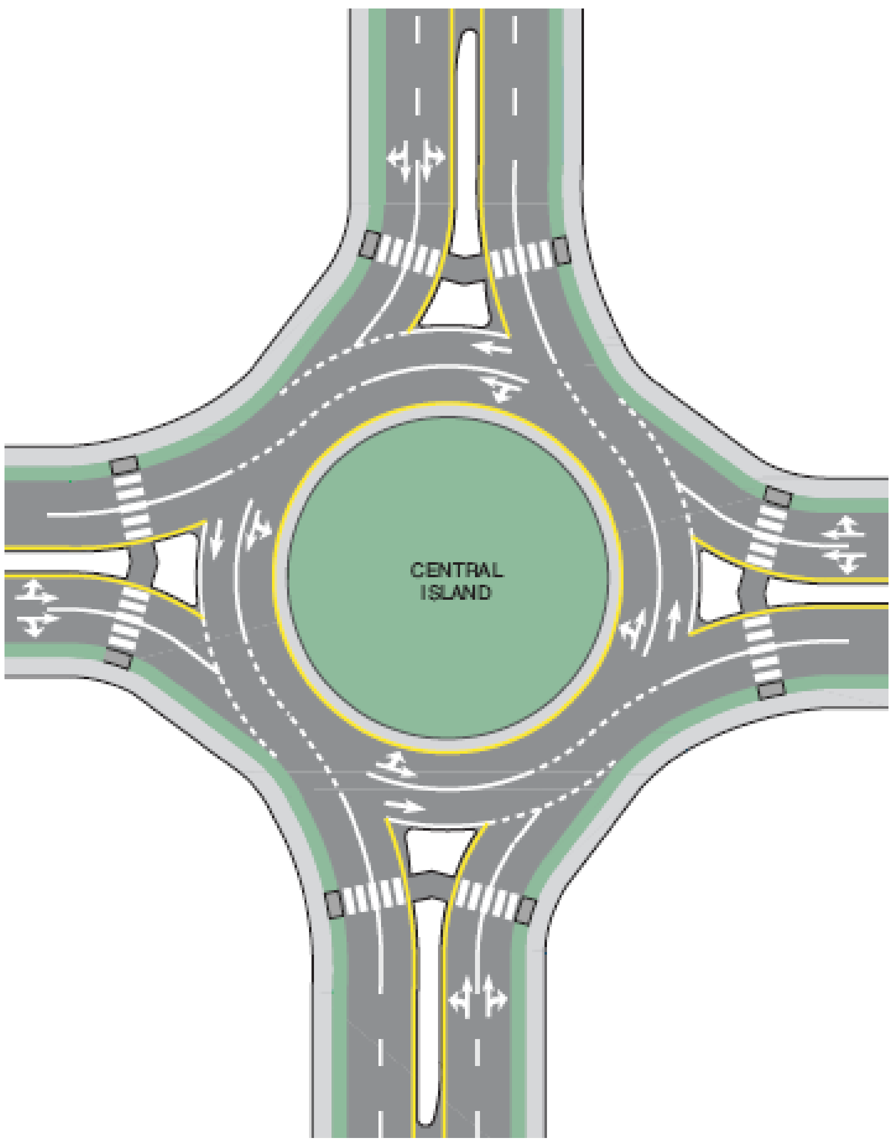
KYTC
Roundabout Interim Requirements
And Guidelines



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To be added upon completion.

1.0 Introduction

The modern roundabout is a form intersection control that is commonly used throughout the world. Until the beginning of the 21st century, many transportation professionals had been hesitant to recommend and install roundabouts due to a lack of objective guidelines on planning, performance and design of roundabouts. Since the publication of the Federal Highway Administration's Roundabouts: An Information Guide, in addition to subsequent federal, state and local guidance, hundreds of roundabouts have been designed and built within the United States.

Experience has shown when properly implemented, roundabouts have performed favorably, in terms of shorter delays, increased capacity, improved safety and improved aesthetics compared to conventionally controlled intersections. Intersections retrofitted with roundabouts have resulted in an overall reduction in the number and severity of crashes, despite the concern that lack of familiarity with this type of intersection would lead to driver confusion.

Roundabouts differ from the rotaries used in northeastern U.S. and other traffic circles such as those found in small Kentucky cities (e.g. Leitchfield and Bardstown). In fact, the beginning of the modern roundabout took place in the United Kingdom as a means to rectify problems associated with other circular-type intersections. The primary features that they introduced were the use of yield at entry rule and a smaller diameter circle. The yield at entry allows for orderly progression within the circulatory roadway and prevents traffic from locking up. The small diameter and adequate deflection on entry improves safety by eliminating or altering conflict types, reducing speeds to less than 30 mph, minimizing speed differentials, and providing a clear indication of the driver's right of way.

