

Mini-Roundabouts



Presentation Overview

- Characteristics of mini-roundabouts with emphasis on principles-based approach to design
- Key considerations for planning, analysis, and design of mini-roundabouts

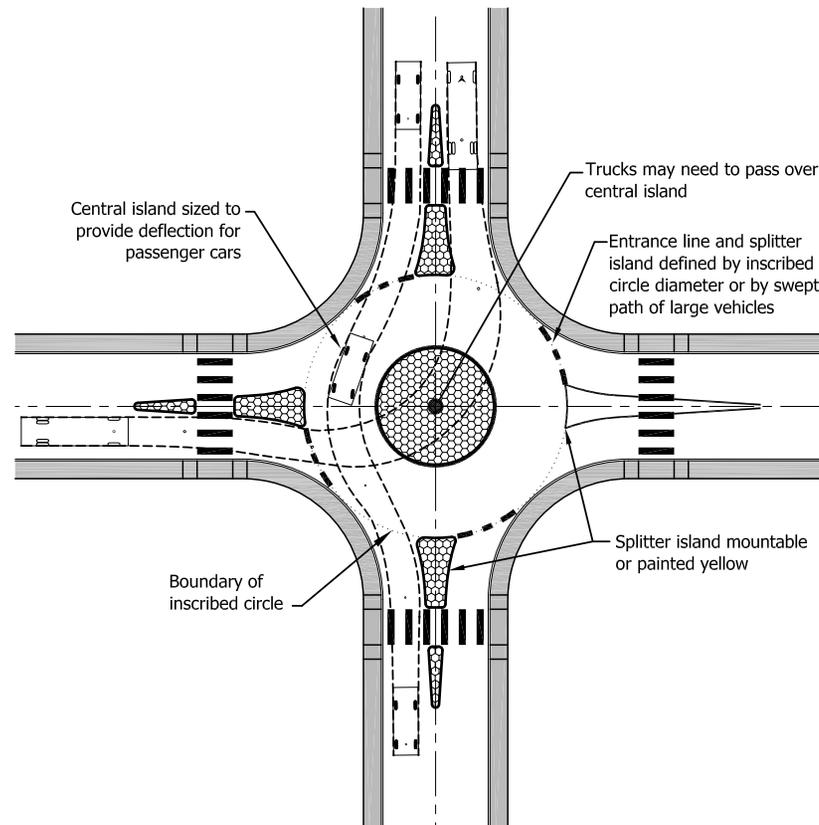
Presentation Outline

- **Characteristics of Mini-Roundabouts**
- Benefits of Mini-Roundabouts
- User Considerations
- Location Considerations
- Operational Analysis
- Design Considerations
- Costs

Mini-Roundabout Design Features



- Mini-roundabouts generally have an inscribed circle small enough to stay within existing right-of-way



Presentation Outline

- Characteristics of Mini-Roundabouts
- **Benefits of Mini-Roundabouts**
- User Considerations
- Location Considerations
- Operational Analysis
- Design Considerations
- Costs

Benefits of Mini-Roundabouts



- **Compact Size**
 - Can be developed to fit within existing right-of-way constraints
- **Operational Efficiency**
 - May provide less delay for a critical movement or an overall intersection compared to other intersection alternatives
 - However, cannot provide explicit priority to specific users
- **Traffic Safety**
 - Reduced crash rates at UK locations by approximately 30% compared to signalized intersections
- **Aesthetics**
 - Landscaping opportunities limited to intersection periphery

Benefits of Mini-Roundabouts (Continued)



- **Traffic Calming**
 - Reduced speeds result from proper design, but roundabouts with raised islands provide better levels of speed reduction
- **Access Management**
 - Provide efficient access to a new or existing development
 - Diameter may be too small for large vehicles to make U-turns
- **Environmental Benefits**
 - May reduce delay, fuel consumption, and vehicle emissions

Presentation Outline

- Characteristics of Mini-Roundabouts
- Benefits of Mini-Roundabouts
- **User Considerations**
- Location Considerations
- Operational Analysis
- Design Considerations
- Costs

