



## 1 - Roundabout Design Process and Qualifications

Due to modern roundabouts' status as a relatively new and unique design form as well as the inherent complexity of their geometric and operational aspects, WisDOT has developed a roundabout design process and requires that a qualified designer participate in each roundabout design.

This procedure describes the 3-stage design process and the critical design elements. A qualified designer must be involved with each stage of the process. In addition, this procedure describes the various roles the qualified designer may take in completing a roundabout design.

## 2 - Roundabout Designer Requirements

A qualified designer must meet the skills, knowledge and experience level determined appropriate by the Wisconsin Department of Transportation for roundabout design. A list of qualified designers for each of the following 3 levels of roundabout complexity is available from the Division of Transportation Systems Development, Bureau of Project Development.

1. Level 1 Roundabout - The design complexity at this level is limited to roundabouts where all legs (not to exceed 4 legs) are single lane entries without bypass lanes. A level 1 designer must have an understanding of roundabout design with high confidence in designing truck aprons, developing a design with appropriate values for the six geometric parameters, design for appropriate fastest speed paths, design for truck turning paths, have the ability to properly run RODEL and evaluate output from the RODEL software program. The Level 1 qualified designer shall inform the Region when the roundabout design exceeds the complexity stated above for a level 1.
2. Level 2 Roundabout - The design complexity at this level is limited to roundabouts where legs are dual lane entries or less and may have bypass lanes. A level 2 designer must be proficient in roundabout design with ability to design truck aprons, developing a design with appropriate values for the six geometric parameters, design for appropriate fastest speed paths, design for truck turning paths, develop special signing and pavement marking needs, and have the ability to properly run RODEL and evaluate output from the RODEL software program. The Level 2 qualified designer shall inform the Region when the roundabout design exceeds the complexity stated for a level 2. See discussion below about dual lane roundabouts in close proximity and the potential for Level 3 involvement.
3. Level 3 Roundabout - The design complexity at this level involves all roundabout designs to include 3 or 4-lane entries, or has closely spaced roundabouts where the operations of one may have an impact on the operations, signing and/or marking of another. See discussion below about dual lane roundabouts in close proximity and the potential for Level 3 involvement. A level 3 designer must have the skills and knowledge for the most complex roundabout designs.

The Region will use the best traffic data available to select the appropriate qualified designer (Level 1, 2, or 3). This is typically determined prior to project solicitation by the Project Development Section.

The project team will select either a Level 2 or 3 qualified designer if the Region anticipates that the project will include a dual lane roundabout. There are certain situations when it is desirable for the Region to involve a Level 3 qualified design on dual lane roundabout projects. Some examples include situations where:

- There are other multi-lane roundabouts in close proximity.
- Lane assignment and/or lane continuity is difficult to achieve without adding another lane.
- Reduction in weaving between roundabouts is desired.
- Queue backup into an adjacent multi-lane roundabout is probable.
- Other special needs that have been identified.

The Region will discuss the involvement of a Level 3 qualified designer for dual lane roundabout projects to determine if expertise is needed beyond that provided by a Level 2 qualified designer.

WisDOT Regions, consultants, local agencies such as a counties, townships, municipalities, and developers, etc. shall have a qualified designer on staff, or contract with an approved designer, to provide the required sign-

off on [Table 1](#) for roundabout designs, as described below, for both WisDOT and WisDOT oversight projects.

Qualified designers may participate in different ways in order to provide the required sign-off on [Table 1](#).

1. Independently complete the roundabout design. When a WisDOT Region, consultant, local agency such as a county, township, municipality etc. or a developer has a roundabout on a project they must have a qualified designer to over see or complete all aspects of the plans, specifications and estimate (PS & E) package for the roundabout according to the 3-Stage Design Process described below.
2. Assist and mentor the project team in their completion of the roundabout design. A WisDOT Region, consultant or local agency such as a county, township, municipality etc. or developer has a roundabout on the project may prefer to contract for assistance or mentoring from a qualified designer in the plans preparation process. The qualified designer must directly assist the project team addressing the critical design elements in the 3-Stage Design Process described below.
3. Independently review the roundabout design prepared by a project team. A WisDOT Region, consultant, local agency such as a county, township, municipality etc. or developer has a roundabout on the project and the design is prepared without any assistance from a qualified designer. The roundabout designer is responsible to contract with one of the qualified designers to review the critical elements of the design at each stage of the 3-Stage Design Process described below. The information to be provided to the qualified designer at each stage of plans complete is provided below.

