116 Roundabout Evaluation

116.1 General

FDM 213 provides criteria for design of roundabouts on the SHS. These requirements are supplemented by guidance contained in the ***National Cooperative Highway Research Program (NCHRP) Report 672, Roundabouts: An Informational Guide***.

116.2 Roundabout Evaluation

A three-step process has been established to determine if a roundabout is the appropriate control measure for a proposed intersection improvement. Following the completion of the three-step process a final determination of the intersection control to be advanced to design will be made.

For evaluation purposes, the 20-year traffic volumes may be estimated using a growth rate between 1 and 3 percent per year.

Use the Highway Capacity Manual (HCM) 6th Edition Roundabout Capacity Model to perform operational analyses of roundabouts with single-lane and two-lane entries. Software that implements this model includes HCS and SIDRA. For roundabouts with more than two entry lanes, use the Sidra Standard capacity model within the SIDRA Intersection software with Environmental Factor of 1.1.

In lieu of the 3-step screening process described in this chapter, roundabouts may be evaluated by using the procedures in the ***Manual on Intersection Control Evaluation*** (ICE).

116.2.1 Step 1 Screening

This step is intended to quickly assess project-specific conditions to determine the viability of the roundabout alternative. If any of the screening criteria identifies a documented deterrent to the roundabout alternative then advancing to Step 2 Benefit-to-Cost (B-C) Evaluation is optional. However, if none of the Step 1 criteria identifies a deterrent, then the roundabout option must be advanced to Step 2. Certain physical or geometric complications could make it impossible or uneconomical to construct a roundabout.

Step 1 Screening is a checklist of screening criteria that will identify site specific conditions that are inconsistent with the installation or operation of a roundabout.

Document the Step 1 Screening using the standard form at the following link:

http://www.fdot.gov/roadway/FDM/

The screening criteria are as follows:

(1) Unfavorable topography or physical constraints (e.g., steep grade, R/W limitations, utility and drainage conflicts,) may limit visibility, complicate construction, or preclude accommodating the design vehicle.

(2) Major roadway AADT exceeds 90% of the total intersection AADT may cause poor operational performance due to limited gaps for minor road.

(3) Presence of pedestrians with special needs that may have difficulty crossing the roadway. This would include areas such as schools, retirement homes, trail crossings, parks, or institutions that serve the visually impaired.

(4) Intersections located within a coordinated signal network. In these situations, the operation of the arterial might be better served with a coordinated signalized intersection incorporated into the system.

(5) Locations where vehicles exiting the roundabout would be interrupted by downstream conditions. This could include proximity to:

  (a) Over-capacity signals, freeway entrance ramps, or mid-block pedestrian crossings.

  (b) Driveways for significant traffic generators

  (c) Traffic control preemption (e.g., fire stations, railroad tracks, drawbridges)

(6) Proximity of historical sites, 4(f) sites, or socially significant trees, and the relocation of residences or businesses. These types of impacts would indicate that the project would not qualify as a Type 1 Categorical Exclusion (federally funded) or Non-Major State Action (state funded).

The presence of one or more of these conditions does not preclude the installation of a roundabout. However, the presence of any physical or geometric complications suggests that special attention will be necessary during the evaluation and design of the roundabout alternative.

Upon completion of the Step 1 Screening, a decision is made to either advance the roundabout to Step 2 B-C Evaluation or eliminate it from further consideration. This decision must be approved by the appropriate FDOT representative as follows:

- District Design Engineer for Design projects
- District Traffic Operations Engineer for Traffic Operations Projects

If the decision is to not advance the roundabout alternative, place the signed Step 1 Screening form in the project file. If the decision is to advance the roundabout alternative to the next evaluation step, include the signed form with Step 2 documentation.