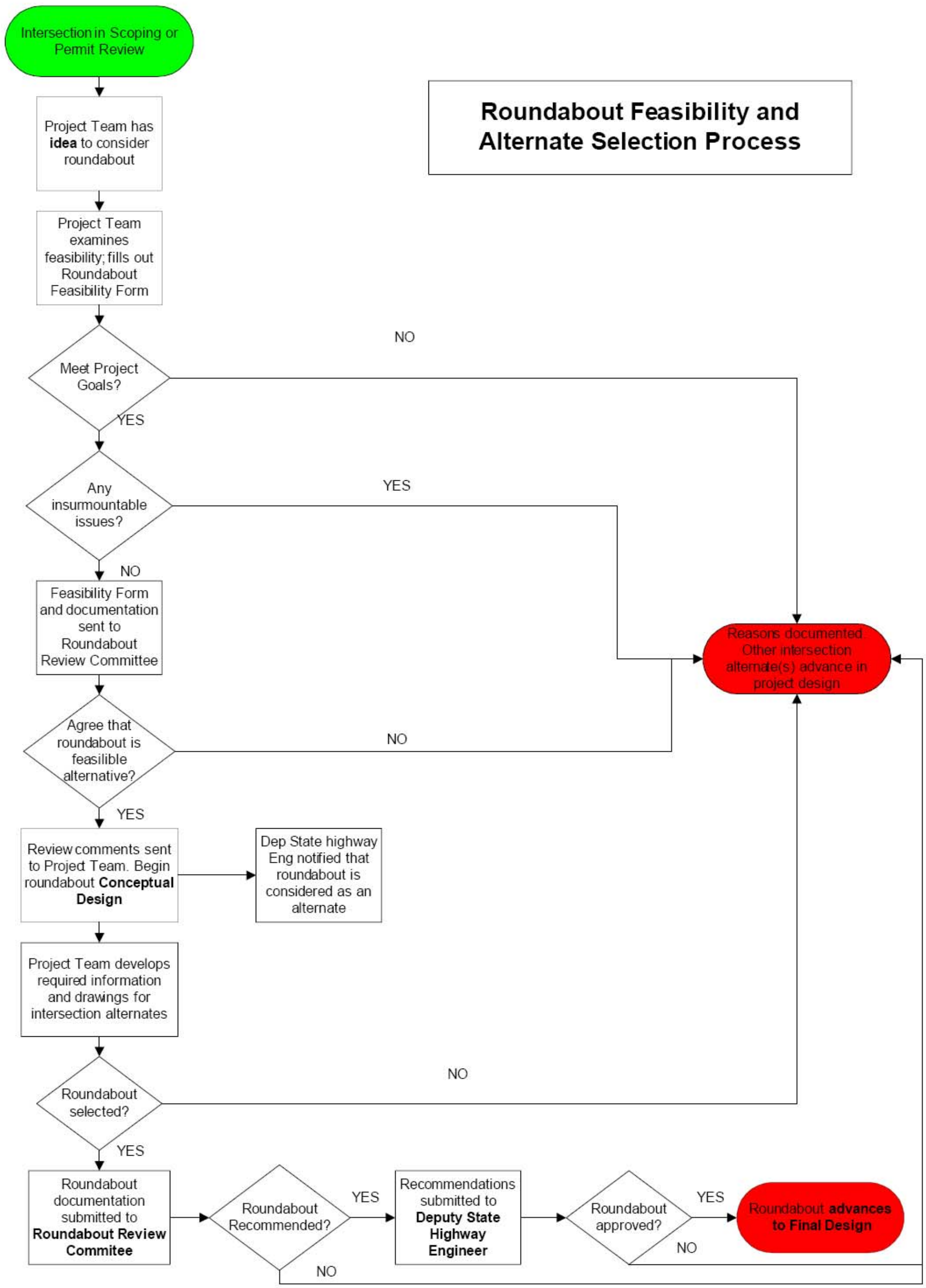
This guidance addresses the three phases of project development:

1. Feasibility (Section 2.0)
2. Alternates Analysis and Conceptual Design (Section 3.0)
3. Final Design (Section 4.0)

In addition, this guidance also describes four types of roundabouts will primarily be considered on state highways (Section 5.0), addresses various site issues (Section 6.0), roundabout intersection types (Section 6.0) and capacity analysis (Section 7.0). Additional information and guidance on roundabout scoping and design is included in the FHWA publication, "Roundabouts: An Informational Guide." The FHWA Guide will be updated and available in 2008.

The Department of Highways has formed a Roundabout Review Committee to develop and update policies and guidance for the implementation of roundabouts on the state highway system. The Committee is also responsible for reviewing Roundabout Feasibility studies and Alternatives Analysis/Conceptual Designs. The Committee will also provide technical assistance to Project Managers considering roundabouts on projects on an interim basis.

Figure 1.1 outlines the process from the initial formation of an idea to use a roundabout at an intersection until it enters final design. A more detailed description of the review and approval processes are included in Sections 2.4 and 3.4.



