SINGLE-LANE ROUNDBOUTS

Single-lane roundabout design consists of single-lane approaches at all legs and a single-lane circulatory roadway around a central island. This design permits slightly higher operation speeds for the entry, exit and the circulatory roadway. Like all roundabouts, the size of single-lane design is largely dependent on the type of design vehicle and available right-of-way.

**Single-lane Geometric Design Characteristics**

- Larger inscribed circle diameters
- Raised splitter islands
- Non-traversable central island
- Crosswalks
- Truck apron

Exhibit 1-12 illustrates the distinguishing features of typical single-lane roundabouts.

Exhibit 1-12
Features of Typical Single-Lane Roundabout
(FHWA. NCHRP Report 672 Roundabouts: An Informational Guide. 2010)

The size of the inscribed circle must be large enough to accommodate the design vehicle’s turning requirements and maintain adequate deflection curvature for safe travel speeds. Close selection of circulatory roadway width, entry and exit widths, entry and exit radii, and entry and exit angles may allow a smaller inscribed circle diameter to be used in constrained locations.
For a WB-50 (Intermediate Semitrailer Truck) design vehicle, the inscribed circle diameter needs to fall within the 105 to 150 ft range. Smaller single-lane facilities may be used for other intersections, where the design vehicle may be a bus (BUS-40) or single-unit truck (SU). For a larger WB-67 (Interstate Semitrailer Truck) design vehicle, a larger inscribed circle diameter (130 to 180 ft) is typically required. Larger inscribed circles may also be appropriate for roundabouts with more than four legs. Truck aprons are used for accommodating larger design vehicles and restricting the inscribed circle diameter to reasonable limits.

**Splitter Islands**

Splitter islands should be provided on all roundabouts unless visibility of the central island is obstructed. Their purpose is to provide refuge for non-motorized users, control vehicle speeds, guide traffic through the intersection, physically separate entry and exit traffic, deter wrong-way movements, and provide a location for signs.

The total length of the raised splitter island should be a minimum of 50 ft. with a desirable value of 100 ft. to provide adequate visibility and refuge. High speed approaches may require splitter island lengths of 150 ft or more. By extending the island beyond the end of the exit curve, exiting vehicles are prevented from accidentally meeting oncoming traffic. The splitter island should have a **minimum width of 6 feet** at the crosswalk to adequately meet non-motorized user needs.

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**Exhibit 6-12**

Minimum Splitter Island Dimensions
(FHWA. NCHRP Report 672 Roundabouts: An Informational Guide. 2010)
Entry Width
A roundabout’s entry width is designed to reduce vehicle speeds and maximize the visibility of the central island. This width is measured from outside curb face to inside curb face at the splitter island point nearest the inscribed circle. The entry width is the key capacity determinant that is dependent on the roadway width and the design vehicle. Entry capacity increases as entry width increases. The minimum circulatory roadway width should be as wide as the widest approach and should remain constant throughout the roundabout.

It is recommended to keep roundabout entry widths to a minimum in order to maximize safe and efficient operation. Optimal capacity and operational balance should also be considered in determining the width and number of approaches.

Typical entry widths range from 14 ft to 18 ft (common starting value of 15 ft) for a single-lane roundabout. Higher or lower entry widths may be acceptable for site-specific design vehicle and speed requirements. However, entry widths greater than 18 ft or those wider than the circular roadway should be avoided in order to prevent driver confusion as to the correct number of lanes. A mountable apron around the central island’s perimeter may be used to provide additional width for accommodating off tracking by combination trucks.

When capacity needs can only be accommodated by increasing the entry width, design options include:

- adding a full lane upstream of the intersection and maintaining parallel lanes through the roundabout
- widening the approach lane gradually through the entry.

Circulatory Roadway Width
The circulatory roadway width is the distance between the outer edge of the inscribed diameter (curb face) and the central island curb face (not including the width of any truck apron). This width defines the roadway width for vehicle circulation around the central island.

The circulating roadway design width within the roundabout depends on the number of entry lanes and the radius of vehicle paths. The circulating width should be constant with the minimum width being at least as wide as the maximum entry width and not exceeding 1.2 times the maximum entry width.

