

PLANNING FOR ROUNDABOUTS

By Jason Stimmel, P.E.

It is important to understand how and where a roundabout can be a successful method of intersection control for your community. Roundabouts are considered a Federal Highway Administration (FHWA) *'Proven Safety Countermeasure'* due to their ability to substantially reduce the types of crashes that result in injury or loss of life. In addition, roundabouts decrease congestion with the generally constant flow of traffic, while also improving pedestrian/bicycle safety due to slower moving traffic and pedestrian refuge areas. Roundabouts may also complement other common community values with reduced noise and more aesthetically pleasing options when compared to traditional intersections.

As part of the department's Intersection Control Evaluation (ICE) policy, roundabouts are required to be considered during the planning/preliminary engineering project phase(s) for projects that significantly impact existing intersections or projects that propose construction of new intersections.

Generally, intersections that have the following characteristics are good candidates and can benefit from the implementation of a roundabout:

- Significant delay on minor road and/or from traffic signal operations,
- High left-turn traffic volumes, and
- History of crashes involving crossing traffic and/or pedestrians.

Roundabout Categories

There are six general categories of roundabouts based on the size, number of lanes, and location of the facility: mini, urban compact, urban single-lane, urban double-lane, rural single-lane, and rural double-lane. Most roundabouts in Pennsylvania are single lane with design speeds between 15 and 30 mph. The following provides a summary of the four most common roundabouts found in Pennsylvania:

- **Mini** – used in low-speed urban or residential environments; inscribed circle diameter (45 to 80 feet) and design speed of 15 mph. Useful at locations with right-of-way constraints. Accommodates passenger cars, but central island is mountable as larger vehicles may track/cross over the island.
- **Urban Compact** – also a low-speed design, same as mini, but includes all the traditional design elements of effective roundabout; inscribed circle diameter (80 to 100 feet) and is primarily non-mountable but may include a mountable apron. The principal objective of the design is pedestrian safety with traffic capacity and/or delay not as critical issues.
- **Urban Single-Lane** – distinguished from urban compact roundabouts by larger inscribed circle diameters (100 to 130 feet), higher design speed (20 mph), and greater defined entries and exits that accommodate higher capacities. These roundabouts are designed to focus on achieving consistent entering and circulating speeds and accommodate larger vehicle sizes. The geometric design includes raised splitter islands and a non-mountable central island (preferably with no apron).
- **Rural Single-Lane** – designed to accommodate higher design speeds (30 mph) and requires additional supplementary advanced signage on approaches to encourage motorists to slow down, and in some cases may even include short approach chicanes. Rural roundabouts also have the largest inscribed circle diameters (130 to 180 feet) to accommodate the higher entry, circulatory, and exit travel speeds. The design includes extended and raised splitter islands, a non-mountable central island, and more pronounced deflection angles for entry and exit points.



(Image courtesy of PennDOT) Motorists, bicyclists, and pedestrians should see this signage upon approaching a roundabout.

Planning Level Questions and Analysis

The goal of ICE is to identify and select an alternative that meets the project purpose and reflects the overall best value as determined by performance-based criteria and accounting for available resources. ICE is scalable, meaning the corresponding level of effort for screening and analysis should be commensurate with the magnitude and nature of the project – less effort for simple, more effort for complex. PennDOT has developed ICE assessment forms to summarize operational analysis, cost analysis, safety performance, multimodal accommodations, and environmental/utility/right-of-way impacts to aid in benefit-cost analysis for comparison of traffic control alternatives. This process provides the planning level analysis to determine if a roundabout is the right solution.

Issues for Consideration

When planning for a roundabout, there are several issues for your municipality to discuss with PennDOT associated with pedestrians, bicyclists, maintenance, and public education.

- Pedestrians – it is imperative that pedestrian access to the circulatory roadway and to the central island be prohibited (discouraged). Where pedestrians are accommodated, ensure the crossings are set back from the yield line by a minimum of 25 feet (one car length) to shorten the crossing distance and separate vehicle - vehicle and vehicle - pedestrian conflict points. Ensuring proper design and location of pedestrian crossings is also important for aiding visually impaired individuals so they can locate the crosswalk, be able to listen for and discern entering or exiting traffic for safe gaps to cross and be able to locate the splitter island refuge area.
- Bicyclists – understand that bike lanes are never to be used within a roundabout due to the complexity of traffic interaction. On a single-lane roundabout, bicyclists should have the option of either mixing with traffic or utilizing a shared-use path with pedestrians. A shared-use path for bicyclists and pedestrians that is located outside of the roundabout is the most preferable option.
- Maintenance – working around and within roundabouts can be more involved and challenging than standard intersections, especially with pavement repair/restoration while maintaining traffic operations. PennDOT has developed a series of typical traffic control applications for roundabouts that are found in the department's "Publication 213 – Temporary Traffic Control Guidelines." Plan for additional effort with snow removal as the geometry of the roundabout makes this task more difficult while also avoiding stockpiling issues that interfere with traffic operations. Furthermore, maintenance costs associated with landscaping must also be considered with the long-term costs for the life of the facility.

- Public acceptance of roundabouts continues to remain one of the biggest challenges that a jurisdiction will face, especially when proposing its first roundabout. Motorists can experience driver confusion when traversing a roundabout for the first time; this is why public outreach is imperative to provide education of the aspects of a roundabout. PennDOT has developed brochures and videos that can help inform the public, but it is best to engage the public during the project development process to obtain the best outcome.

Successful planning will ensure that a roundabout is the right decision for your community. When the decision to install a roundabout is proposed, planning helps ensure the design meets the needs and fits within the context of your community.



S. Chester Rd. Roundabout, Swarthmore, PA. Photo: PennDOT This photo shows the roundabout in Swarthmore, just outside of Philadelphia.

Guidance Resources

- Federal Highway Administration – Proven Safety Countermeasures, Roundabouts (https://highways.dot.gov/sites/fhwa.dot.gov/files/Roundabouts_508.pdf)
- NCHRP Report 672 – Roundabouts: An Informational Guide, Second Edition (<https://www.trb.org/Main/Blurbs/164470.aspx>)
- NCHRP 1043 Guide for Roundabouts (<https://www.trb.org/Publications/Blurbs/182939.aspx>)
- PennDOT Roundabouts Resource Webpage (<https://www.penndot.pa.gov/ProjectAndPrograms/RoadDesignEnvironment/RoadDesign/Pages/Roundabouts.aspx>)
- PennDOT Intersection Control Evaluation Webpage (<https://www.dot.state.pa.us/public/Bureaus/BOMO/Portal/TSPortal/ICE.html>)
- PennDOT Publication 10X, Appendix AI – Intersection Control Evaluation Policy (<https://www.dot.state.pa.us/public/PubsForms/Publications/PUB%2010/Pub%2010X/December%202021%20Change%20No.%204.pdf#page=565>)
- PennDOT Publication 213 – Temporary Traffic Control (<https://www.dot.state.pa.us/public/PubsForms/Publications/PUB%20213.pdf>)