Motorist and Emergency Vehicle Considerations



- **Motorist considerations: Enhance driver safety**
 - Allow more time to make decisions, act, and react
 - Reduce the number of directions of conflicting traffic
 - Reduce the need to judge gaps in fast traffic
- **Emergency vehicle considerations**
 - Unlikely to have significant difficulty negotiating a mini-roundabout

Pedestrian and Bicyclist Considerations



- **Pedestrian considerations**
 - Accommodated at crosswalks around the perimeter
 - Smaller splitter islands than roundabouts require pedestrians to cross the street in one stage
- **Bicyclist considerations**
 - Usually comfortable negotiating the roundabout as a motor vehicle
 - Can also navigate the intersection as a pedestrian on sidewalks and crosswalks

Presentation Outline

- Characteristics of Mini-Roundabouts
- Benefits of Mini-Roundabouts
- User Considerations
- **Location Considerations**
- Operational Analysis
- Design Considerations
- Costs

Location Considerations



- Mini-roundabouts may have traffic calming properties and are most effective in lower speed environments
- Mini-roundabouts can be advantageous in a number of locations
- However, certain constraints may adversely affect their feasibility at a specific site

Common Site Applications



- Space-constrained locations: May be a solution where a larger roundabout will not fit
- Residential environments: Offer a low-speed, low-noise intersection option
- Intersections with high delay: Can reduce delay at stop-controlled intersections that do not meet signal warrants

Potential Site Constraints



- High volume of trucks will significantly reduce the capacity of the mini-roundabout
- Locations in which U-turn truck traffic is expected since trucks may not be able to make a U-turn
- Locations with light volumes of minor street traffic may cause major street vehicles to ignore the intersection control
- Challenges for other types of roundabouts may make it infeasible to construct a mini-roundabout

Methods to Address Site Constraints



- Design modifications
- Coordination with affected parties
- Consideration of other intersection types if these constraints cannot be overcome

Presentation Outline

- Characteristics of Mini-Roundabouts
- Benefits of Mini-Roundabouts
- User Considerations
- Location Considerations
- **Operational Analysis**
- Design Considerations
- Costs

Operational Analysis



- Recommended for intersections with total entering daily traffic volume less than 15,000 vehicles
- Operational performance models for mini-roundabouts have not been developed for US conditions
- Calibration of international models to US drivers has not been determined

Presentation Outline

- Characteristics of Mini-Roundabouts
- Benefits of Mini-Roundabouts
- User Considerations
- Location Considerations
- Operational Analysis
- **Design Considerations**
- Costs

Key Objectives of Mini-Roundabout Design



- Slow entry speeds
- Smooth channelization
- Adequate accommodation for design vehicles
- Meeting needs of pedestrians and bicyclists
- Appropriate sight distance

Horizontal Design



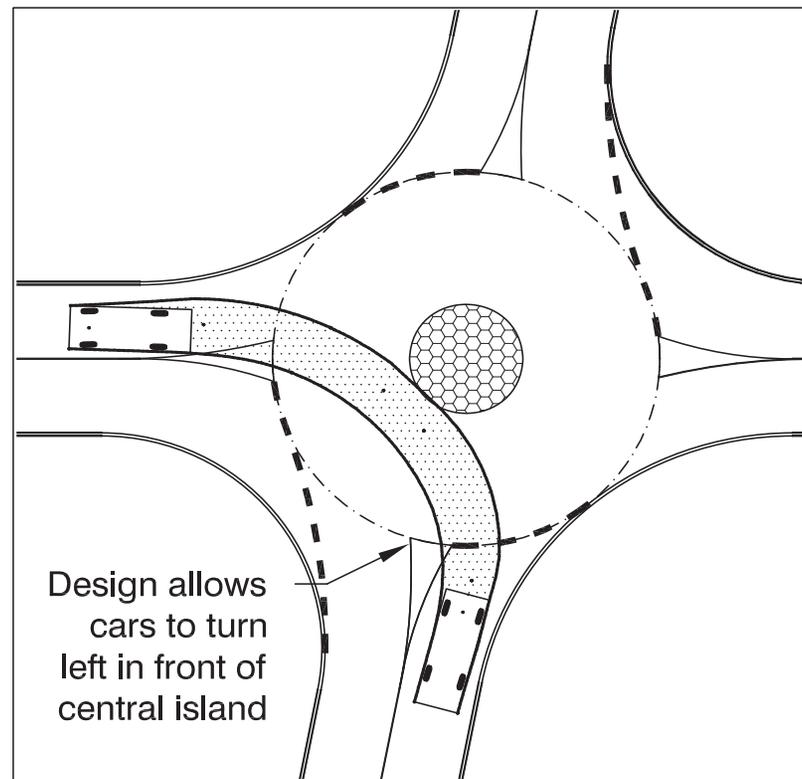
- Key areas for consideration
 - Entrance line placement
 - Splitter islands
 - Size
 - Design vehicle
 - Design speed
 - Central island