2.0 Feasibility

The purpose of the Feasibility phase is to determine whether a roundabout will be suitable for consideration as an alternate in the next phase of project development. Chapters 2, 3 and 4 of the FHWA Roundabout Guide provide additional information regarding issues of feasibility. Roundabouts may be considered in urban and rural locations and on low or high speed facilities. Roundabouts may also be considered for a number of facility types including, but not limited to:

- Freeway interchange ramp terminals
- State route intersections
- State route/local intersections
- State route/private entrance intersections

2.1 Appropriate Applications

Roundabouts may be considered, but are not limited, to address the following situations:

2.1.1 High crash intersections

Roundabouts can provide a possible solution for high crash rates by reducing the number of conflict points at which the paths of opposing vehicles intersect. For example, many accidents at conventional intersections occur when a driver (1) misjudges the distance or speed of approaching vehicles making a left turn, or (2) causes a right angle collision after violating a red light or stop sign. Such crashes would be eliminated with a roundabout where left turns and crossing movements are prohibited. Collisions at roundabouts tend to involve low speeds and low angles of impact resulting in crashes with few injuries or fatalities. Studies of existing intersections that were retrofitted with a roundabout have shown a decrease in all crashes by 40% or more and a decrease in fatal or injury crashes by up to 90%.

2.1.2 Traffic flow problems

a. High delay intersections

A roundabout may be preferable to other conventional alternates such as stop signs or a traffic signal. With a traffic signal, only alternating streams of vehicles are permitted to proceed through the intersection at one time, causing a loss of capacity to occur when the intersection clears between phases. In contrast, the only restriction on entering a roundabout is the availability of gaps in the circulating traffic flow. The slow speeds within the circulating roadway allow road users to safely select a gap that is relatively small. Allowing vehicles to enter simultaneously from multiple approaches using short headways makes the roundabout more efficient and may improve capacity over other intersection controls.

b. Long queue lengths

Roads are often widened to create storage for vehicles waiting at traffic signals, but the reduced delays and continuous flows at roundabouts allow the use of fewer lanes between intersections. Roundabouts can produce improvements that may reduce the queue lengths that cause operational problems at downstream intersections or where limited space is available for queuing.

c. High left-turn volume intersections

Accommodating left-turning vehicles using traffic signals often requires separate turning phases. With high volumes of left-turning vehicles, those phases must be increased resulting in a longer cycle length and more delay to the other movements. A roundabout may accommodate left-turning vehicles more efficiently resulting in lower delays. Application of a pair of roundabouts may possible at diamond interchange ramp terminals, where high left turn volumes can cause traffic signal operations to fail.

2.1.3 Unusual Geometry

Conventional forms of traffic control are often less efficient at intersections with a difficult skew angle, significant offset, odd number of approaches or close spacing. Roundabouts may be better suited for such intersections because they do no require complicated signing (though still critical to the design) or signal phasing. Their ability to accommodate high turning volumes make them especially effective at “Y” and “T” junctions. Roundabouts may also be useful in eliminating a pair of closely spaced intersections by combining them to form a multi-legged roundabout.

2.1.4 Projects implementing medians or access management

The introduction of roundabouts may be possible in situations where access needs to be controlled via raised medians. Roundabouts facilitate left turns and U-turns to access properties on the opposite side of the highway. Improved access via roundabouts might reduce opposition to left turn restrictions.

2.1.5 Physical site restrictions

a. Structures (under or overpass) on approach roadways that would need widening for other alternates

Often, intersections in close proximity to an overpass or underpass bridge structure need capacity increased via the addition or lengthening of a turning lane. This may require the widening of the structure resulting in large project cost. The use of a roundabout often will eliminate the need to widen the approach leg to improve capacity thus allowing the structure to remain unchanged.

b. Other ROW Restrictions

While the inscribed circle diameter may take more right-of-way at the intersection than a traffic signal or stop control, roundabouts offer the potential for reducing spatial requirements on the approaches. The location of buildings or other features close to the existing roadway may make it costly and difficult to widen a roadway to accommodate left and right turning lanes needed for conventional intersections. The use of a roundabout may result in lower impacts and overall project cost if the need to widen the approach legs is eliminated.

There may also be secondary project goals that the use of a roundabout or a series of roundabouts may help address such as:

2.1.6 Reducing speeds

There may be a need for traffic calming along a roadway to improve vehicular and pedestrian safety. Roundabouts encourage vehicular speed reduction and consistency that results in a more balanced operating environment for all road users.

2.1.7 Transition in land-use or a city gateway.

There may be a need to signify to drivers that they are entering an area where the character of the road and surrounding land use is changing. A roundabout can serve in the capacity of delineating the change in land use and roadway character or as a gateway between rural and urban environments. A roundabout gateway signals the driver to change their driving behavior.

2.1.8 Aesthetics

The project team or public may be interested in a roundabout because of the aesthetics or ambiance it may bring to the local environment.

2.2 Site and Other Considerations

2.2.1 Adjacent Intersections

Consideration should be given to the interactive effects between a proposed roundabout and the adjacent intersections (including entrances.) Traffic queues may form at a roundabout and cause interference with adjacent driveways and intersections. Also, adjacent intersections and entrances may cause a backup from turning vehicles into the roundabout. It is critical to analyze the predicted maximum queue to understand these impacts so that these impacts are minimized. The project team must make decisions on how to control access to these adjacent locations so that the safety and integrity of operations is maintained. This may include lengthening the splitter island to form a right-in/right-out condition, relocating or closing an existing driveway or street, or purchasing a property or access rights if no other alternate can be determined. Queues from traffic entering the roundabout should be determined using the RODEL model.