For single lane roundabouts, the constant widths of the circulating roadway range from 16 to 20 ft. Designers should avoid making the circulatory width too wide in order to prevent drivers from interpreting the roundabout as a multilane design.
Central Island
The central island is the raised, non-traversable area in the center of a roundabout that is surrounded by the circulatory roadway. This island is typically landscaped for aesthetic reasons and may include a traversable apron for large vehicles. Central islands should always be raised to enhance visibility of the roundabout upon approach. The size of the central island is dependent on the inscribed circle diameter and the circulatory roadway width.

Although the central island is typically circular, other shapes may be required for unusual site conditions. A circular island with a constant-radius roadway helps promote constant speeds around the center of the roundabout. Irregular shapes are more challenging and can result in higher speeds on the straight sections and reduced speeds on the curves. This speed differential can make it difficult for approaching traffic to judge the speed and availability of gaps - resulting in more loss-of-control crashes.

Entry Design
A roundabout entry is bordered by a curb with one or more curves connected to the circulatory roadway. The entry curb radius affects both capacity and safety by controlling the amount of deflection imposed on a vehicle’s entry path. Too small (below 50 ft) entry curb radii may lead to single-vehicle crashes while too large radii may result in higher entry speeds with little effect on capacity.
Exhibit 6-14
Single-Lane Roundabout Entry Design
(FHWA. NCHRP Report 672 Roundabouts: An Informational Guide. 2010)

The goal in selecting an entry curb radius is to meet appropriate speed requirements for the design vehicle. For an urban single-lane roundabout, entry radii typically range from 50 to 100 ft (common starting point: 60 to 90 ft).

For speed differential values between rural approaches and entries greater than 12 mph, it may be advantageous to add features to reduce the approaching vehicle speeds.

The angle of visibility is another important roundabout design consideration. This angle to the left should allow drivers to see oncoming traffic from the upstream entry or the circulatory roadway. Typical values for entry angles range between 20 to 40 degrees. Severe entry angles may result in poor visibility, driver strain, and merging behavior. While shallow entry angles may not produce successful lane alignment or prevent wrong-way movements.

Exit Design
The exit width is where the width of the exit meets the inscribed circle. This width is measured perpendicularly from the right curb to the intersection of the left curb and the inscribed circle. The exit radius is the curvature of the outside curb face at the exit.
For urban single-lane roundabouts, exits should be designed for a curved exit path with a design speed under 25 mph in order to maximize pedestrian safety. Exit radii should normally be a minimum of 50 ft. However, for locations with low speeds, low traffic and pedestrian activity, these radii may be as low as 33 to 39 ft. resulting in a very slow design speed that maximizes safety and comfort for pedestrians. Such low exit radii should only be used with a similar entry design for urban compact roundabouts with a maximum inscribed circle diameter of 115 ft.

In rural locations with few pedestrians, larger exit radii may be used to allow vehicles to exit quickly and accelerate back to normal speeds. Any straight paths tangential to the central island should be avoided since many existing rural locations may become urban in the future. Pedestrian activity should be considered at all exits except where conditions eliminate the chance of any future pedestrian activity.

**Design Vehicle Considerations**
The design vehicle is the controlling factor for most of the following roundabout considerations:

- **Entry width**
- **Entry radii**
- **Inscribed circle diameter**
- **Circulatory roadway width**

Roundabouts may be required to accommodate both over-sized and passenger vehicles. Location constraints can limit the ability to provide adequate deflection for small vehicles while accommodating large trucks or emergency vehicles. Truck aprons can be used to provide additional area around the central island for trucks and discourage overtopping by passenger vehicles.

The location of a roundabout may determine its specific design vehicle. Rural agricultural areas may need to use farm equipment. Urban cities may need large semi-trailer combinations. Recreational areas may require motor homes or buses. The design vehicle’s needs should be used in the preliminary stages of the roundabout design since it helps to determine size, position, and approach alignments.
MULTILANE ROUNDBOUTS

Multilane roundabouts contain a minimum of one entry (two or more lanes) and require wider circulatory roadways to accommodate more than one vehicle traveling side by side. The roundabouts may have a different number of lanes or transitions on one or more legs. The number of lanes should be the minimum needed for the anticipated traffic demand. The design speeds at the entry, on the circulatory roadway, and at the exit may be slightly higher than those for single-lane roundabouts. Multilane roundabouts include raised splitter islands, truck aprons, a non-traversable central island, and appropriate entry path deflection.