Horizontal Design Consideration: Placement of Entrance Line



- Incorrect placement can introduce undesirable driver behavior

Incorrect Placement

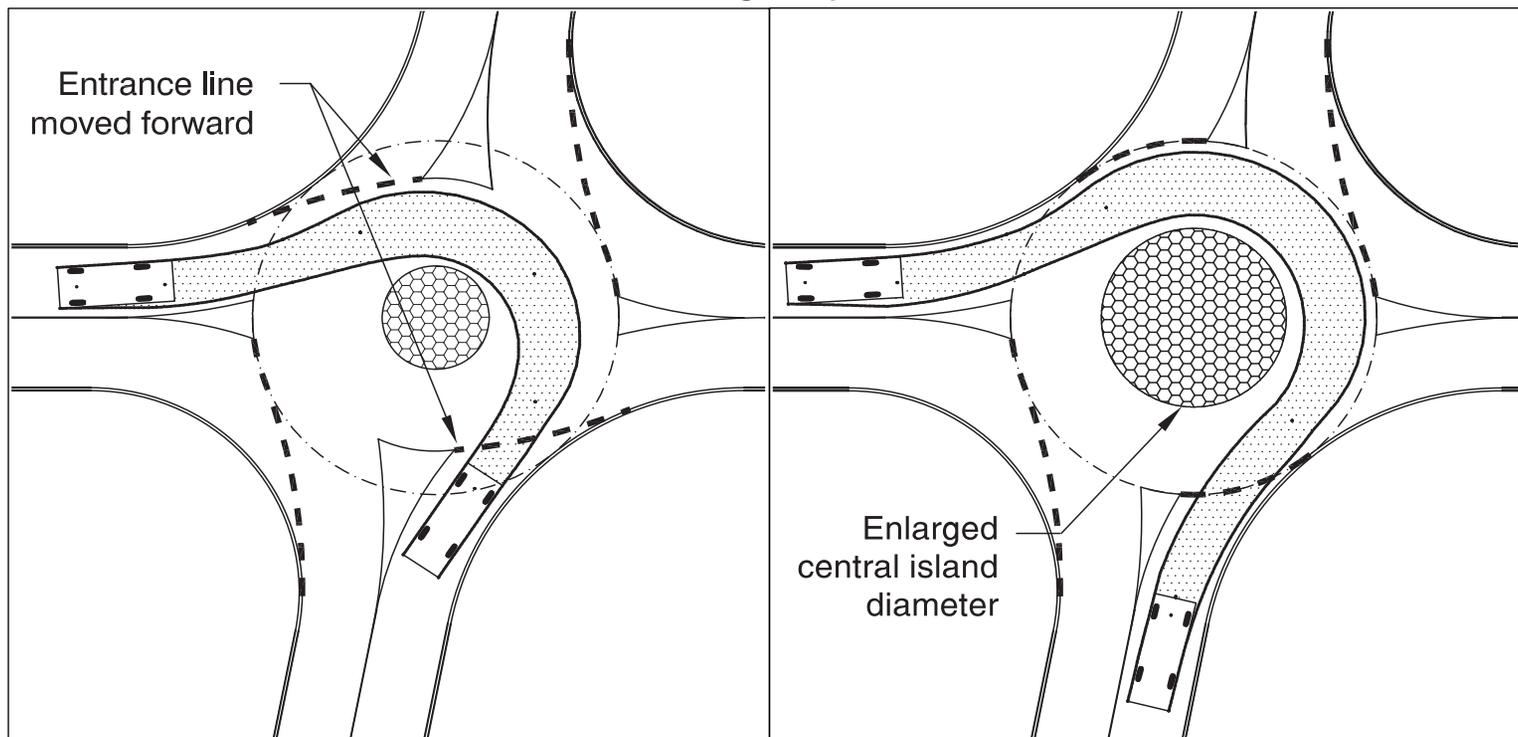


Horizontal Design Consideration: Placement of Entrance Line (Continued)



- Two design improvement options to induce desirable driver behavior

Possible Design Improvements



Other Horizontal Design Considerations



- **Splitter islands**
 - Align vehicles, encourage deflection and proper circulation, and provide pedestrian refuge
 - In general, raised islands are preferred over flush islands
- **Size**
 - Should be made as large as possible within the existing intersection constraints
 - Maximum recommended inscribed circle diameter is 90 feet
- **Design speed**
 - Location of central island should allow for all movements to be accommodated with counterclockwise circulation

Other Horizontal Design Considerations (Continued)



- **Design vehicle**
 - Location and size are dictated by passenger car swept path requirements
 - Buses should be able to navigate through without encroaching on the central island
- **Central island**
 - Fully traversable
 - Should be domed using 5 to 6 percent cross slope, with a maximum height of 5 inches

Pedestrian and Bicycle Design Treatments



- Cutting walkways through splitter islands instead of providing ramps helps visually-impaired pedestrians
- Pedestrians may need to cross intersection in one stage if splitter island refuge is not adequate
- Bicyclists are encouraged to navigate through a mini-roundabout as if they were a motor vehicle
- Bicycle lanes should end in advance of mini-roundabout as bicyclists merge into traffic