2.2.2 Signalized and Coordinated Signal Systems

It is generally undesirable to have a roundabout located near a signalized intersection; however, an analysis of operations may show the roundabout as a suitable option. A comprehensive traffic analysis is needed if the proposed location is within a coordinated signal network. There may be a situation where the particular intersection's signal requires a very long cycle length which is caused by high cross road traffic or a large percentage of turning movements; this may result in a reduction in the overall efficiency of the coordinated system. Replacing this intersection with a roundabout may allow for the system to be split into two systems thus improving the efficiency of both halves while improving the efficiency of the entire roadway segment.

2.2.3 Capacity Limitations

When considering a roundabout, capacity of each entering leg should be analyzed for the design year. The design year is typically defined as date that the finished road project will be open to traffic (OTT) plus 20 years. In addition, it may be beneficial to analyze an intermediate year such as OTT plus 10 years to determine an initial design and a final design that could be slightly modified to accommodate higher future traffic.

For additional information about examining capacity in the feasibility stage, see section 2.3.1 Traffic Operations and section 6.0, Roundabout Traffic Operations Evaluation.

2.2.4 Entry Volume Balance

There is no formula of minimum side road traffic (volume or % of total entering volume) where a roundabout will not function properly. To assess how a roundabout will function, a traffic operational analysis using RODEL should be conducted (see section 6.0). When the volume on the major road is much heavier than that on the minor road, the equal treatment of approaches may increase delay to the major road. Also, if the major road carries a heavy stream of through traffic, there may a lack of adequate gaps that deter the minor flow from entering the roundabout.

2.2.5 Approach Alignment

The alignment of the approach roadway must enable the design of an acceptable entry deflection without the creation of severe horizontal curvature or poor stopping sight distance. To determine acceptability, the centerline of the approach roadway should be projected across the roundabout. The projected line should be left of or intersect the center of the roundabout.

For high speed entries (>=50mph), rumble strips may be considered to help slow motorists. Additionally, a series of reverse curves may be used to help transition (reduce) speeds before the roundabout entry deflection. Each subsequent curve should reduce the operating speed by less than 15 mph. The use of such features may enhance the safety of the roundabout.

2.2.6 Terrain and Slopes

Roundabouts typically should be constructed on relatively flat or rolling terrain with an approach grade that is desirably less than 3%, but not greater than 5%. Grades approaching 4% and steeper terrain may require greater transitions to provide an appropriate flat area or plateau for the intersection; this enables drivers to slow or stop on the approach and so appropriate sight distance can be established. Under the same conditions, other types of at-grade intersections often will not provide better solutions. Therefore, the roundabout should not necessarily be eliminated from consideration at such a location. Rather, the intersection should be relocated or the vertical profile modified, if possible.

2.2.7 Context

The team should perform a cursory examination of the context and surroundings to determine the appropriate type of roundabout and if there are any features that need to avoided. The type and intensity of development will be a factor in determining the category of roundabout (see Section 5.0) and the level of accommodations for pedestrians and bicyclists. If pedestrians and bicyclists are present or expected due to development growth, a combination of crosswalks, sidewalks, bicycle lanes and bicycle entrance/exit ramps may be needed. Additional assistance may be needed from the KYTC Pedestrian and Bicycle Coordinator to determine the appropriate pedestrian and bicycle accommodations. The context may also help determine the level of lighting necessary.

There may be features such as historic properties, environmentally-sensitive properties or community resources that may affect or inhibit the design of project. Creating an environmental footprint and gathering input from the public, regulating agencies and elected officials are ways to identify these items. This information will be helpful as the project advances to the development of alternatives and conceptual design.

2.2.8 Public Involvement and Education

It is recommended that public involvement take place after a roundabout has been determined to be a feasible alternative. Additional information about public involvement and education about roundabouts can be found in Section 3, Alternatives Analysis and Conceptual Design.

2.3 Feasibility Determination

To determine feasibility, complete a Roundabout Feasibility Study to preliminarily examine:

- Traffic operations of each leg
- General size and configuration
- Crash analysis (for existing intersections)
- Other issues that may affect feasibility or design

2.3.1 Traffic Operations

<u>Capacity</u>, <u>delay</u> and <u>queue lengths</u> for each leg should be determined for the design year using the methodology outlined in Section 7.0, Roundabout Traffic Operations Evaluation. This analysis will also help determine the number of lanes that will be required for each entry. Table 1 can be used as a rule-of-thumb to help understand a range of AADT and hourly volumes of traffic that a roundabout may handle. Additional capacity may be gained by increasing the number of lanes on one or more entries. Also, additional capacity may be gained by providing a right-turn bypass lane where there are high right turn volumes. <u>Actual intersection capacity varies significantly based on entry</u>

volumes and turning movements for each leg, the number of legs and the number of lanes for each entry. To truly understand the capacity and effects of delay and queue, a RODEL analysis must be performed for each individual case.

	Single Lane	Double Lane	Triple Lane
Peak Hour (vehicles/hour)	<2,000	2,000 – 4,000	4,000 - 7,000
Daily (vehicles/day)	<20,000	20,000-40,000	40,000-70,000

Table 1: Planning Level Maximum Roundabout Capacities

2.3.2 Size and Configuration

General size and configuration (geometric layout) of a roundabout should be determined (in the same iterative process for determining capacity) to see if there are any limiting physical barriers to its implementation. Approximations for the following features should be determined:

- Inscribed diameter
- Number of entry lanes (for each leg)
- Entry width (for each leg)

The inscribed diameter needed for the roundabout is the most critical space requirement for installation. Typical inscribed diameters are outlined in the Table 2.