The size of a multilane roundabout is typically determined by balancing two critical design objectives:

- the need to achieve deflection;
- providing sufficient natural vehicle path alignment.

To achieve both of these objectives, a diameter larger than those used for single-lane roundabouts is required. Generally, the inscribed circle diameter of a multilane roundabout ranges from 150 to 220 ft (two-lane) and 200 to 300 ft (three-lane) for achieving adequate speed control and alignment. Truck aprons are recommended to accommodate larger design vehicles and keep the inscribed circle diameter reasonable.

Exhibit 1-11
Typical Urban Double-Lane Roundabout
(FHWA. Roundabouts: An Informational Guide. 2000)
Entry Width
The entry width is determined by the number of lanes required and the turning needs of the design vehicle.

### Typical Entry Lane Widths

- **Single-lane**: 12 to 15 ft
- **Two-lane**: 24 to 30 ft
- **Three-lane**: 36 to 45 ft.

Unless the entry can be fully utilized by traffic, any excessive entry width may not benefit capacity.

Where additional entry capacity is needed, the following designs may be used:

- Gradually widening the approach
- Adding a lane for parallel entry

Research shows that flared entries are an effective means of increasing capacity while requiring less land and having little impact on safety.

Minimal entry widths with maximum flare lengths should produce desired capacity and acceptable safety.

In multi-lane roundabouts, over-sized vehicles may travel the entire width of the circulatory roadway. Roundabouts with truck aprons or gated roadways through the central island may accommodate large trucks, emergency vehicles, or trains.

### Circulatory Roadway Widths

Multilane roundabout circulatory roadway widths depend on the types of vehicles that need to be accommodated side-by-side through the roundabout. For locations where traffic is mainly passenger cars (P) and single-unit trucks (SU), the appropriate width may be either two passenger cars or a car/truck combination. For semi-trailer traffic (WB-50) greater than 10%, it may be acceptable to design for a semi-trailer/passenger vehicle combination.

Typical lane widths for multilane circulatory roadways range from 14 to 16 ft, resulting in total widths of 28 to 32 ft for two-lane and 42 to 48 ft for three-lane circulatory roadways.

### Entry Geometry and Approach Alignment
For multilane roundabouts, the designer should ensure that the proposed entry design directs vehicles to stay within the appropriate lanes of the circulatory roadway and exits. Path overlap occurs when the natural vehicle paths overlap or cross one another.

Creating an optimal design with good path alignment within multilane roundabouts while controlling entry speeds with adequate deflection can be difficult. Designs that improve path alignment may also increase fastest path speeds. An optimal geometric design for a multilane roundabout balances the entry speed, path alignment, design vehicle, and other needs.

One possible design technique is to locate the entry curve for the projection of the inside entry lane at the entrance line connects tangentially to the central island. Exit design should also provide sufficient exit radii and alignment to allow drivers to maintain their proper lane. Other techniques involving changes to approach alignment, entry curvature, and/or inscribed circle diameter may result in creating trade-offs.

Problems can occur when a design has excessive distance between entries and exits. Large separations can cause entering vehicles to join next to circulating traffic and create conflicts at the exit point between exiting and circulating vehicles.
Possible solutions include changing lane configurations, revising inscribed circle diameters, and realigning the approaches. Realignment of the approach legs to allow the paths of entering vehicles to cross the paths of the circulating traffic (rather than merging) minimize conflict. This increases the likelihood that entering drivers will yield to both conflicting lanes.

**Splitter Islands**
For multilane roundabouts, the entry geometry is typically developed to control fastest-path entry speeds, avoid entry path overlap, and accommodate the design vehicle. The splitter island is designed to provide sufficient median width for non-motorist users and signage.

**Exit Curves**
Exit curvature design for multilane roundabouts is more complex and larger than the other types. Exit conflicts may occur if appropriate lane assignments for exiting and circulating vehicles are not provided. At locations where the exit radius is too small, vehicles on the inside of the circulatory roadway may exit in the outside exit lane.

