7.10 Roundabout Design Standards

7.10.1 Definitions

Important components of roundabouts are shown in Figure 7.10.1, and these components and other concepts associated with roundabout design are defined below.

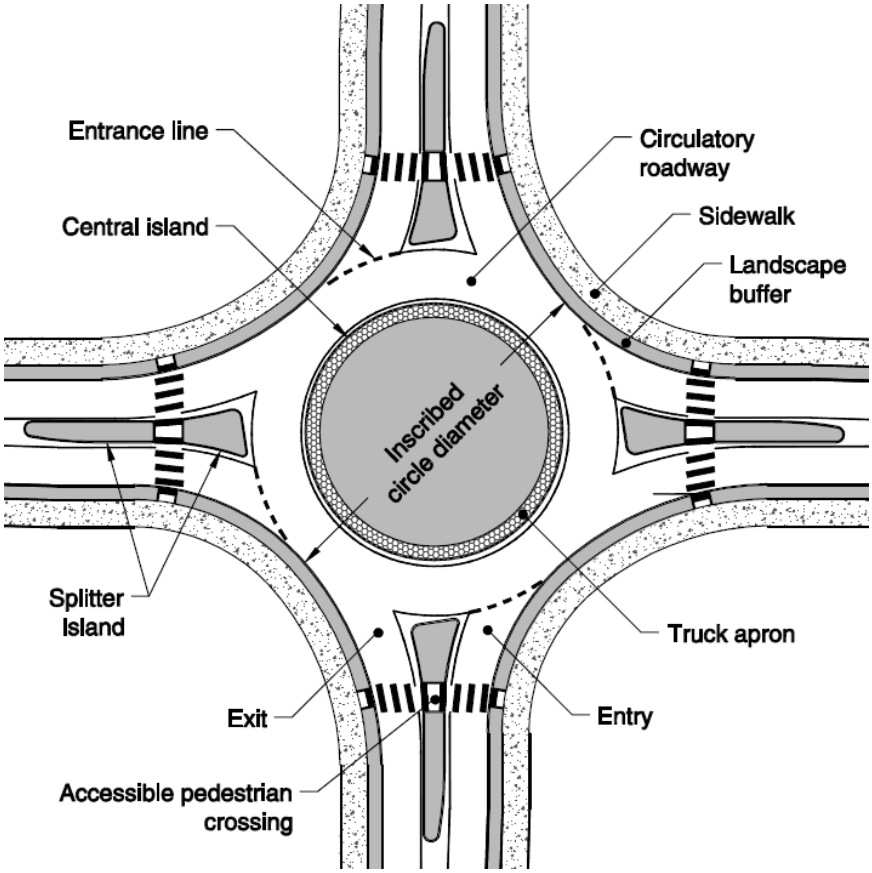

Figure 7.10.1 – General Roundabout Features

Central Island – The raised, generally circular area in the middle of a roundabout around which traffic circulates.

Circulatory Roadway – The roadway used for traffic to travel around the central island.

Deflection – The change in trajectory of a vehicle imposed by roadway geometry and markings including the splitter islands and central island.

Entrance Line – Marks the edge of the circulatory roadway, assists circulating traffic in choosing an exit path, and assists entering traffic in determining where to yield.

Inscribed Circle Diameter – The maximum diameter of the curve defining the outside edge of the circulatory roadway and one of the principle roundabout design components that impact traffic operations.

Landscape Buffer – Separates the sidewalk from circulating traffic. Provides a buffer against traffic and assists visually impaired pedestrians in safely navigating the roundabout.

Mini Roundabout – Application of a roundabout with a small, traversable central island, usually on low-volume neighborhood streets.

Multilane Roundabout – A roundabout with two or more lanes in the circulating roadway and two or more lanes on at least one entry.

Path Overlap – Conflict between the natural paths of vehicles in a roundabout, usually due to improper geometry.

Single Lane Roundabout – A roundabout with a one-lane circulatory roadway and one-lane entries.

Splitter Island – The raised or painted area between entering and exiting traffic at each approach. Provides deflection for entering traffic and refuge for pedestrians to make two-stage crossings of the approach.

Truck Apron – Part of the central island that is raised above the circulatory roadway to enable trucks to negotiate the roundabout while also discouraging excessive speeds by other vehicles.

7.10.2 Procedure for Design and Approval

7.10.2.1 Reference Documents

All roundabouts constructed in the City of Sugar Land must comply with the latest editions of all relevant national, state, and local standards that pertain to roadway and intersection design, including but not limited to:

- *Texas Manual on Uniform Traffic Control Devices* (TMUTCD)
- *NCHRP Report 672: Roundabouts: An Informational Guide*
- *A Policy on Geometric Design of Highways and Streets* (Green Book)
- *City of Sugar Land Neighborhood Design Policy*, City of Sugar Land

7.10.2.2 Pre-Design Meeting

A pre-design meeting shall be held between parties interested in constructing a roundabout and officials from the City of Sugar Land. The purpose of this meeting is to ensure that fundamental design criteria for the proposed roundabout are determined before significant design resources are expended. The meeting will discuss:

- Appropriateness of a roundabout at the proposed location
- Scope of required Pre-Design Report, including scope of data collection and traffic counts
- Design vehicle for roundabout geometry
- Availability of and potential impacts to public right-of-way
- Location of and potential impacts to public utilities

7.10.2.3 Pre-Design Report

Prior to the design of a roundabout, a traffic analysis shall be performed and a summary report prepared and submitted to the City of Sugar Land for review. The full scope for the summary report will be defined in the pre-design meeting. The traffic analysis shall include morning and afternoon weekday peak hour turning movement counts as well as any other counts as defined in the scoping meeting. Capacity analyses using accepted methodology defined in this document shall be conducted for existing traffic volumes and for projected traffic volumes. The report shall include at minimum the following information:

- Existing turning movement counts
- Projected turning movement counts
- Description of existing traffic control
- Description of adjacent land uses
- Description of roadway network in vicinity of intersection, including adjacent traffic signals.
- Identification of year at which a single lane roundabout will no longer function at an acceptable LOS
- Description of proposed ultimate roundabout geometry (number of entry lanes, exit lanes, and circulating lanes)
- Capacity analysis reports including LOS, queue length, and delay per vehicle for future volumes and proposed ultimate roundabout geometry
- Identification of proposed design vehicle for each approach to the roundabout
- The 50% submittal, as described in Section 7.10.2.4, may be submitted as part of the pre-design report

7.10.2.4 Design Submittals

The roundabout design plan shall include, at minimum, a 50% submittal and a 100% submittal. The components of each submittal are listed below:

- 50% submittal
    - A preliminary roundabout schematic showing exterior curb lines, central island, truck apron, and splitter islands. The schematics should be drawn on an aerial photograph that shows existing pavement, driveways, and other fixed geometric features that may be impacted by roundabout construction. A preliminary pavement marking plan should be included.
    - Schematics showing fastest paths for the left-turn movement, the through-movement, and the right-turn movement for each approach. The fastest paths should be

constructed utilizing the methodology detailed in *NCHRP 672: Roundabouts: An Informational Guide*. As many schematics as needed should be produced to show these fastest paths clearly. A table that lists the radii of the component curves of each fastest path and the corresponding design speed for the curve as listed in *A Policy on Geometric Design of Highways and Streets* (AASHTO, latest edition) should accompany the schematics.

- 100% submittal
    - Includes all components specified in the Construction Plan Requirements section.

7.10.2.5 Construction Plan Requirements

Construction Plans for Roundabouts shall conform to the City's graphic standards. The basic set of roundabout construction drawings shall include, but is not limited to, the following:

- Title Sheet and/or Index of Sheets
- General Construction and Utility Notes
- Basis of Estimate
- Condition Layout
- Paving Layout
- Pavement Marking and Signing Layout
- Pedestrian Walkway Details
- Landscaping Plans
- Illumination Drawing
- Phasing of roundabout construction (if applicable) / Traffic Control Plans
- Standard Detail Sheets (all required and latest)

The construction plans may be submitted as a standalone set or combined into a larger project set.

7.10.3 Roundabout Operations

This section outlines general concepts about roundabout operations. Each of these concepts is crucial to the proper design of a roundabout.

7.10.3.1 Yield on entry

Vehicles entering the roundabout yield to all conflicting vehicles within the roundabout regardless of whether those vehicles are circulating or exiting.

7.10.3.2 Counterclockwise flow

Vehicles flow in a counterclockwise direction within the roundabout.

7.10.3.3 Yield to pedestrians

Vehicles obey normal traffic laws with regard to yielding to pedestrians in the crosswalk.

7.10.3.4 Maximum fastest path speeds

The fastest path speed is the maximum speed at which a vehicle can navigate the roundabout if the driver ignores all lane designations and pavement markings. The fastest path is defined with a series of reverse curves, and the fastest path speed is the speed at which a passenger vehicle can navigate the smallest-radius curve as defined in the AASHTO publication *A Policy on Geometric Design of Highways and Streets*. NCHRP 672 outlines a procedure for estimating the fastest path speed. Fastest path speeds should be defined for all movements possible for each approach as shown in Figure 7.10.2.

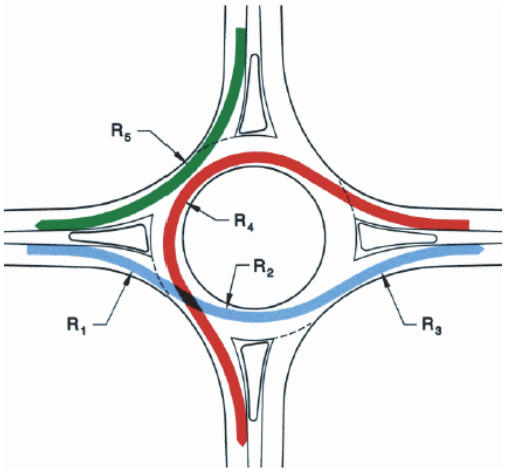

Figure 7.10.2 – Fastest Paths

For all movements shown in Figure 7.10.2, the desirable maximum speed is 20 mph for a single lane roundabout and 25 mph for a multilane roundabout. The absolute maximum speed for each movement is 25 mph for a single lane roundabout and 30 mph for a multilane roundabout.

Measurements for the fastest path speed are taken from a point three to five feet from the edge of the traveled way. The edge is typically either the face of curb or the edge of the truck apron. Where other fixed objects are present in the roadway (e.g. plastic bollards) these can also function as the edge of travelled way for the purposes of a fastest path calculation. Figure 7.10.3 illustrated how the fastest path movements should be constructed for the measurement of R1, R2, and R3.