Roundabout Type	Typical Inscribed Diameter
Urban Single-Lane	100-160 ft
Urban Multi-Lane (2-lane entry)	150-200 ft
Urban Multi-Lane (3-lane entry)	180-330 ft
Rural Single-Lane	115-180 ft
Rural Multi-Lane (2-lane entry)	180-230 ft
Rural Multi-Lane (3-lane entry)	180-330 ft

Table 2: Typical Inscribed Diameters by Roundabout Type

Changes to geometric layout approximations in the feasibility phase should be expected as the design evolves into Preliminary and Final Design phases.

2.3.3 <u>Crash Analysis</u>

A crash analysis for existing intersections should review the crash history and examine the trends of crash patterns. The implementation of a roundabout may provide a solution for locations where the history of crashes indicates a pattern of left turn or right angle collisions.

A crash diagram shows the types of crashes (i.e. right angle, rear-end, sideswipe) and the direction each car was traveling. This can be used to observe if there is a crash problem and the pattern of crashes. If the purpose of the project is to improve the safety of an existing intersection, it is recommended that the project team create a crash diagram and note the crash patterns as part of the feasibility.

Once a crash rate and pattern has been determined, benefits of constructing a proposed roundabout can be calculated. To calculate the benefits, follow the guidelines established for the Hazard Elimination System published by the Division of Traffic Operations.

2.3.4 Other Considerations

Finally, the feasibility analysis should give a cursory review of other factors that the project manager may either need to be addressed in subsequent design stages or may prevent a roundabout from being advanced as an alternate. A series of questions that should be considered in the feasibility phase is included in the Roundabout Feasibility Form.

2.4 Feasibility Review Process

2.4.1 Roundabout Feasibility Study Form

The project manager or permit reviewer shall complete a **Roundabout Feasibility Study** form to help determine whether a roundabout is a viable alternate. The project manager or permit reviewer is encouraged to coordinate with the Division of Traffic Operations early in the project development process (scoping study or conceptual design). The form is located in Appendix A of this guidance.

2.4.2 Roundabout Review Committee

The Roundabout Review Committee will review all Roundabout Feasibility Study forms for the use of roundabouts on the state highway system during the Conceptual Design phase (see process described in Section 3.4). The project manager shall submit four copies of the form and attached information to the Division of Traffic Operations which will then distribute the information to the Roundabout Review Committee.

The Roundabout Review Committee is comprised of one appointed member from the Divisions of Traffic Operations, Highway Design and Planning. The committee will review and compile comments and recommendations on the proposed roundabout. The recommendations will include whether or not a roundabout should advance to the alternatives analysis project development phase. A copy of the form and supporting documentation, comments and recommendations will be sent to Project Manager and the Deputy State Highway Engineer.

5.0 Roundabout Types

Roundabouts have been categorized by size and context. The following is a list of four of the basic categories from the FHWA Roundabout Guide that will be addressed in these guidelines. Mini-roundabouts and urban compact roundabouts are not included in this guidance. There will be situations where categories are not applicable or do not fit given the situation. Rather than base the design on strict rules or one-size fits all standards, the planning process and final design methodologies for roundabouts are to be based on guiding principles.

Urban (Suburban) Single Lane
This roundabout type is characterized by having a single-lane entry at all legs and one circulatory lane. The design is focused on achieving consistent entering and circulating vehicle speeds. The geometric design includes raised splitter islands, a non-mountable central island and may include an apron surrounding the non-mountable part of the central island to accommodate long trucks. The design speeds should be low (max 20 mph) and should be consistent throughout the roundabout. The minimum inscribed diameter to accommodate a WB-65 vehicle should be at least 110 feet but may be smaller if using a smaller design vehicle.