Sight Distance and Visibility and Vertical Design

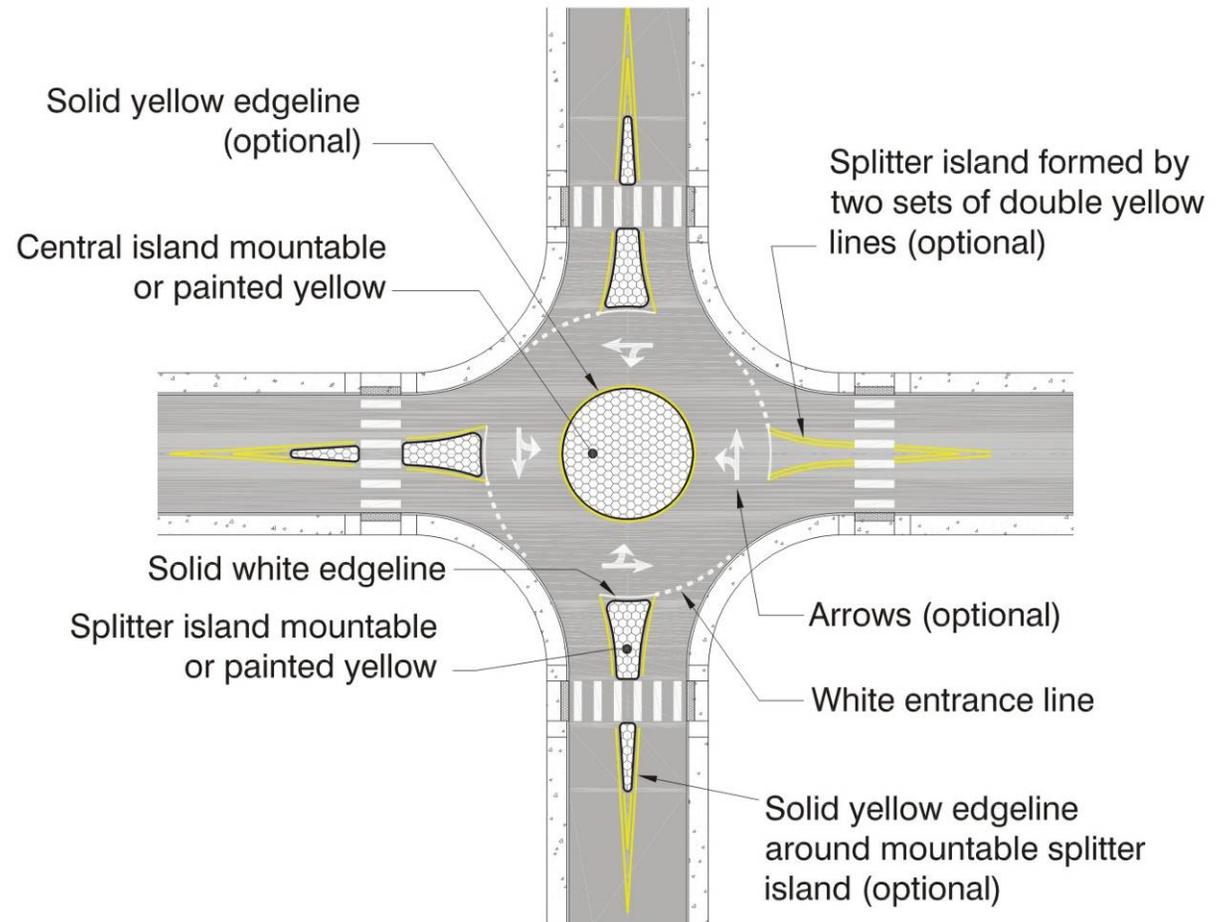


- Principles of sight distance and visibility at mini-roundabouts are consistent with other roundabouts and other intersections
- Vertical design
 - Mini-roundabouts should be designed to be outward draining
 - Consistent with most standard intersection grading, so in most retrofit situations installation of a mini-roundabout does not require significant grade modifications to the intersection