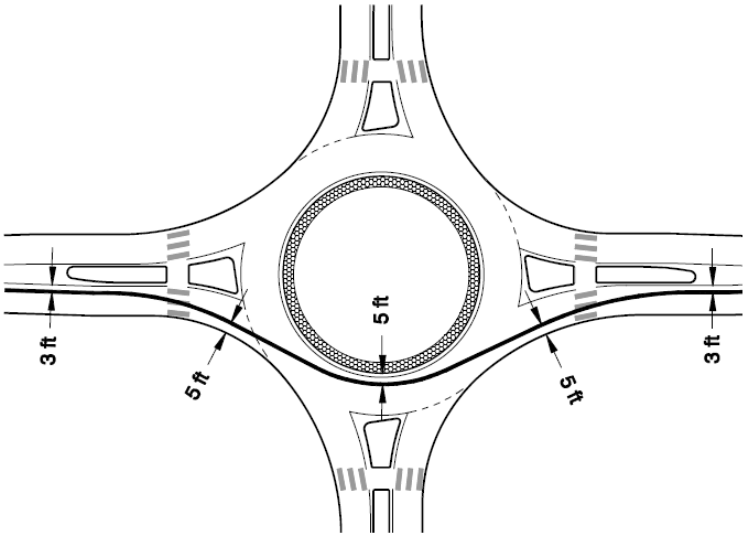

Figure 7.10.3 – Measurement of Fastest Path

7.10.4 Roundabout Planning

7.10.4.1 Lane configuration

The first step in roundabout design is the selection of lane configuration. Lane configuration is selected to achieve the desired intersection level of service (LOS) for a future planning year. A 20-year horizon shall be used, and traffic projections for that horizon should be made using a combination of growth factors and knowledge of planned developments.

Highest classification of involved streets	Minimum intersection LOS for future design year
Collector	LOS C
Arterial	LOS D

The roundabout geometry may be asymmetrical to minimize the number of entry and/or circulating lanes required to achieve the target LOS. Minimizing the number of lanes wherever possible can make the roundabout easier to navigate for drivers and decrease crossing distances for pedestrians.

Roundabouts with circulatory roadways consisting of up to two lanes are permitted within the City of Sugar Land. Any proposed roundabout with any part of the circulatory roadway consisting of more than two lanes is not permitted except with the approval of the City.

7.10.4.2 Phasing of roundabout construction

Providing roundabout capacity to meet LOS targets for future traffic volumes can result in a larger roundabout than what is required by existing traffic volumes. Drivers at such a roundabout may not respect lane designations until traffic volumes grow sufficiently and may drive faster than is desired. Phasing roundabout construction can be desirable to accommodate changing traffic volume levels. The

pre-design report should discuss capacity needs for existing and future conditions as well as the necessary timing for phasing to accommodate existing and future conditions.

7.10.4.3 Capacity Analysis

Various methodologies and software packages are available for roundabout capacity analysis. These include the 2010 Highway Capacity Manual (HCM), SIDRA Intersection, RODEL, Synchro, and VISSIM. The Highway Capacity Manual methodology and Synchro Software are typically sufficient for minor intersections with standard geometries. SIDRA Intersection is appropriate for intersections with more complex geometries. VISSIM is appropriate for analyzing roundabout capacity when a complex network of intersections, driveways, and other factors in the vicinity of the roundabout may impact roundabout operations. The capacity analysis methodology to be used for a given intersection will be selected during the pre-design meeting.

7.10.4.4 Design Vehicle

Selecting an appropriate design vehicle is a critical step in the design of a proper roundabout. Selecting an inappropriately large design vehicle can result in an unnecessarily large roundabout that encourages higher speeds than desirable and creates crossing challenges for pedestrians. On the other hand, selecting an inappropriately small design vehicle can result in a roundabout that is too small to accommodate trucks and fire trucks, which may damage curbs and other roundabout features as they attempt to navigate the roundabout. Capacity can also be decreased below acceptable levels if a large number of trucks require multiple lanes to negotiate the curves.

The selection of the design vehicle should be sensitive to the context of the roadway network and adjacent development. Typical design vehicles for various roadway types are shown below; however, the ultimate design vehicle will be selected during the pre-design meeting.

Roadway Classification	Truck Apron	Edge of Pavement
Arterial	WB-67	BUS
Collector	WB-50	BUS
Local	No truck apron	BUS
Rural	WB-67	BUS

Each roundabout design should be checked to ensure that fire trucks and school buses can navigate the roundabout without any use of the truck apron.

The roundabout should be designed such that the design vehicle can navigate it with a 1-foot clearance from the turning radius to any nonmountable curb face. The front wheels of the design vehicle should not encroach on the truck apron.

7.10.5 Geometric Design

7.10.5.1 Types, purpose, and importance of deflection

Deflection is a key component of roundabout design and is a primary determinant of traffic operations and safety. Deflection is achieved with physical geometric elements and ensures that no vehicle can travel a straight path through the roundabout without hitting curb or other physical delineator (see Figure 7.10.2). Three types of deflection are used to control speeds in a roundabout:

- Entry deflection – deflection caused by the geometry of the entry lanes and the splitter island on an entry leg (R1)
- Exit deflection – deflection caused by the geometry of the exit lanes and the splitter island on an exit leg (R2)
- Central island deflection – deflection caused by the placement of the central island within the path of an entering vehicle (R3)

Deflection will vary to ensure that entry speeds, circulating speeds, and exit speeds are kept within a desirable range, path overlap is minimized, and all design vehicles can be accommodated.

7.10.5.2 Inscribed Circle Diameter

The diameter of the inscribed circle should be chosen so that it is the smallest possible diameter that will accommodate the design vehicle, the desired number of lanes, the maximum desired entry speed, and the maximum desired circulating speed.

Roundabout Geometry	Typical Inscribed Circle Diameter
Single Lane Roundabout	90-150 ft
Two Lane Roundabout	150-220 ft

7.10.5.3 Central Island

The diameter of the central island is determined after the roundabout inscribed circle diameter, design vehicle, circulatory roadway width, and truck apron size are selected to accommodate the design vehicle and minimize the fastest path speed.

Pedestrians shall not be permitted to access the central island.

Landscaping on the central island is discussed in 7.10.8 Landscaping, Drainage, and Visibility.