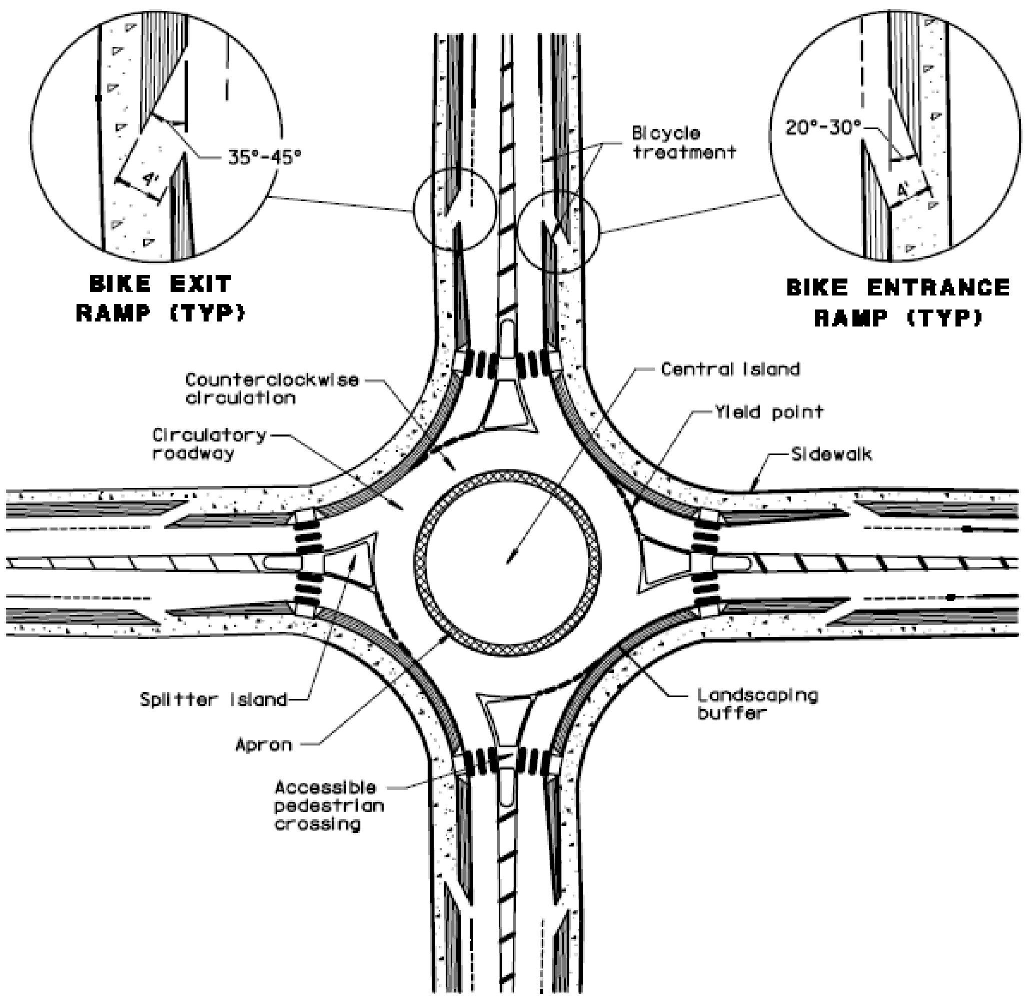
Urban (Suburban) Multi-Lane
This category includes all roundabouts in urban or suburban areas that have at least one approach leg with two or more entry lanes. This includes roundabouts with an entry or entries that flare from one to more lanes or the approach road(s) is a multi-lane facility. The design is focused on achieving consistent entering and circulating vehicle speeds. The geometric design includes raised splitter islands, a non-mountable central island and may include an apron surrounding the non-mountable part of the central island to accommodate long trucks. Multi-lane circulatory roadways must be wider to accommodate more than one vehicle traveling side by side. The design speeds should be low (max 25 mph) and should be consistent throughout the roundabout. A typical minimum diameter for a two-lane circulating roadway is 150 feet. See Section 2.0 for a table of inscribed diameter ranges.

Rural Single Lane
This roundabout type generally has roadway approach speeds of 45 to 55 mph. To encourage drivers to slow to an appropriate speed entering the roundabout, supplementary geometric and traffic control device treatments may be installed on the approaches. These roundabouts may have larger diameters than urban single lane roundabouts to allow slightly higher design speeds at the entries (25 mph max). This is acceptable if few pedestrians are expected at this location now and in the future.

If the intersection is located in an area that is expected to urbanize in future, it should be designed as an urban roundabout with slower speeds and pedestrian treatments

Rural Multi-Lane
This category includes all roundabouts in rural areas that have at least one approach leg with two or more entry lanes. This includes roundabouts with an entry or entries that flare from one to more lanes or the approach road(s) is a multi-lane facility. These roundabouts may have larger diameters than urban multi lane roundabouts to allow slightly higher design speeds at the entries (30 mph max). This is acceptable if few pedestrians are expected at this location now and in the future.

If the intersection is located in an area that is expected to urbanize in future, it should be designed as an urban roundabout with slower speeds and pedestrian treatments



Basic Features of a Roundabout

6.0 Roundabout Traffic Operations Evaluation

RODEL Interactive Roundabout Design Software should be used to determine size and space requirements and the operational characteristics such as entry capacity, delay and maximum queues.

A traffic forecast must be conducted to get both the current year and design year turning movement volumes and truck percentages. A forecast may be obtained by submitting a Traffic Forecast Request Form to the Division of Planning. This information will be used for both the roundabout analysis as well as analysis of other forms of traffic control such as 2-way stop or a traffic signal.

The data needed at the Feasibility phase will be traffic turning movement estimates for the design year and truck percentages for each leg. These estimates may be derived by either applying a simple growth factor (based on historic traffic growth) to an existing turning movement count or by using daily volumes from the latest traffic count and applying an appropriate K factor (.10 is a rule-of-thumb) and estimating the split of turning vehicles for each leg. For the Conceptual Design and Final Design phases, turning movement estimates should be estimated based on a current year traffic count.

The design of a roundabout is an iterative process. However, it is appropriate to begin with certain default values for the six geometric parameters that are required to run the RODEL software listed in Table 3. Please note, that metric values are included because RODEL currently only uses metric.

