	• Signalized intersections increase capacity in coordinated signal networks,. • Signals may be preferred at intersections operating at higher than designed capacities.
Delay	• Overall delay may be less than for an equivalent volume signalized intersection (this does not equate to a higher level of service). • During the off-peak, signalized intersections may produce unnecessary delays.	• Drivers may not like the geometric delays requiring them to divert from straight paths. • With queuing, entering drivers tend to enter with shorter gaps, increasing delays on other legs and the number of accidents.
Cost	• In general, less right-of-way is required. • Roundabout maintenance costs may be lower than signalized intersections. • Lower accident costs, fewer accidents, less severity.	• Construction costs may be higher. • In some locations, roundabouts may require more illumination, increasing costs.
Pedestrian and Bicyclist	• Splitter island provides pedestrian refuge. • At low speed and low traffic volume, roundabouts should improve safety for bicyclists.	• Islands may be difficult for wheelchairs. • Tight dimensions uncomfortable to bicyclists. • Longer travel distances for pedestirans & bikes. • More delay for pedestrians seeking gaps to cross.

Safety

Roundabouts are expected to reduce accident numbers and severity compared to other control alternatives. Based on numerous studies, higher safety at roundabouts is due to:

- Fewer conflict points. For comparison, an uncontrolled four-legged intersection has 28 conflict points, but a roundabout has only eight conflict points.
- No left-turn accidents, the cause of most fatal or serious accidents at cross intersections.
- Simple decision-making at the entry point.
- Slow relative speeds of all vehicles in the conflict area.
- Splitter islands provide pedestrian refuge, and permit them to cross one direction of traffic at a time.

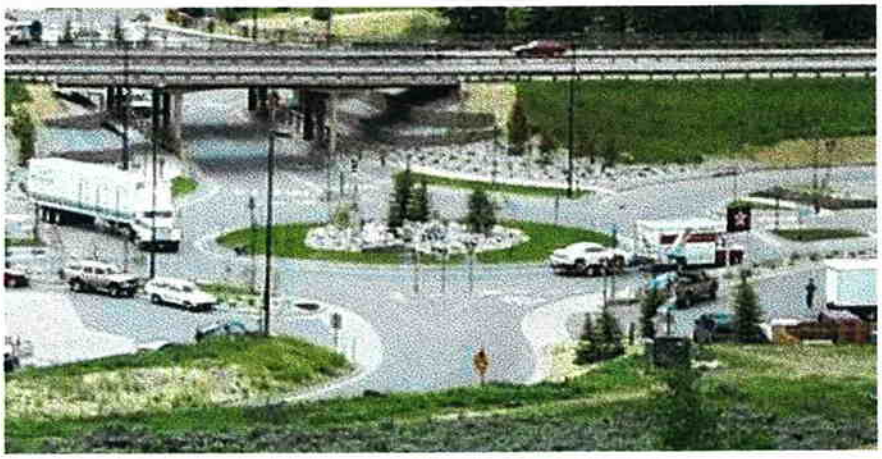
Pedestrian and Bicyclist Considerations

Providing safe mobility for pedestrians and bicyclists can be complex. The study provides alternative designs and considerations for accommodating bicycles and pedestrians. For a roundabout implementation plan in Oregon, concerns that need to be addressed include:

- Signing and striping for safe pedestrian crossing,
- Use of marked or unmarked crosswalks,
- Establishment of site criteria when pedestrians and bicyclists are concerned,
- Determination of the proper location of crosswalks,

Roundabout Design

- Incorporation of the needs of impaired pedestrians,
- Determination of the appropriate size of splitter islands,
- Recommendations for bicycle lanes including exclusive bicycle lanes.



Geometric Design of Roundabouts

The report summarizes three US design guidelines (Florida, Maryland and California), the Australia design guideline, and partial translation of the French design guideline. Recommendations in the following areas are proposed for Oregon: design vehicle, design speed, approach characteristic, entry and exit width, circulating width, entry and exit curve, sight distance, deflection, central island, splitter island, and superelevation.

Calculating Roundabout Capacity and Delay

Methodologies have been developed to evaluate the functional performance of roundabouts. Capacity and delay are used by most countries as a measure of performance. Since ODOT uses the volume/capacity (v/c) ratio to evaluate intersection performance, the report focuses on the capacity formula.

Software Models for Roundabouts

The research project did not acquire or evaluate existing software, but collected information on three major software packages used to analyze or design roundabouts: SIDRA, ARCADY, and RODEL. Recently, a test of the SIDRA program in the US found agreement between SIDRA delay output and collected field data. The RODEL package has been used to design roundabouts in the US, but no study has been done on the ability of RODEL to predict roundabout performance in this country. ODOT is currently evaluating the SIDRA program as a potential roundabout planning tool for Oregon.

Other Related Topics

Public Perception: To avoid public opposition, successful proposals should start with educating people about the difference between roundabouts and traffic circles. Brochures, videotapes, and mass media used during the development stage will help the public understand roundabouts, and opposition will be gradually reduced. This strategy has been successful in improving public perception in Florida, Maryland, and Vermont.

Functional Hierarchy: Roundabouts should be appropriate at intersections with similar functional classes. Another appropriate location is the transition between a freeway ramp and an arterial, when the speeds on the arterial can be adequately controlled.

Public Transit: A bus stop can be situated on an entrance leg, upstream from the crosswalk (in a pullout), or on an exit lane. On larger roundabouts, a bus pullout can be located on the outside perimeter of the circulating roadway.

Roundabouts should be considered as an option to improve safety of intersections with high accident rates. Roundabouts can be a good replacement for all-way stop control where traffic volumes are high. In order to

implement roundabouts successfully, public involvement during the planning stage is important. Educating people on the difference between a traffic circle and a modern roundabout is a key to success, so a task force to develop a public involvement strategy is recommended. *The Modern Roundabouts for Oregon* report is a first step to develop guidance for roundabout use in Oregon. A task group is working to develop preliminary siting criteria for roundabout use in Oregon. The preliminary list has been approved by the Project Development Line Team (PDLT) and is available from Mark Johnson, (503) 986-3564.

To Find Out More.....

Request a copy of the research report from the Research Unit by phone, e-mail, or in person. If you have access to the ODOT Network, an electronic copy is available at "s6000e/TDB/6531shar/Roundabouts Reports" (two versions are there — the full report, and the Executive Summary). A copy will soon be available via the Research Unit web page as well.

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