To prevent potential problems from too much separation between entries and exits, two possible design alternatives are available:

1) Using a combination of striping/physical modifications for compatible traffic volume
2) Realignment of approaches for entry vehicle paths to cross (and not merge with) circulatory traffic
MINI-ROUNDABOUTS

Mini-roundabouts are small intersection designs with a fully traversable central island that are commonly used in low-speed urban environments (average operating speeds of 30 mph or less). The small footprint of a mini-roundabout (inscribed circle diameter less than 90 ft) can be useful in such environments where conventional roundabout design is limited by right-of-way constraints. The small diameter is made possible by using a fully traversable central island for accommodating heavy vehicles. Passenger cars should be able to exit the mini-roundabout without running over the central island. The overall design should naturally guide entering vehicles along their intended path and minimize traversing the central island.

Mini-roundabouts are very popular for retrofit applications due to their low cost from requiring minimal additional pavement at the intersecting roads and minor widening at the corner curbs. Small, mini-roundabouts are also seen as pedestrian-friendly with short crossing distances and very low vehicle entry/exit speeds.

Limitations of mini-roundabouts are due to the reduced ability to control speeds with the traversable central island. Therefore, it is important to consider the advantages and limitations of mini-roundabouts versus the larger-diameter roundabouts and intersection designs based upon site-specific conditions.

Figure 1 (Mini-Roundabouts Technical Summary) shows the distinctive features for a typical mini-roundabout.
General Design Criteria for Mini-Roundabouts
The geometric design of a mini-roundabout, as with other types of roundabouts, requires the balancing of competing design objectives with different emphasis areas. Substandard designs may result in speeding, improper yielding, left turn movements at the intersection, or vehicles running over the central island.

Size
A major benefit of using a mini-roundabout versus a larger, single-lane roundabout is minimizing the impacts to the existing intersection footprint. For a mini-roundabout, the existing intersection curb line is a typical starting point for establishing the inscribed circle diameter. Mini-roundabouts should be made as large as possible within existing conditions with a maximum inscribed circle diameter of 90 ft. Any inscribed circle diameter greater than 90 ft will be large enough for a single-lane roundabout design which accommodates traffic navigating around a raised central island and provides physical channelization to control vehicle speeds.
Design Vehicle
As with other roundabouts, it may be desirable to accommodate buses within the circulatory roadway rather than traveling over the central island within a mini-roundabout. However, the turning radius of a bus is typically too large to navigate around the central island while staying within the circulatory roadway with very small inscribed circle diameters. Using a bus for the design vehicle instead of a passenger car may result in a geometric design with a wider circulatory roadway and smaller central island.

Central Island
The central island location should be at the center of the left-turning inner swept paths - which will be near the center of the inscribed circle. Large design vehicles should be accommodated by the footprint of the central island while passenger cars should be able to safely navigate counterclockwise through the intersection without over-tracking.

Designing the central island size and location for deflection through the roundabout will result in proper circulation and reduced speeds through the intersection.

The central island is typically a small, conspicuous and fully traversable island composed of asphalt concrete, Portland cement concrete, or other paving material. The central island should be domed or raised with a mountable curb using 5 to 6 percent cross slope, with a maximum height of 5 in. The mountable curb for a mini-roundabout should be designed in a similar way to truck aprons on other roundabouts.

Entrance Line Placement
The entrance line is defined as the edge line extension across the approach leg of a mini-roundabout, and incorrect placement can result in unsafe driver behavior.
Two common designs are used for entrance line placement:

1. **Advancing the entrance line forward,**

   The outer path of passenger cars and the largest vehicle likely to use the intersection are identified for all turning movements. The entrance line is placed a minimum of 2 ft outside the vehicle paths.

2. **Simultaneously enlarging the central island and reducing the circulatory roadway width, with the entrance line coincident with the inscribed circle of the roundabout.**

Advancing the entrance line may be used to discourage left-turns in front of the central island but it may also reduce capacity due to yields at the entry.
Splitter Islands
For mini-roundabouts, splitter islands are used to provide pedestrian refuge, to encourage deflection and proper circulation, and to align vehicles. These islands may be raised, mountable, or flush depending upon their size and whether trucks will need to mount the splitter island in order to successfully navigate the intersection.

NCHRP Report 672 (FHWA) provides the following general guidelines for the types of splitter islands under various site conditions:

- Consider a raised (non-traversable) island if one or more of the following conditions exists:
  -- All design vehicles can navigate the roundabout without tracking over the splitter island area
  -- Sufficient space is available to provide an island with a minimum area of 50 ft², and/or
  -- Pedestrians are present at the intersection with regular frequency.