Pavement Markings and Signs

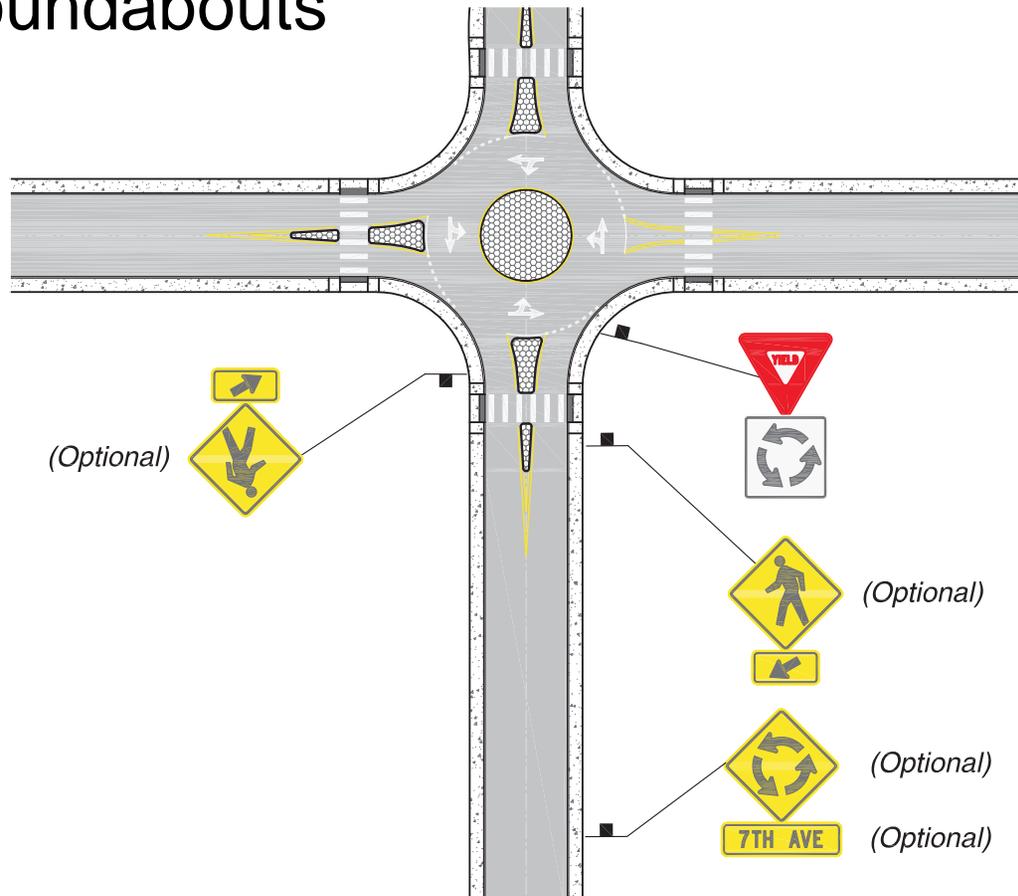


- Pavement markings and signs work together to guide and regulate road users
- Detailed guidelines can be found in the most current Roundabout Guide and MUTCD



Pavement Markings and Signs (Continued)

- Signing at mini-roundabouts is similar to signing at other roundabouts



Lighting and Landscaping



- Lighting should make mini-roundabouts be visible to approaching drivers
- The resources and principles used for lighting roundabouts apply also to mini-roundabouts
- Landscaping is minimal since the central island and often the splitter islands are traversable
- Landscaping provided around the perimeter should minimize roadside hazards and maintain adequate sight distance throughout the mini-roundabout

Other Design Details and Applications



- Right-turn bypass lanes: Similar to those used at conventional intersections
- Access management: Nearby driveways may experience restrictions similar to those of signalized intersections, but mini-roundabouts offer the opportunity to include driveways as a curb cut or fully developed approach
- At-grade rail crossings: Introduce challenges related to crossing control and queue clearance
- Evacuation routes: Use manual control similar to other intersections and allow vehicles to traverse central island
- Bus stops: Can be provided on the entry or exit side of a mini-roundabout, but not within the circulatory roadway

Presentation Outline

- Characteristics of Mini-Roundabouts
- Benefits of Mini-Roundabouts
- User Considerations
- Location Considerations
- Operational Analysis
- Design Considerations
- **Costs**

Costs

- Construction costs for mini-roundabouts vary widely
- A benefit-cost analysis may be useful for programming purposes
- Mini-roundabouts may have longer service lives than signalized intersections



Photo: Kittelson & Associates, Inc.