7.10.5.4 Alignment of Centerlines

The centerlines of approach roadways should align with the center of the roundabout or up to 40 feet offset left of center as shown in Figure 7.10.4. A slight offset left approach is typically desirable to achieve target entry speeds. Offset right approaches should be avoided because of their tendency to increase entry speeds.

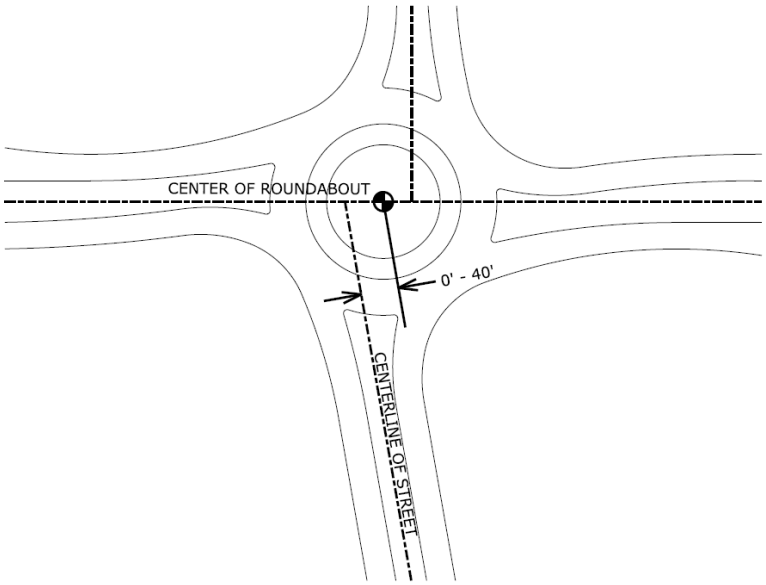

Figure 7.10.4 – Acceptable Centerline Offsets

7.10.5.5 Number of Approaches

Roundabouts are permitted to have three, four, or five approaches. More than five approaches can result in a roundabout with a large inscribed diameter and high speeds.

7.10.5.6 Angle Between Approach Centerlines

The centerlines of adjacent approaches should intersect at as close to 90 degrees as is practicable. Centerlines intersecting at oblique angles can result in high speeds for the right-turn movements, which may require additional design treatments.

7.10.5.7 Splitter island design

The splitter islands are a critical component of the roundabout geometry to create entry deflection, control vehicle speeds, and provide pedestrian refuge areas.

Pavers shall be used on the splitter island unless otherwise approved by the City.

The table below defines minimum dimensions for splitter island components.

Splitter Island Attribute	Minimum Dimension
Yield line to tip length	50 ft, 100 ft preferable
Crosswalk cut through width	10 ft
Crosswalk cut through length	6 ft
Yield line to crosswalk setback	20 ft

Figure 7.10.5 illustrates these dimensions for splitter island design.

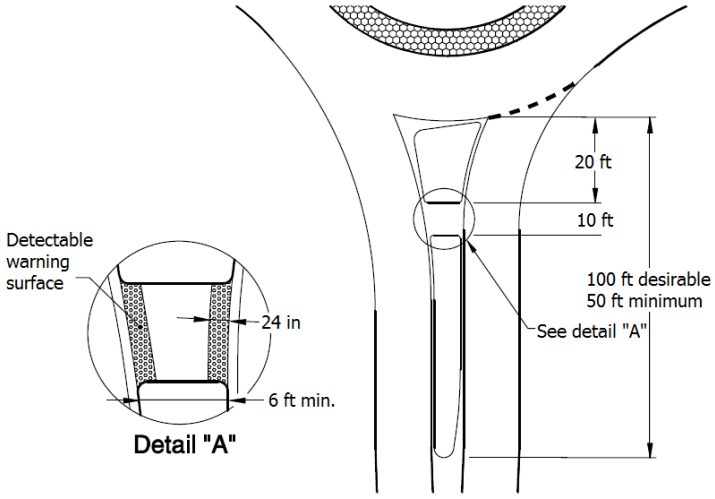

Figure 7.10.5 – Splitter Island Dimensions

7.10.5.8 Truck Apron

Truck aprons should be designed to provide enough room for the design vehicle to pass without running up on a curb. Depending on the design vehicle, a truck apron may not be necessary. Where truck volumes are low, trucks may be assumed to utilize two lanes of a multi-lane roundabout.

The roundabout shall be designed such that transit vehicles, school buses, fire trucks, and passenger vehicles do not have to use the truck apron to navigate around the roundabout.

The truck apron should usually fall within a range of 3 to 15 feet, although the ultimate need for and width of a truck apron will be determined by analysis of the design vehicle and roundabout performance metrics.

The cross slope of the truck apron shall be 2% down from the central island.

The outside edge of the truck apron shall be 4 inches above the circulatory roadway.

An 18” mountable curb shall be used between the truck apron and the circulatory roadway.

The truck apron shall be constructed of an 8” Portland cement base overlaid with pavers, as shown in the City of Sugar Land Standard Construction Details.

If no truck apron is necessary, a 3’ mow strip shall be provided around the central island.

7.10.5.9 Entry Width

Entry width is measured from the point where the entrance line intersects the left edge of traveled way, along a line perpendicular to the right curb line. Entry width is chosen to control speed and accommodate design vehicles. Exceeding the recommended entry widths can encourage higher speeds

and can encourage drivers to treat the entry as having more lanes than is intended. Recommended maximum entry widths are shown in the table below.

Roundabout Geometry	Maximum Entry Width
Single Lane Approach	20 ft
Two-lane Approach	32 ft

Figure 7.10.6 illustrates these standards for entry width and for other geometric elements.

