ROUNDABOUTS

Description

Intersections are common sources of recurring congestion, as well as crashes that cause additional congestion. Intersections in the United States are traditionally controlled by traffic signals or stop signs; these traffic control devices are inherent sources of delay by their very nature of stopping one direction of traffic to permit a conflicting movement to proceed.

The modern roundabout design counteracts those sources of delay; it is an intersection design that has been long established in other countries and is being increasingly utilized in the United States. A roundabout is a type of circular intersection with yield control for entering traffic, splitter islands on the approaches, and appropriate roadway curvature to reduce vehicle speeds on each approach.[1] All vehicles enter at lower speeds and traverse the roundabout, but it is not necessary for any vehicle to stop unless waiting on a gap in traffic on the circulating roadway.

Target Market

Arterials and Collectors

Modern roundabouts are frequently used on arterials and collectors in suburban areas, though there are also applications for rural and urban installations where right-of-way is available and the design is appropriate for the approach speeds. Roundabout designs are typically evaluated for all existing intersections that have been identified as needing major safety or operational improvements. This includes intersections with freeway interchange ramp terminals where signal coordination and recurrent queuing can be problematic.[2]

How Will This Help?

Roundabout designs can reduce delays, shorten travel times, and lower speeds when compared to traditional signalized intersections. The design helps to reduce the amount of time

AZDOT

Cost:	●●●●○
Time:	**Moderate**
Impact:	**Spot/Corridor**
Who:	**City/State**
Hurdles:	**Right-of-Way**

vehicles are stopped at the intersection to decrease delay and travel time, as they only have to yield as they approach. The roundabout geometry also encourages drivers to slow down in order to traverse the intersection.

Roundabouts can improve safety by preventing crashes and reducing crash severity at the intersection. A roundabout eliminates some of the conflicting traffic, such as left turns, which cause crashes at traditional intersections. Because roundabout traffic enters or exits through right turns only, the occurrence of severe crashes is substantially reduced.[3]

Implementation Examples

Modern roundabouts have been installed in many locations across the country, particularly in states such as Colorado, Florida, Kansas, Maryland, New York, and Washington. There are also successful installations within Texas.

Golden, Colorado: A roundabout corridor in Golden, Colorado, replaced a series of signalized intersections with four roundabouts on a 0.5-mile segment of an arterial.[4] A comparison of before-and-after conditions indicated that speeds were lowered between major intersections in the corridor, but there were also lower travel times (reduced from 78 to 68 seconds). In addition, the average measured delay before the roundabouts was 28 seconds with a maximum of 118 seconds; after installation, average delay was reduced to 13 seconds and maximum of 40 seconds. Traffic volumes increased from 11,500 to 15,500 vehicles per day, but the number of annual crashes dropped from 123 to 19. Calculated crash rates declined by 88 percent, from 5.9 to 0.4 crashes per million vehicle miles; injury crashes were reduced from 31 in the three years prior to installation to only one in the 4½ years after—a 93 percent decline in injury crash rate. The study also reported sales tax revenues along the corridor increased 60 percent; 75,000 square feet of retail/office space was built after installation.

Application Principles and Techniques

The purpose of the roundabout design is to create an intersection that allows vehicles to traverse the intersection with minimal stopping (only to yielding to oncoming cars currently in the roundabout) and improves the traffic flow through the intersection in an effort to decrease congestion and delay.

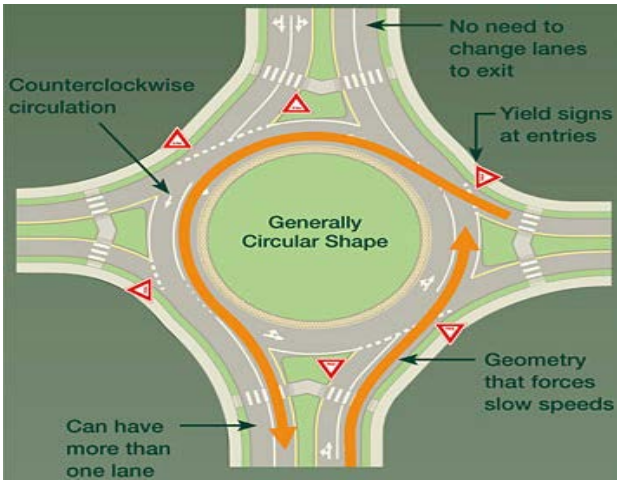
Planning is a key when evaluating roundabout implementation. Practitioners should determine if a roundabout is appropriate for the location based on traffic volumes and available right-of-way. They should also find the adequate size, evaluate the possible impacts of the design, and consider providing education and outreach to help transition drivers into using the new design.[5]