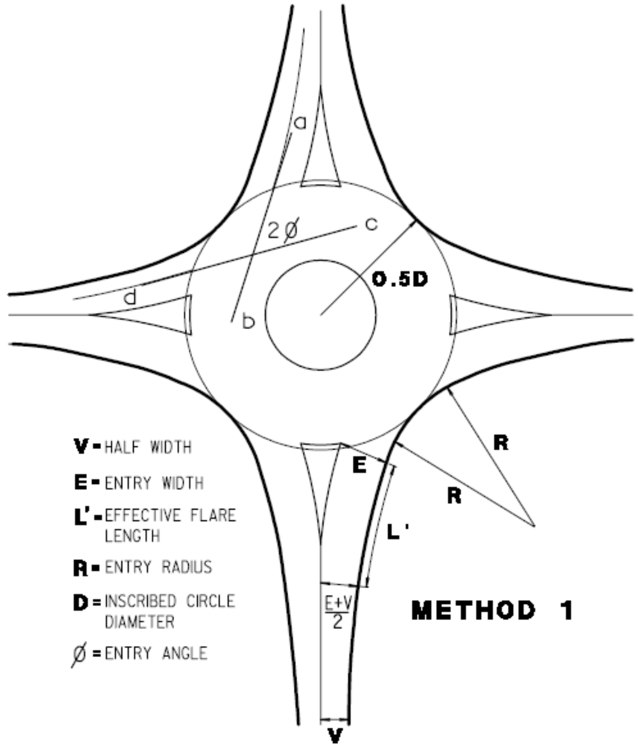
In the RODEL software, the confidence level should be set at 50% to determine the delay that will be used to compare to other traffic control alternates. Operational characteristics should be checked at 85% confidence level to ensure proper design.

For further assistance on using the RODEL software, please refer to the RODEL manual or contact the Division of Traffic Operations.

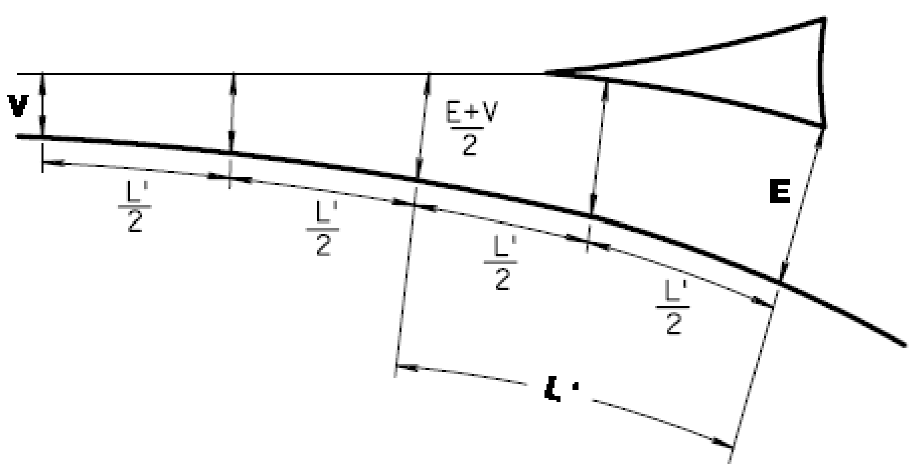
Geometric Parameter	Single-Lane Entry	Dual-Lane Entry	Triple-Lane Entry
Half Width*	Approaching travel lane(s) width prior to any flared section		
Entry Width*	15 ft (4.5 m)	26 ft (8.0 m)	40 ft (12m)
Effective Flare Length*	15-330ft (5-100m), if needed		
Inscribed Diameter	130 ft (40 m)	160 ft (50 m)	250 ft (75 m)
Entry Radius	65 ft (20 m)	80 ft (25 m)	100 ft (30m)
Entry Angle	30˚	30˚	30˚
Circulating Roadway Width**	1.0-1.2 times Entry Width		
Exit Radius**	50-65 ft (15-20 m)	65-100 ft (20-30 m)	100-130 ft (30-40 m)

*Parameter has high influence on capacity
**For informational purposes only. Not necessary to run RODEL

Table 3: Default (starting) values for RODEL analysis



Geometric features used in RODEL analysis



Entry geometric layout

Key Roundabout Design Parameters

Parameter	Description
Half Width = V, meters	The half width is the width of the roadway used by approaching traffic upstream of any changes in width associated with the roundabout. The half width is typically no more than half of the total width of the roadway. If the facility has a marked bike lane the half width is to the white line. If there is no marked bike lane then the width is measured from the curb face on the right side to the curb face of the splitter island, or marked centerline, on the left side.
Entry width = E, meters	The entry width defines the width of the entry where it meets the inscribed circle. It is measured perpendicularly from the outside curb face to the inside curb face at the splitter island nearest point to the inscribed circle.
Effective Flare Length = L', meters	Half the total distance between V and E. At this distance the approach roadway width equals the average of V and E. The flare must be developed uniformly and avoid a sharp break where the flare starts. Full flare length is twice the effective flare length.
Entry radius = R, meters	The entry radius is the minimum radius of curvature of the outside curb at the entry.
Entry Angle = ∅, degrees	**Method 1**. Half the angle formed by the junction of the tangent line (a-b) projected from the entry lane and the tangent line (c-d) projected from the adjacent exit lane(s). ∅ is used in the empirical formula. **Method 2**. The angle formed by the intersection of the tangent line (a-b) projected from the entry lane(s) with a tangent line (c-d) drawn along the middle of the circulatory roadway. Used at "T" intersections or where the adjacent entrance and exit lane(s) are far apart.
Inscribed Circle Diameter = D, meters	The inscribed circle diameter is the basic parameter used to define the size of a roundabout. It is measured between the outer edges of the circulatory roadway**.**