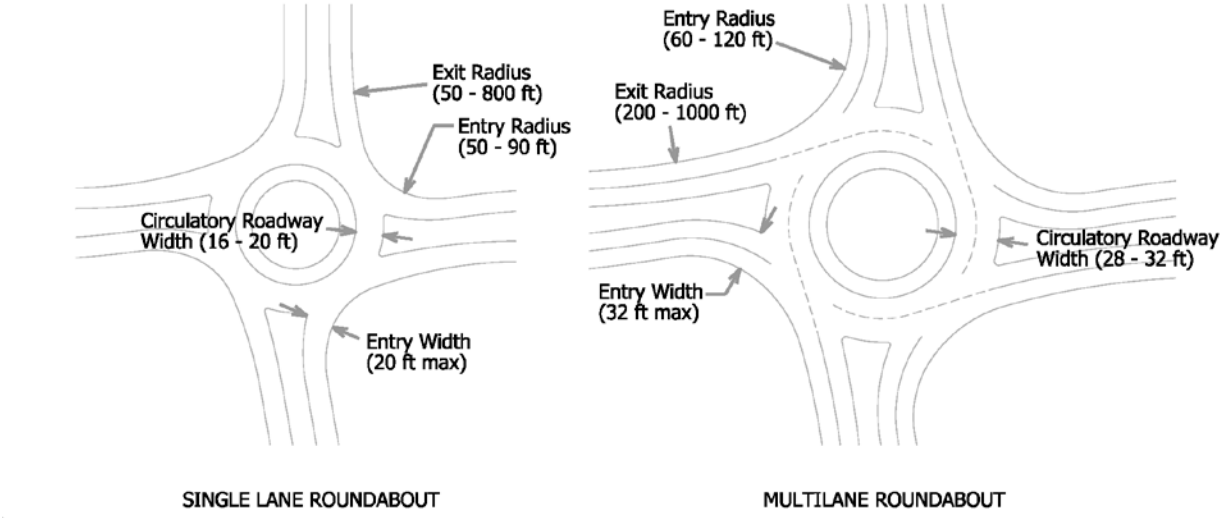

Figure 7.10.6 – Entry and Exit Radius, Entry, and Circulating Width

7.10.5.10 Entry Radius

The entry radius is the minimum radius of curvature along the face of the right-hand curb at entry. It is one of the principal geometric components that create the deflection necessary for speed control at a roundabout. A range of entry radii is frequently acceptable for a given roundabout approach; the chosen radius should achieve the dual goals of controlling the fastest path speed and accommodating the design vehicle.

For a multi-lane roundabout, a compound curve is frequently necessary to provide adequate deflection while minimizing entry path overlap. An initial, small angle curve with a typical radius between sixty feet (60’) and one hundred and twenty feet (120’) controls speed and is followed by a secondary, large angle curve greater than one hundred and fifty feet (150’) or a tangent line that aligns the entering vehicles to avoid path overlap.

Typical ranges for entry radii are shown in the table below and in Figure 7.10.6.

Roundabout Geometry	Typical Entry Radius
Single Lane Roundabout	50-90 ft
Two Lane Roundabout – Initial Radius	60-120 ft
Two Lane Roundabout – Secondary Radius	>150 ft (or tangent)

7.10.5.11 Exit Radius

The exit radius is the minimum radius of curvature of the outside right curb at an exit.

Exit radii are typically higher than entry radii to promote movement out of the roundabout and minimize congestion. However, the higher speeds that result from larger radius exit curves can make the road crossing difficult for pedestrians so the desire to minimize congestion must be weighed against pedestrian needs particularly in areas with high pedestrian volumes. Typical ranges for exit radii are shown in the table below and in Figure 7.10.6.

Roundabout Geometry	Typical Exit Radius
Single Lane Roundabout	50-800 ft
Two Lane Roundabout	200-1000 ft

7.10.5.12 Circulatory Roadway

The width of the circulatory roadway is typically determined through an iterative approach that simultaneously considers the design vehicle, the inscribed diameter, the truck apron, entry radii, and other geometric elements. Typical circulatory roadway widths are shown in the table below and in Figure 7.10.6.

Roundabout Geometry	Typical Circulatory Roadway Width
Single Lane Roundabout	16-20 ft
Two Lane Roundabout	28-32 ft

The circulatory roadway shall be constructed with Portland cement concrete. Joint patterns shall be concentric and radial to the circulatory roadway within the roundabout. The joints should not conflict with pavement markings.

7.10.5.13 Path overlap on multilane roundabouts

Path overlap can occur on multilane roundabouts when the geometry of the roundabout guides traffic from one lane into an adjacent lane. This situation is frequently encountered on entry paths and exit paths with insufficient deflection, as shown in Figure 7.10.7.

The natural path of vehicles at each entry to the roundabout should be tested for path overlap. If overlap is a problem, then a larger radius curve, compound curve, or tangent section should be provided on the approach.