The practitioners should also consider using different design techniques for roundabouts. Considering the angle of approach so that it provides slow entry speeds and more consistent speeds throughout the roundabout is necessary when designing a roundabout. Determining the appropriate number of lanes for adequate capacity, evaluating lane volume balance, and evaluating lane continuity are also important aspects when implementing a new roundabout. Practitioners should also consider providing smooth channelization that is intuitive to drivers, designing for proper vehicles, designing for pedestrians, and ensuring adequate sight distance and visibility for a roundabout.[5]

Issues

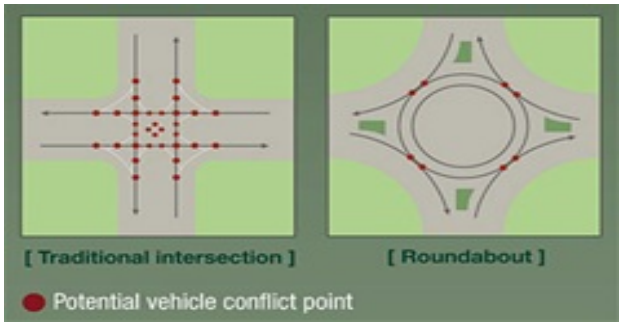
There are three primary issues that affect the successful implementation of modern roundabouts:

- Sufficient right-of-way to install the circulatory roadway and approaches.
- Geometric design that ensures reduced speed for entering and circulating vehicles and provides accessibility for all road users.
- Education of drivers and other road users that may not be familiar with characteristics of modern roundabouts and how to navigate them.



FHWA

For more information, please refer to: http://mobility.tamu.edu/mip/strategies.php.



FHWA

In some developed areas, acquisition of right-of-way may be a substantial portion of the project's cost and timeline; however, in undeveloped areas and at locations where large existing intersections are being converted, there may already be sufficient right-of-way to construct all of the necessary elements for proper operation.

Proper site selection and channelization for motorists, bicyclists, and pedestrians are essential to making roundabouts accessible to all users. In particular, it is important to ensure safe accommodation of bicyclists at higher-speed roundabouts and for pedestrians with visual or cognitive impairments. A peer review of the design, such as that provided by the Federal Highway Administration (FHWA), [6] is also a recommended step in the design process.

In addition to right-of-way concerns, education of drivers and pedestrians is also critical, because the new operational scheme of the intersection may be unfamiliar to road users. Public announcements, brochures and flyers, public meetings, and videos containing images of simulated anticipated operations (or of existing intersections at other locations) are all useful in educating the public how to navigate the new intersection. Examples of educational programs and materials are provided by the FHWA.[7]

Who Is Responsible?

In many cases, cities will be the responsible agencies as roundabouts are commonly installed on arterials and collectors within city limits. TxDOT will be involved for installations on city streets that are also part of the state highway system, and rural intersection installations.

Project Timeframe

The timeline for a modern roundabout project is similar to that of a project for construction or reconstruction of a traditional intersection (e.g., 3 to 12 months). Depending on existing conditions, additional time may be required for right-of-way acquisition, utility relocation, or extra construction phases to carry existing traffic through the work area.

Cost

If sufficient right-of-way is available, construction costs may be little different from construction of a traditional intersection. Additional costs may be required if the resulting amount of paved surface is greater than previous conditions, including not just the traveled way for vehicles but any reconfiguration of pedestrian paths that may be necessary. However, there are no costs for traffic signal installation at the time of construction, nor are there ongoing maintenance costs to maintain them, so the cost of a roundabout may be equal to or less than a signalized intersection over its expected life cycle.

Data Needs

When considering the installation of a modern roundabout, the practitioner should consider the adjacent development and access needs, and the available right-of-way. The design also needs to consider all approach volumes, turn volumes, pedestrian and bicycle counts (including crossing counts per hour), and the average speed on each intersection approach.

Other useful information includes the intersection crash history (type and frequency), intersection geometry, typical delay, and the traffic signal data.

Roundabouts Best Practice

- Type of Location: Wide variety of intersections (arterials, collectors, local streets); frequently used at low- to moderate-speed and/or volume locations, though higher speeds and volumes are also possible.
- Agency Practices: Coordination between planning, design, safety, and operations.
- Frequency of Reanalysis: After substantial land use changes or development; as travel increases or trips change in the area; at time of roadway widening or reconstruction.
- Supporting Policies or Actions Needed: Capability to fund improvements, multi-agency agreements, and policies where roadways cross jurisdictional boundaries; driver education campaign.
- Complementary Strategies: Intersection improvements – pedestrian treatments, access management.

For More Information

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A Policy on Geometric Design of Highways and Streets, American Association of State Highway and Transportation Officials, Washington, D.C., 2004.

References

1. FHWA. *Roundabouts: A Safer Choice*. Report No. FHWA-SA-08-006. Federal Highway Administration, Washington, DC. 2008.

2. FHWA Safety Program. Guidance Memorandum on Consideration and Implementation of Proven Safety Countermeasures. Federal Highway Administration, Washington, DC. http://safety.fhwa.dot.gov/policy/memo071008/. Accessed: October 28, 2011.

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