- Consider a mountable (traversable) island if:
  -- Some design vehicles must travel over the splitter island area and truck volumes are minor, and
  -- Sufficient space is available to provide an island with a minimum area of 50 ft².

- Consider a flush (painted) island if:
  -- Vehicles are expected to travel over the splitter island area with relative frequency to navigate the intersection
  -- An island with a minimum area of 50 ft² cannot be achieved, and
  -- The approach has low vehicle speeds (preferably no more than 25 mph).

Figure 4 illustrates the recommended longitudinal dimensions for splitter islands at mini-roundabouts. For narrow approach widths, it may be necessary to extend the islands between the entrance line and the crosswalk. For raised islands, it is crucial for them to be highly visible to approaching motorists.
**Figure 4.**
Recommended Longitudinal Dimensions of a Mini-Roundabout
(FHWA. Mini-Roundabouts Technical Summary. 2010)

**PERFORMANCE CHECKS**

**Fastest Path**
The fastest path through any roundabout is the flattest and most efficient traverse of the intersection – from entry to around the circulatory roadway and out the exit. These routes need to be determined for all approaches and traffic movements. The fastest path represents the theoretical design speed as opposed to expected traffic speeds.

Five critical path radii must be checked for each approach:

- **R1 - entry path radius**
  minimum radius on the fastest through path prior to the entry

- **R2 - circulating path radius**
  minimum radius on the fastest path around the central island.

- **R3 - exit path radius**
  minimum radius on the fastest path to exit.

- **R4 - left-turn path radius**
  minimum radius on the path of conflicting left-turns
**R5 - right-turn path radius**
minimum radius on the fastest path of right-turn vehicles

Please note that these vehicular path radii are not the same as the curb radii.

**Exhibit 6-46**
Vehicle Path Radii  (FHWA. NCHRP Report 672 Roundabouts: An Informational Guide. 2010)
Exhibit 6-47
Recommended Maximum Entry Design Speeds
(FHWA. NCHRP Report 672 Roundabouts: An Informational Guide. 2010)

<table>
<thead>
<tr>
<th>Site Category</th>
<th>Recommended Maximum Theoretical Entry Design Speed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mini-Roundabout</td>
<td>20 mph (30 km/h)</td>
</tr>
<tr>
<td>Single Lane</td>
<td>25 mph (40 km/h)</td>
</tr>
<tr>
<td>Multilane</td>
<td>25 to 30 mph (40 to 50 km/h)</td>
</tr>
</tbody>
</table>

Vehicle Path Assumptions
- Vehicle width: 6 ft
- Minimum lateral clearance: 2 ft

Centerline of Vehicle Path
- Distance from concrete curb: 5 ft
- Distance from roadway centerline: 5 ft
- Distance from edge line: 3 ft

The fastest path should begin a minimum of 165 ft before the entrance line. $R1$ should be measured over a distance of 65 to 80 ft.

The maximum speed differential between conflicting traffic movements within roundabouts should be less than 10 to 15 mph which can be achieved from low absolute maximum speed for the fastest entry traffic.
CLOSELY SPACED ROUNDBOUTS

In some cases, it may be necessary to consider the operation of multiple roundabouts in close proximity to each other. The expected queue length at each roundabout is a major design consideration. For closely spaced intersections, the engineer should compute the 95th-percentile queues for each approach in order to determine if sufficient queuing space is available for vehicles between the roundabouts. Insufficient space may result in occasional queuing at the upstream roundabout and gridlock to the entire system.

A system of closely spaced roundabouts may also produce a traffic calming effect for arterial roadways. Drivers may be hesitant to speed on connecting roadways if they know that they will be required to slow down for the upcoming roundabout.

Figure 25.
Chickamauga Dam Roundabouts
Chattanooga, TN (Google Earth)

Figure 25 shows two closely spaced roundabouts at a high traffic intersection system connected to an interstate. The two roundabouts work together as a system to effectively serve the traffic demands. Serious consideration must be given to a system of roundabouts with this complexity in order to produce optimal geometric designs that have sufficient capacity for each approach leg and driver-friendly intersections without lane changes or weaving.
SIGNS

The *Manual on Uniform Traffic Control Devices (MUTCD)* provides excellent guidance for the design and placement of traffic control devices (signs, pavement markings, signals, etc.) for roundabouts. These devices should work together as an integrated unit to guide the user.