Roundabout Feasibility Study Form

Item #	
District	
County	
City	
Primary Street	
Milepoint	
Secondary Street	
Prepared By	
Date	

Justification Categories

	Primary Purpose (check at least one)		Secondary Purpose
	Safety Improvement		Speed Reduction
	Current High Delays		Land-use Transition
	Queuing Improvement		Other
	Unusual intersection geometry		
	Provide for access management		
	Possible ROW savings		

Current Traffic Control

	Two-way Stop Control (TWSC)		N/A New Project
	All-way Stop Control (AWSC)		Other
	Traffic Signal		

Traffic Turning Movements Estimation

Current Year____________ Design Year______________

	Current Year Estimates		Future Year Estimates
	Traffic Turning Movement Count		Trend Line Projection
	Estimates from AADT		Simple Growth Rate (non-trend line)
	Other Traffic Model		Traffic Model

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Attachments

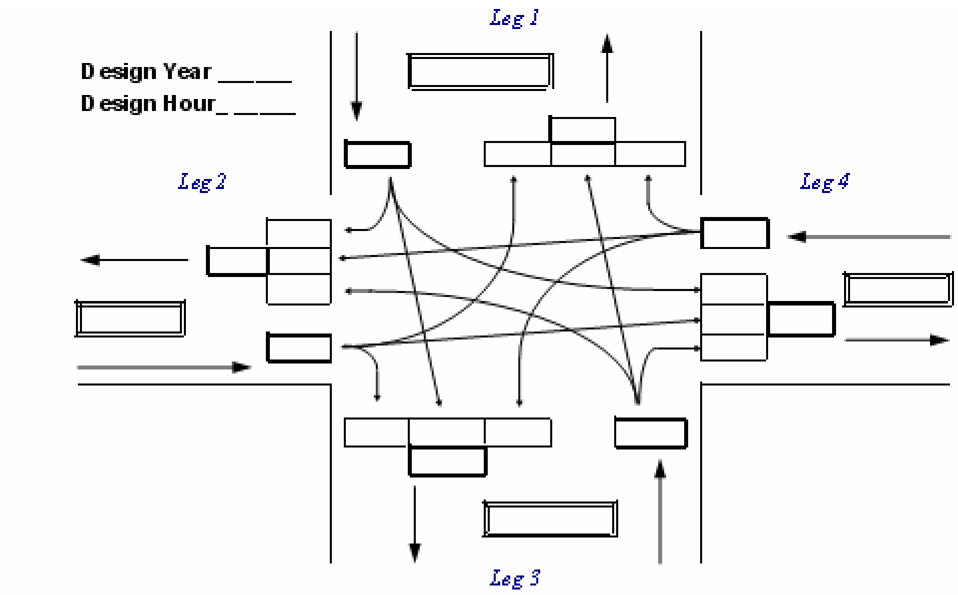
	Traffic counts & turning movement forecast report (required)		RODEL Analysis Input and Output (required)
	Geometric layout of roundabout		TWSC, AWSC, or signal analysis (optional)
	Plan sheet or layout of existing intersection (required, if applicable)		CRASH data spreadsheet, sorted by crash type (required)
	Aerial photograph of location (required)		Crash diagram by crash type (required for existing inter.)

Analysis Assumptions & Results for Design Year

Entry Leg Name and Direction	# Lanes at Entry	Entry Width E	Half Width V	Effective Flare L'	Inscribed Diameter D	Entry Radius R	Entry Angle Φ	Average Delay (seconds)	Maximum Queue

Crash Statistics (for existing intersections)

Years Examined (3 total)	
Intersection CRF (for intersections of state maintained roads)	
Total Number of Collisions	
Number of Fatal Collisions	
Number of Injury Collisions	
Number of PDO Collisions	



Design Year Traffic Movements

Entries should be listed in counterclockwise order

Entry Number	Entry Name	Direction	Volume Turning to Entry 1	Volume Turning to Entry 2	Volume Turning to Entry 3	Volume Turning to Entry 4	Volume Turning to Leg 5*
1							
2							
3							
4							
5*							

*This applies only to intersections with 5 legs

1. Is the intersection located in the middle of a traffic signal system? Will a roundabout negatively impact the operation of the system?

2. Are there adjacent bottlenecks that create traffic queues into the intersection?

3. Are there nearby preempted signals or highway-rail crossings that could negatively impact the roundabout?

4. What features (man-made, historic and natural) will be impacted?

5. What is the community acceptance of a roundabout as an alternate?

6. What level of bicycle and pedestrian accommodation needs to be provided?

7. What are the approach grades to the intersection?

8. What is the angle of approach for each leg of the intersection

9. What is the context of the intersection (rural, suburban, urban)?

10. What will the needs to control access within the functional area of the intersection and how will it impact the cost of ROW purchase?