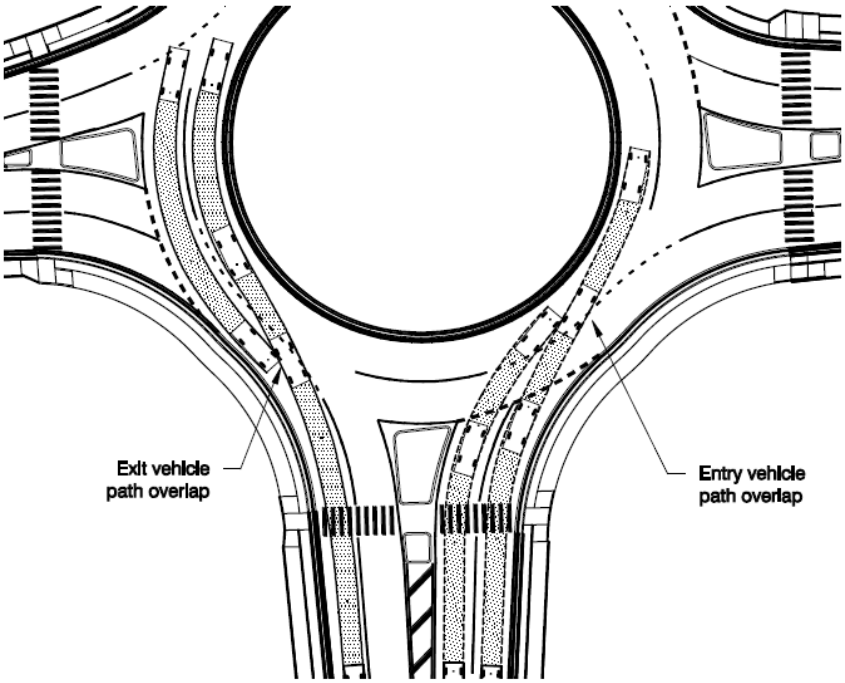

Figure 7.10.7 – Examples of Path Overlap

7.10.6 Signage and Pavement Markings

7.10.6.1 Pavement markings

All roundabout pavement markings must conform to the TMUTCD standards (where applicable), provisions in Section 7.7.2, and the City of Sugar Land Standard Details.

Lane use pavement markings, including arrows and solid or dashed lines shall be used on all multilane roundabouts. They shall be provided on each entry lane prior to the entry crosswalk and on each lane of the circulatory roadway past each exit.

A wide dotted pavement marking shall delineate the edge of the circulatory roadway at each entry. Yield triangles shall be used to mark the location at which drivers must yield to circulating traffic. For each approach lane, the yield markings shall extend from the point at which the edge of the inside lane line intersects the circulatory roadway to a point that is perpendicular to the edge of the outside lane line. Supplemental “YIELD” pavement marking may be required where field observations indicate a significant number of vehicles do not yield.

Yellow edge lines shall be placed along the left edge of the entry and exit of each approach roadway along the edge of the splitter islands. Splitter island curbs may be painted yellow in lieu of providing edge lines.

White edge lines are required along the portion of the splitter island which outlines the outside of the circulatory roadway.

7.10.6.2 Signage

All roundabout signage must conform to the TMUTCD standards (where applicable), latest revision and as provided for in section 7.7.1.

Generally, signage should be minimized to reduce visual clutter and focus driver concentration on potential conflicts and the geometry of the roundabout.

Advance roundabout warning signs (W2-6) with cross street name signs are required on all approaches to the roundabout.

Yield signs shall be placed on the right side of the road at the point where vehicles are to yield when entering the roundabout. Yield signs shall also be placed in the splitter island for multilane approaches and for single lane approaches where a single yield sign is not adequate because of alignment or sight distance problems. “YIELD” pavement marking may be required where field observation warrants.

Lane assignment signs depicting the lanes maneuvering around the roundabout shall be provided on all multi-lane approaches, including single lane approaches with auxiliary turn lanes, one hundred seventy five feet (175’) to two hundred feet (200’) from the yield line. These signs should be accompanied by lane use pavement markings.

Street name signs with a minimum of 6” lettering shall be placed on the splitter islands oriented toward traffic on the circulatory roadway.

The roundabout directional sign (R6-4 series) shall be used in the central island oriented towards each entry approach. The signs shall be composed of black chevrons on a white background. The standard R6-4 sign shall be used for single-lane roundabouts, and the larger R6-4a or R6-4b should be used on two-lane roundabouts.

One-way signs shall not be used to designate roundabout circulation because of the potential for drivers to confuse the sign with an indication of cross street directionality.

7.10.7 Bicycle and Pedestrian Access

7.10.7.1 Sidewalks

All sidewalks and ramps are to be constructed in accordance with the City of Sugar Land Standard Details and in accordance with ADA requirements.

Sidewalks shall be located on each side of the roundabout between wheelchair ramps. Sidewalk width shall be six feet (6') minimum and ten feet (10') desirable. If bike slip ramps are provided, sidewalks shall be a minimum of ten feet (10') in width between bike slip ramps.

ADA-compliant wheelchair ramps shall be required at all crosswalks.

The walkway through the splitter island shall be cut through instead of ramped.

A landscape strip with minimum width of 2 feet shall be provided between the sidewalk and the roadway pavement between crosswalks on all sides of the roundabout.

Figure 7.10.8 illustrates these standards for the design of sidewalks at a roundabout.

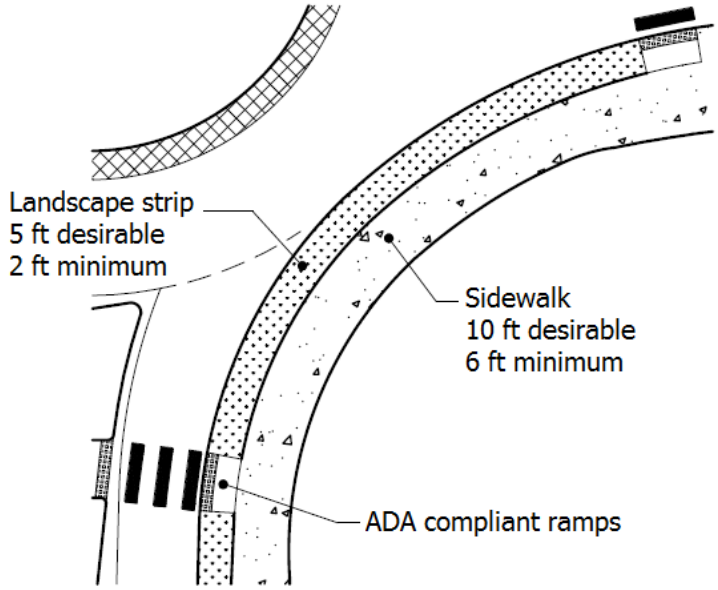

Figure 7.10.8 – Sidewalk Dimensions

7.10.7.2 Crosswalks

Pedestrian crosswalks shall be provided across all approaches. The crosswalk across a given entry or exit leg may be perpendicular to the outside curb, resulting in a V-shape across the splitter island, or may be perpendicular to the approach centerline, resulting in a straight crosswalk across the road.