**Figure 2B-22**
Example of Regulatory and Warning Signs for a One-Lane Roundabout
(FHWA. Manual on Uniform Traffic Control Devices . 2010)
Signing for roundabouts is similar to the methods for other intersections. The signs should be located for maximum visibility with proper regulatory control, advance warning, and directional guidance while meeting driver expectations. Roundabout signage designs are dependent on its location (urban or rural) and category (mini-roundabout, single-lane, or multilane).

**REGULATORY SIGNS**

Regulatory signs for roundabouts provide directions to the user that must be obeyed.

![Yield Sign](image)

**Yield Sign (R1-2)**

Required on right-side of approaches  
Additional Yield Sign recommended on left side (splitter island)

![Roundabout Directional Arrow Sign](image)

**Roundabout Directional Arrow Sign (R6-4, R6-4a, R6-4b)**

Should be placed on central island opposite of entries  
Directs counterclockwise traffic  
Replaces black-on-yellow chevron warning signs

![One Way Sign](image)

**One Way Sign (R6-1R)**

May be used instead or addition to Roundabout Directional Arrow  
Required in some states
**Roundabout Circulation Plaque (R6-5P)**

- May be used below Yield signs on approaches
- Defines direction of circulation

**Keep Right Sign (R4-7, R4-7a, R4-7b, R4-7c)**

- Used at nose of non-mountable splitter island
- Narrow Keep Right Sign (R4-7c) or Object Marker may be used for small splitter islands

**Intersection Lane-Control Sign Arrow Options**

- Used at multilane roundabouts to utilize left, through, and right movements
- Required for approaches with double left-turn or double right-turn lanes
WARNING SIGNS

Warning signage for roundabouts is directly related to the intersection’s location and approaching speeds.

**Circular Intersection Sign (W2-6)**

To be installed on each roundabout approach to give advance notice

Universal and easily recognizable symbol

**Pedestrian Crossing Sign (W11-2)**

May be used for crossings at roundabout entries and exits

Can be supplemented with Diagonal Downward Pointing Arrow Plaque (W16-7P)

**Yield Ahead (W3-2)**

Recommended to be used to provide advance notice on approaches for special cases
Object Markers

Used at nose of non-mountable splitter island in addition to or instead of Keep Right signs
Reduces clutter and improves sign visibility
Type 3 Object Markers are more appropriate for narrow splitter islands
GUIDE SIGNS
Guide signs for roundabouts provide navigational information to motorists.

Text Exit Destination Signs (D1-2d, D1-3d)
- May be used on approaches to show destinations for each exit
- Curved arrows may be used for left-turns

Dragrammatic Exit Destination Signs (D1-5, D1-5a)
- Used similar to Text Exit Destination Signs
- Arrows can be used to show each leg and their angles
Advance Street Name Signs (D3-2)
Can be used prior to roundabouts to inform users of next street intersection
Advance Street Name Plaques (W16-8 or W16-8a) may be placed with
Circular Intersection Sign (W2-6) as an alternative

Exit Guide Signs (D1-1d, D1-1e)
Used to designate roundabout exit destinations
Placed either on exit’s right-hand side or in splitter island
PAVEMENT MARKINGS

Pavement markings are used to delineate travel paths within roundabouts (entrances, exits, circulatory roadway, etc.) and provide guidance for the user.

**APPROACH & DEPARTURE PAVEMENT MARKINGS**

- Lane Lines
- Edge Lines
- Lane-Use Arrows
- Word and Symbol Markings
- Yield Lines
- Crosswalk Markings

Exhibit 7-1
Approach and Departure Pavement Markings
(FHWA. NCHRP Report 672 Roundabouts: An Informational Guide. 2010)
**Yellow edge lines** should be used along splitter islands on the left edge of entries and exits, as well as the left edge of right-turn bypass roadways.

**Double yellow centerline markings** should be installed on undivided approaches to splitter islands. These centerline markings should split and taper to the splitter island.

**White edge lines** may be used on the right side of approaches and departure roadways to enhance driver awareness.

**Raised pavement markers** can supplement edge lines and provide additional roadway visibility.

**White lane lines** should be used on multilane approaches and departures to discourage lane changes in the immediate roundabout vicinity.