Coordinate the proposed roundabout design with a qualified designer early in the design process. It is better to allow the qualified designer to be proactive and in a position to suggest modifications rather than to be reactive and lose design options because the design or commitments on the project are too far along.

The qualified designer's review comments shall be submitted to the project team and the WisDOT Region at each Stage. The critical design recommendations from the qualified designer should be identified clearly so the roundabout design team knows what to modify on the plans. Less critical comments will likely improve the design more toward optimal and should not be taken lightly. A discussion between the qualified designer, design team, and Region may be needed to properly address recommendations in the plans or document the dismissal of the comment(s).

The qualified designer in consultation with WisDOT will determine which elements of the design are critical in the situation where a dispute may take place. Department personnel are responsible to ensure that the qualified designer recommendations and comments are properly addressed by the design team.

### **3 - Intersection Control Evaluation, Program Level Scoping phase.**

For an explanation of the required level of analysis see [FDM 11-25-3](#). The Program Level Scoping phase typically does not yield the final determination on the selected intersection control. However, there are 3 early screening criteria identified in [FDM 11-25-3](#) and evaluated during the Program Level Scoping phase that may eliminate the roundabout from further consideration.

A qualified designer is not required for the Program Level Scoping phase of an Intersection Control Evaluation.

### **4 - The 3-Stage Roundabout Design Process**

The following information describes each of the stages of development where it is critical to have a qualified designer involved in the roundabout design. There may be a project schedule delay or adverse cost ramifications associated with a roundabout design if each stage of the evaluation is not followed in sequence.

#### **4.1 - Stage 1, Roundabout Design Process**

Prior to 30% plans complete. While the desired type of intersection control may still be undetermined; the roundabout has been identified as one of the viable alternatives from the Program Level Scoping phase. Complete Stage 1, requires qualified designer involvement, prior to the 30% plans complete level so the comments and design adjustments are incorporated and ready with the typical 30% plan review discussion/meeting conducted by the region. For designs prepared outside the Region, submit Stage 1 plans to the Region in .dgn format. Generally, it is preferred to have the roundabout design developed far enough to have an idea of right-of-way needs, raised median locations identified, access, major utilities and other potential impacts prior to a Public Informational Meeting (PIM) so relatively accurate information can be presented and discussed with property owners to include Level of Service (LOS), or delay, comparisons with other intersection control alternatives. There may be situations where the design is accurate and detailed enough showing the proper size and location of the roundabout, LOS, extent of the splitter island curb locations and type of access along the roadway that a more detailed design could be completed after the PIM.

This is a list of critical elements of design that the qualified designer needs to address at this stage of plans complete.

1. Determine optimum location of circle with inscribed diameter.
2. Use Traffic Flow Worksheet, [FDM 11-26-20](#), Figure 5. Completed with existing volumes, design year volumes for AM and PM peak and midday if a tourist area that may have higher midday than AM or PM peaks.
3. Establish lane configuration(s).
4. Complete lane markings and pavement arrows for multilane only.
5. Complete a highly developed design that shows face of curb locations, crosswalks, splitter islands, sidewalk or multi-use path, bike ramps, truck apron etc. with appropriate widths.
6. Use RODEL analysis for design with measured design parameters.
7. Verify design vehicle movement checks (WB-65 on STH system).
8. Show the fast path with speed calculations for R1 thru R5.
9. Fill out [Table 1](#).
10. Prepare preliminary stopping sight distance for - approach, circulatory roadway, crosswalk and exit, and the intersection sight distance.
11. Prepare preliminary centerline profile of circulatory and approach roadway.
12. Prepare preliminary typical sections on the mainline roadway.