Pedestrian crossings should be marked with ladder style markings consisting of 2' x 10' markings placed to accommodate the wheel path.

7.10.7.3 Bicycle access

If an approach to the roundabout has bicycle lanes, then a bicycle slip ramp as shown in Figure 7.10.9 should be provided to allow bicyclists to utilize the sidewalk to negotiate the roundabout. Bicyclists on other roads can be assumed to utilize the circulatory roadway because of the reduced speeds of vehicles in the roundabout.

Bicycle lanes shall not be continued through the roundabout on the circulatory roadway.

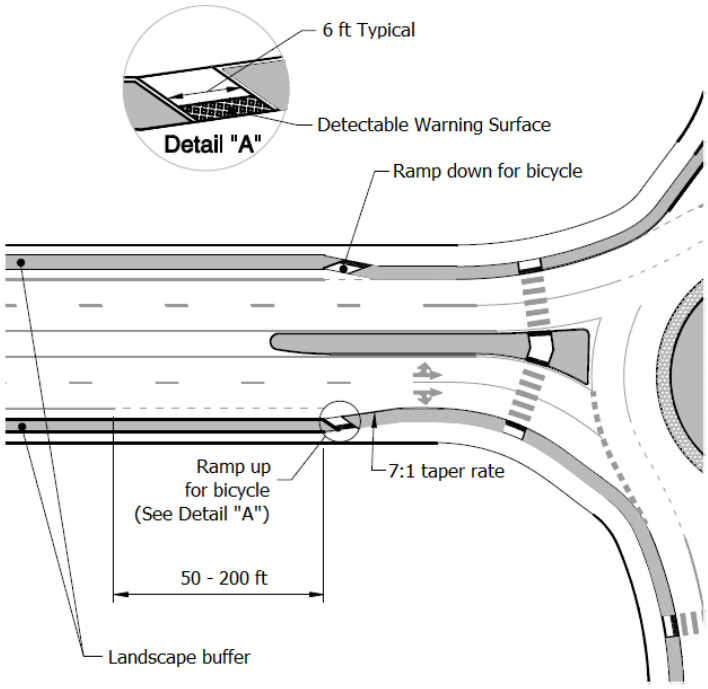

Figure 7.10.9 – Bicycle Slip Ramp

7.10.8 Landscaping, Drainage, and Visibility

7.10.8.1 Principles of Roundabout Landscaping

Landscaping on the central island, the edges of the roundabout, and all splitter islands shall provide sufficient stopping sight distance and intersection sight distance for all vehicles approaching and using the roundabout.

Hardscape features and fixed objects should be restricted to the inner section of the central island to minimize impacts by errant vehicles.

The central island should be domed or mounded with a minimum elevation of 3.5 feet and maximum elevation of 6 feet above the ground elevation. The slope of the central island should not exceed a horizontal-to-vertical ratio of 6:1 in order to enable errant vehicles to recover.

7.10.8.2 Clear zone and visibility

Adequate stopping sight distance (SSD) and intersection sight distance (ISD) should be provided for all approaches to the roundabout and for the circulatory roadway. Sight distance should be checked using methodology from the AASHTO “Green Book.”

SSD should be checked for each approach to the roundabout, for all points on the circulatory roadway, and for right-turn movement to the conflicting crosswalk, as shown in Figure 7.10.10.

ISD should be checked for each approach to the roundabout. Sight triangles should be constructed from fifty feet (50') back from the yield line to vehicles on the circulatory roadway and vehicles entering the roundabout on the upstream approach. The distance to the conflicting approaches should be measured along the curvature of the roundabout. More information regarding the computation of ISD for roundabouts is available in Section 6.7.3.4 of NCHRP Report 672.