**White channelizing lines** are used on approaches and departures for right-turn bypass islands with traffic on both sides.
**Bike lane lines** on roundabout approaches should end in advance of the circulatory roadway (at beginning of taper and a minimum of 100 ft from the roadway’s edge). The last 50 to 200 ft of these lines should be dotted to provide advance warning of required merging maneuvers.

**Lane-use arrows** are crucial at roundabouts for directing users to their appropriate lane. These markings should be installed at approaches with double left-turn or double right-turn lanes as well as at other locations to improve lane utilization. The arrows should be installed far enough in advance of the roundabout to give users adequate selection time for their path of travel. These markings may be repeated to encourage proper approach lane selection.

**Left-turn arrows** should be included wherever lane-use arrows are used on approaches. This pavement marking combination will encourage proper lane use by drivers.

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**Pavement Word and Symbol Markings**

**ONLY word marking**
May be used with lane-use arrows in single movement lanes

**Route numbers, destinations, street names, directions**
May be used with lane-use arrows, lane-use signs, and guide signs (examples: NORTH, EAST, HWY 58, I-75, US 411)

**Yield Ahead symbol or word marking**
Can be used on approaches to supplement Yield Ahead sign

**YIELD word marking**
May be used at entries with Yield sign for additional yield emphasis

**Dotted circulatory edge lines** should be used as entrance lines across roundabout entrance lanes to emphasize the border between entry and circulating traffic.
**Yield lines** consist of a series of white solid triangles ("shark teeth") pointing toward approaching traffic. These markings (placed at right angles to the roadway) can be used to supplement entrance lines and enhance yielding requirements.

**Crosswalk markings** for pedestrians should be used at all crossing locations (entries, exits, right-turn bypasses) for roundabouts. Longitudinal crosswalk markings ("zebra" or "continental") are preferred. Their advantages include: better visibility; less user confusion; and less maintenance.

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**CIRCULATORY ROADWAY PAVEMENT MARKINGS**

- **Lane Lines**
- **Edge Lines**
- **Lane-Use Arrows**

**Yellow edge lines** (4 to 6 in width) may be used along the circulatory road’s inside edge (central island or truck apron). These markings can be used with lane lines for channelizing traffic to appropriate roadway lanes.

**White edge lines** (normal width) are to be installed on the circulatory roadway’s outer edge.

**White dotted edge line extensions** (12 to 18 in width) across roundabout entries have a typical marking pattern of 2 ft lines with 2 to 3 ft gaps.
Multilane roundabouts should have *lane lines* (4 to 6 in width) within the circulatory roadway for channelizing traffic to their appropriate travel path. The markings on the circulatory roadway should work with approach pavement markings to guide the user.

*Lane-use arrows* are normally installed in front of the splitter island at the beginning of the circulatory roadway lane line. These markings provide adequate visibility and confirm the driver’s lane choice within the roundabout.

**CONCLUSION**
The modern roundabout is a common intersection application which is becoming increasingly popular in the U.S. As with any intersection, its selection and design requires balancing competing objectives (economics, safety, environmental concerns, operation, accessibility, land usage, aesthetics, etc.). Therefore, it is crucial to provide sufficient flexibility for tailoring the roundabout’s design to its particular situation.

The intention of this course was to explain some principles of good roundabout design and show potential trade-offs that may be encountered. By combining these principles with work experience and engineering judgment, the designer may produce plans that greatly benefit the traveling community.

Exhibit 7-17
Circular Intersection Sign (W2-6)
(FHWA. NCHRP Report 672 Roundabouts: An Informational Guide. 2010)

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Figure 4 – Recommended Longitudinal Dimensions of a Mini-Roundabout

FHWA. Roundabouts Technical Summary. 2010
Figure 7 – Fastest Vehicle Path Through a Single-Lane Roundabout

FHWA. Manual on Uniform Traffic Control Devices. 2010
Figure 2B-22 – Example of Regulatory and Warning Signs for One-Lane Roundabout
Regulatory Signs Warning Signs Guide Signs

Google Earth
Figure 25 – Chickamauga Dam Roundabouts
Exhibit 3-24
Example of General Informational Brochure
(FHWA. NCHRP Report 672 Roundabouts: An Informational Guide. 2010)

REFERENCES


Florida Department of Transportation. *Florida Roundabout Guide. 2nd Ed.* Florida Department of Transportation, 1998.