#### 4.2 - Stage 2, Roundabout Design Process

Prior to 60% plans complete. Complete design revisions recommended by the qualified designer from the previous 30% design. At this stage a qualified designer is required to complete the design/review of the critical design elements identified below. Prepare the plans such that the environmental documents may be completed, DSR approved and plat work may begin. Complete Stage 2, including all qualified designer involvement prior to the 60% plans complete level so the review comments and design adjustments are incorporated and ready for the Region in preparing for the typical 60% plan review discussion/meeting. For designs prepared outside the Region, submit Stage 2 plans to the Region in .dgn format. At this stage the Qualified designer shall sign [Table 1](#) for attachment to the DSR. One of the primary critical elements of design at this stage is the vertical control with each leg having vertical profiles, circulating roadway profile, crown location, slope intercepts, central island grading, drainage consideration with inlet locations, and spot elevations.

This is a list of critical elements of design that the qualified designer needs to address at this stage of plans complete.

1. Finalize horizontal design changes implemented.
2. Establish roadway profiles on each leg.
3. Establish circulating roadway profile.
4. Show crown location, cross slopes, spot elevations.
5. Consider central island grading design.
6. Consider drainage design/inlet locations.
7. Show preliminary light standard locations.
8. Identify the need for large green and white guide signs, overhead guide signs, or other non-standard installations.
9. Finalize lane marking and lane assignment pavement marking for multilane roundabouts.
10. Identify major utility conflicts (i.e. utility conflicts that may result in relocating the circle).
11. Prepare preliminary typical sections.
12. Consider preliminary construction staging layout and identify potential staging conflicts, such as access control, large grade differences between stages, etc. that may impact the design.

#### 4.3 - Stage 3, Roundabout Design Process

Prior to 90% plans complete. Finalize the vertical, drainage, pavement marking, signing, lighting, landscaping plans, work zone traffic control, and utility coordination. In preparation for PS & E complete Stage 3, including all qualified designer involvement, prior to the 90% plans complete level so the review comments and design

adjustments are incorporated and ready for the region in preparing for the typical 90% plan review discussion/meeting. This is the final design with construction staging or detour plan.

This is a list of critical elements of design that the qualified designer needs to address at this stage of plans complete.

1. Complete final plan and profile with any vertical and horizontal control details included for field layout.
2. Prepare final signing and pavement marking plan.
3. Prepare final landscaping and lighting plan.
4. Prepare final construction staging plan.

**5 - Roundabout Criteria**

For each proposed roundabout, the critical design parameters in [Table 1](#), and described above must be provided to the qualified designer at Stage 1 and Stage 2 of project development. The roundabout design process and associated project criteria are explained above. The qualified designer must sign and date [Table 1](#) and attach it to the Design Study Report after Stage 2 project complete. (A working version of this table: [FDM 11-26-5, doc1](#))

**Table 1. Critical Design Parameters**

Intersection	Leg 1	Leg 2	Leg 3	Leg 4	Leg 5	Leg 6
Half width, ft, (V=)						
Entry width, ft, (E=)						
Effective Flare, ft, (L'=)						
Entry Radius, ft, (R=)						
Entry Angle (Phi ∅=)						
R1, Radius/speed						
R2, Radius/speed						
R3, Radius/speed						
R4, Radius/speed						
R5, Radius/speed						
Exit Width						
Stopping Sight Distance						
Intersection Sight Distance						
Inscribed Circle Diameter., ft, =						

Design Vehicle: \_\_\_\_\_

Circulating Roadway Width: \_\_\_\_\_

Truck Apron Width, if present: \_\_\_\_\_

Vertical control has been reviewed & comments provided: Yes or NO (circle one).

Circulating Roadway Cross Slope (Typical section)

Control of Access & Parking near the roundabout: \_\_\_\_\_

Pedestrian/Bicyclist Accommodations: \_\_\_\_\_

Reviewers Name: \_\_\_\_\_ Date: \_\_\_\_\_. The reviewer's name/signature on this document indicates that the design has been reviewed and is in general compliance with good roundabout principles. The Stage 2 critical design elements have been addressed. The project design engineer in responsible charge of plans development will stamp the plans when applicable.