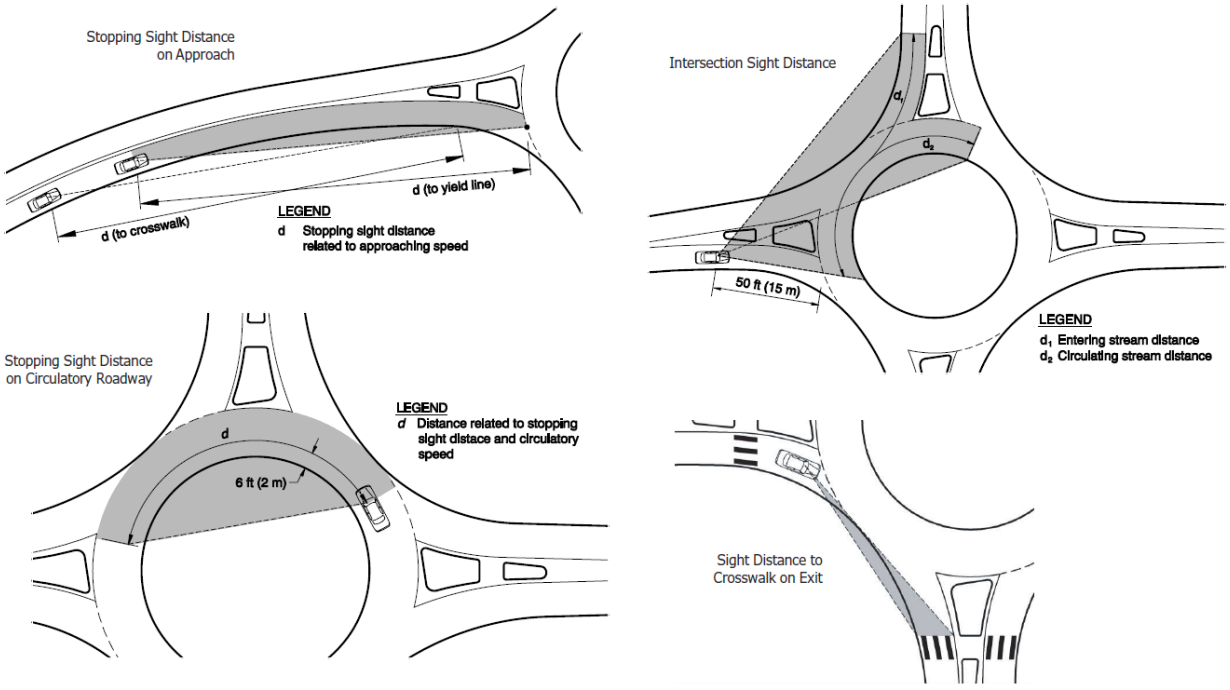

Figure 7.10.10 – Stopping Sight Distance and Intersection Sight Distance triangles

The combination of SSD and ISD computations will define areas along the edge of the roundabout, on the splitter islands, and on the central island where large obstructions must be limited. Objects such as low-growth vegetation, poles, sign posts, and narrow trees may be acceptable in these areas provided they do not create a hazard for errant vehicles.

The construction of SSD and ISD sight distance triangles defines areas where various levels of landscaping and fixed objects may be appropriate, as shown in Figure 7.10.11.

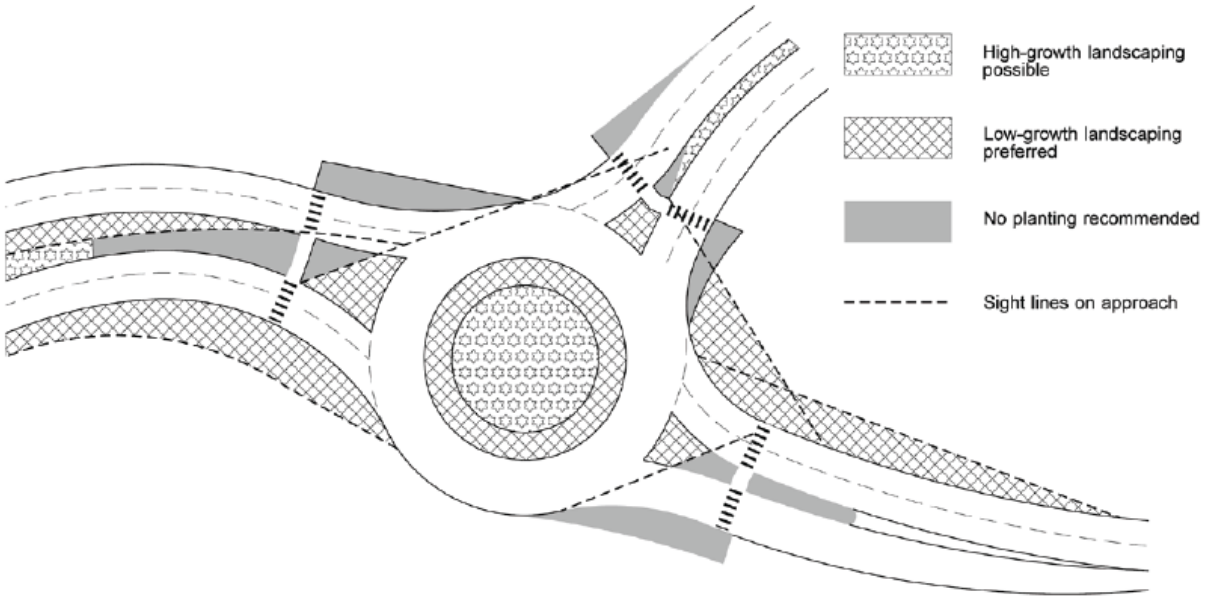

Figure 7.10.11 – Planting patterns related to combined sight triangles

7.10.8.3 Illumination and power

Lighting should be provided to adequately illuminate all conflict areas, particularly entry conflicts and pedestrian conflicts.

Where new lighting is provided, it should be installed on the exterior edges of the roundabout between adjacent crosswalks. Breakaway poles shall be used to minimize injury in event of a collision.

If lighting is provided on the central island, it shall point from the outside in to increase visibility of the central island without causing glare for drivers.

Conduit for electrical wiring shall be installed to the central island even if no illumination or electrical features are currently planned.

7.10.8.4 Drainage

Roundabouts should be designed to drain away from the central island. A 2% cross slope is typical. In addition to drainage, a 2% cross slope away from the central island also helps to regulate vehicle speeds. Drainage inlets will typically be located along the outer curb line.

Inlets and low points should be located upstream of the crosswalks.

7.10.8.5 Irrigation and plant materials

Irrigation or piping for future irrigation shall be provided along the outside perimeter of the roundabout and to the central island regardless of whether or not vegetative landscaping is planned for those locations.

Note: Figures 7.10.1-3, 7.10.5, and 7.10.7-10 have been adapted from NCHRP 672, Roundabouts: An Informational Guide. Figure 7.10.11 has been adapted from the Washington State Department of Transportation Design Manual.