Conclusion

- Mini-roundabouts offer most of the benefits of regular roundabouts with a smaller footprint
- They are best suited to environments with low speeds and constraints that preclude the user of a larger roundabout
- Design elements work together to provide desirable safety and operational characteristics

References



- Federal Highway Administration. *Technical Summary on Mini-Roundabouts*. 2010.
- Federal Highway Administration. *Roundabouts: An Informational Guide*. June 2000.
- National Cooperative Highway Research Program. *Roundabouts: An Informational Guide, 2nd Edition*. 2010.
- Federal Highway Administration. *Technical Summary on Roundabouts*. 2010.
- United Kingdom Department for Transport. *Mini Roundabouts, Good Practice Guidance*. November 2006.
- European Transport Conference Proceedings. “Mini-Roundabouts: Enabling Good Practice.” September 2006.

References (Continued)

- United Kingdom Department for Transport. “TD 54/07, Design of Mini-Roundabouts.” *Design Manual for Roads and Bridges*. August 2007.
- Moor Value Ltd. *Mini-Roundabouts: A Definitive Guide for Small and Mini-Roundabouts*. 2007.
- United States Access Board. *Americans with Disabilities Act Accessibility and Architectural Barriers Act Accessibility Guidelines*. July 2004.
- Federal Highway Administration. *Manual on Uniform Traffic Control Devices*. December 2009.
- Illuminating Engineering Society. *Design Guide for Roundabout Lighting*. February 2008.

For More Information



- This presentation is part of a set of roundabout outreach materials which includes Technical Summaries, a video and a brochure.
- Visit FHWA's intersection safety web site to access more materials highlighting roundabouts:

<http://safety.fhwa.dot.gov/intersection>

- Or Contact:

Ed Rice

Intersection Safety Team Leader,
FHWA Office of Safety

Phone: (202) 366-9064

E-mail: ed.rice@dot.gov