Safety Aspects of Roundabouts
Roundabouts

Terminology

All Circular Intersections

Rotaries

Roundabouts

Neighborhood Traffic Circles

Others
What isn’t a Modern Roundabout?

- Traffic Circle
- Rotary
- Neighborhood Circle
What is a Modern Roundabout?

• A compact circular intersection in which traffic flows counterclockwise around a center island
• Entering traffic yields
• Approaches are channelized to deflect traffic into a proper entry path
• Designed to slow the speed of vehicles
What is a Modern Roundabout?

- 120-250 ft
- 600+ feet

Image of a modern roundabout with a diameter of 600+ feet.
• Rotaries and Traffic Circles Emerge
  - Columbus Circle in NYC credited as the first
• Circular intersections out of favor
• Great Britain tries variants of circular intersections
  - Adopted mandatory “yield at entry” rule
• Modern roundabouts widely used in Europe and Australia
• Modern roundabouts start to be built in the US
Key Features

- Yield control
- Circulatory roadway
- Central island
- Splitter island
- Pedestrian access
- Landscaping
- Truck apron
- Signing and marking
Vehicles yield upon entry in a modern roundabout.
No traffic control in the circulatory roadway. Movement is counter-clockwise.
Central Island

Central island deflects vehicles from a straight-line path.
Splitter Island

Splitter islands separate, deflect, and slow traffic.
Landscaping is needed as a visual element to drivers.
Pedestrian crossings must conform to ADA standards.
Where trucks are common, a properly designed apron may be necessary.
Proper signing help drivers navigate the roundabout.
Proper signing help drivers navigate the roundabout.
Proper pavement markings help drivers navigate the roundabout.
Why a Roundabout?

- Improve safety
- Reduce congestion and pollution
- Save money
- Complement other common community values
Vehicle Conflict Points

- Crossing (0)
- Diverging (4)
- Converging (4)

- Crossing (16)
- Diverging (8)
- Converging (8)
Vehicle-Pedestrian Conflict Points

- Crossing (8)
- Crossing (16)
Type of Crashes

Typical 4-leg intersection

- Angle
- Left turn

Roundabout

- Sideswipe
Study Results

Convert signalized intersection to roundabout

- 48% All crashes
- 78% Fatal/injury crashes
- 60% Fatal/injury crashes in urban area
Study Results

Convert two-way stop intersection to roundabout

- 44% All crashes
- 87% Fatal/injury crashes in rural area
- 78% Fatal/injury crashes in urban area
- 72% 1-lane
- 72% 2-lane
Older Drivers and Safety

- Narrowing of visual field
- Restricting of the area of visual attention
- Decreased motion sensitivity
- Decline in selective attention
- Decline in divided attention
- Decline in perception-reaction time (PRT)
- Loss of flexibility
### Older Drivers and Safety

<table>
<thead>
<tr>
<th>Conventional Intersection</th>
<th>Roundabout</th>
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</thead>
<tbody>
<tr>
<td>High speeds</td>
<td>Low speeds</td>
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<tr>
<td>Little response time</td>
<td>Situation changes slowly/More PRT</td>
</tr>
<tr>
<td>High energy crashes</td>
<td>Low energy crashes</td>
</tr>
<tr>
<td>Unforgiving environment</td>
<td>Forgiving environment</td>
</tr>
<tr>
<td>High severity crashes</td>
<td>Low severity crashes</td>
</tr>
<tr>
<td>Complexity</td>
<td>Easier to judge gaps</td>
</tr>
<tr>
<td>Wide visual scans</td>
<td>Narrow visual scans</td>
</tr>
</tbody>
</table>
Reduce Congestion and Pollution

Efficient during peak and off-peak

- Stops
- Idling
- Delay
• No signal equipment to install, power, and maintain
• May require less right-of-way
• Less pavement may be needed
Roundabouts

- Quieter
- Functional
- Aesthetically pleasing
Special Considerations

- Pedestrians
- Bicyclists
- Visually-impaired
Multi-Lane Roundabouts
Mini-Roundabouts

- Smaller design for urban areas
- Speed zones < 35 mph
- Central island is often painted
- Relatively inexpensive
Rural Roundabouts

- Higher approach speeds
- Properly designed splitter island is critical
Roundabouts

Right-of-Way Requirements

Before

After
<table>
<thead>
<tr>
<th>Where to Consider Roundabouts</th>
</tr>
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<tbody>
<tr>
<td>Intersections with high crash rates/high severity rates</td>
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<tr>
<td>Intersections with complex geometry, skewed approaches, &gt;4 approaches</td>
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<tr>
<td>Rural intersections with high-speed approaches</td>
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<td>Freeway interchange ramp terminals</td>
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<td>Closely spaced intersections</td>
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<tr>
<td>Replacement of all-way stops</td>
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<tr>
<td>Replacement of signalized intersections</td>
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<td>At intersections with high left turn volumes</td>
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<tr>
<td>Replacement of 2-way stops with high side-street delay</td>
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<tr>
<td>Intersections with high U-turn movements</td>
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<td>Transitions from higher-speed to lower-speed areas</td>
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<tr>
<td>Where aesthetics are important</td>
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<tr>
<td>Where accommodating older drivers is an objective</td>
</tr>
</tbody>
</table>
Roundabouts in Interchanges

- Fewer queue backups
- Less bridge width possible
Roundabouts and Schools
Issues to Review

- Context
- Space feasibility
- Physical or geometric complications
- Proximity of railroad grade crossings, drawbridges
- Traffic congestion
- Presence of oversize vehicles
- Presence of pedestrians and bicyclists
Public Attitude Towards Roundabouts
(Before and After Construction)

Source: NCHRP Synthesis 264
Roundabout Resistance

Reasons Why Agencies Have Not Built Roundabouts

- Concerned about liability
- Not part of AASHTO Guides
- Not sure they are safe
- Not sure they work efficiently
- Not sure drivers will get used to them

Source: NCHRP Synthesis 264
Keys to Success

- Proper design
- Public involvement
- Stakeholder support
• FHWA Office of Safety
  – http://safety.fhwa.dot.gov/
• Institute of Transportation Engineers
  – http://www.ite.org/
• U.S. Access Board
  – http://www.access-board.org/
• National Cooperative Highway Research Program
  – http://www.trb.org/