116.2.2 Step 2 B-C Evaluation

Step 2 B-C Evaluation is a systematic approach to comparing the benefits and costs of a roundabout alternative with a traditional intersection (stop controlled or signal controlled). Benefits are measured in the cost savings associated with a reduced frequency and severity of crashes for each alternative. Costs consider the required investment for each alternative (e.g., R/W, utilities, construction, operation, maintenance). Road user costs can also be included in the analysis if information on driver delay is available. The Step 2 B-C Evaluation spreadsheet and supporting documentation can be downloaded at:

http://www.fdot.gov/roadway/FDM/

The Step 2 spreadsheet analysis provides a B-C ratio that indicates whether or not the roundabout alternative delivers a return on investment over the traditional intersection. A B-C ratio greater than 1.0 indicates that a roundabout is economically warranted.

At the completion of Step 2 B-C Evaluation, the District Traffic Operations Engineer or District Design Engineer will approve or deny the decision to advance the roundabout alternative to Step 3 Geometric and Operational Analysis.

A summary form with signature block is included in the spreadsheet under the “Step 2 Form” tab. If the decision is to not advance the roundabout alternative, place the Step 1 and Step 2 signed forms in the project file. If the decision is to advance the roundabout alternative to the next step, include the Step 1 and Step 2 signed forms with Step 3 documentation.

116.2.3 Step 3 Geometric and Operational Analysis

The Step 3 Geometric and Operational Analysis includes a preliminary design that establishes the roundabout alignment, geometry, and lane requirements. The preliminary design must meet sight distance criteria, accommodate turning movements of the design vehicle, and control the operating speed of entering, circulating, and exiting traffic. The Step 3 Geometric and Operational Analysis form can be downloaded at:

http://www.fdot.gov/roadway/FDM/

An operational analysis is conducted to determine if the roundabout will accommodate projected traffic volumes at an acceptable level of service (LOS). Roundabout LOS is measured in control delay consistent with other unsignalized intersections.

Required data for the analysis includes the following:

(1) The number and configuration of lanes on each approach

(2) Either of the following:

  (a) Demand volumes for each entering vehicular turning movement and each pedestrian crossing movement during the peak 15 minutes, or

  (b) Demand volumes for each entering vehicular turning movement and each pedestrian crossing movement during the peak hour, and a peak hour factor for the hour

(3) Percentage of trucks

(4) Volume distribution across lanes for 2-lane entries

(5) Length of analysis period, generally a peak 15-minute period within the peak hour

In cases where a roundabout, all-way stop, or signalized intersection would be located within a half mile of the roundabout being evaluated, a systems-level operational analysis should be completed using software specifically designed for roundabouts in a system.

116.3 Roundabout Summary Report

Document Step 3 in a Roundabout Summary Report that includes the following:

(1) **Cover Sheet**: Describe the project purpose and need and how the roundabout alternative would address these issues. Include a summary of the results from Step 1 Screening, Step 2 B-C Evaluation, and Step 3 Geometric and Operational Analysis. The standard form also contains a check box to indicate whether or not the roundabout will be advanced to final design. The signatures of the District Traffic Operations Engineer and the District Design Engineer are required.

(2) **Operational Analysis**: Include the results of the analysis. Present by lane group in terms of volume-to-capacity ratio, average control delay, level of service, and 95th percentile queue. Use Department-approved 20-year traffic projections for morning and afternoon peak hours for the design year analysis.

(3) **Geometric Performance Checks**: Include documentation for sight distance, swept path, and fastest path performance checks. Indicate the selected design vehicle.

(4) **Preliminary Roundabout Design**: Include a plan sheet of the conceptual geometric layout and alignment of the circulatory roadway and approaches using either a scaled aerial or topographic data. Label the dimensions for major geometric components, including splitter islands, circulatory roadway, truck aprons, center island, and bypass lanes (if required). Also include the following on the plan sheet:

(a) Significant topographic features; e.g., buildings, driveways, drainage structures, utilities, bicycle, pedestrian, and transit facilities.

(b) Existing and proposed R/W lines

(5) **Step 1 and Step 2 signed forms**: Include signed forms from Step 1 and Step 2 as well as the crash data used to complete the Step 2 evaluation.