



# CITY OF LOMPOC

## ENGINEERING BULLETIN #06-01

TO: ALL INTERESTED PARTIES

FROM: KEVIN P. MCCUNE, CITY ENGINEER KM

DATE: APRIL 4, 2006

SUBJECT: ROUNDABOUT DESIGN CRITERIA

Unless otherwise approved by the City Engineer, roundabouts shall be designed and evaluated in accordance with the Federal Highway Administration (FHWA) technical publication, Roundabouts: An Information Guide FHWA-RD-00-067 and the following criteria.<sup>1</sup>

### PLANNING

1. Roundabout shall be designed to accommodate the City's build-out traffic volumes. However, the City may approve a phased implementation. The interim roundabout is often constructed with the ultimate inscribed circle diameter, but with a larger central island and splitter islands. At the time additional capacity is needed, the splitter and central islands can be reduced in size to provide additional widths at the entries, exits, and circulatory roadway.

### OPERATION

1. In general, roundabout capacity analysis will not be required if the total entering volume for a 4-leg roundabout is less than 10,000 veh/day for single lane roundabouts and 20,000 veh/day for two-lane roundabouts. For 3-leg roundabouts, use 75% of above volumes. Volumes above these amounts do not automatically warrant increasing the size of the roundabout.
2. The City Engineer may require a capacity analysis for any proposed roundabout; particularly if the number of entry lanes is not the same for all legs, if volumes on the legs aren't balanced, if there is a high percentage of left-turn movements (over

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<sup>1</sup> These design guidelines only apply to single-lane and two-lane roundabouts on City streets. Roundabouts with more than two-lanes will require expert analysis and design. Roundabouts on State Highways shall conform to the State of California guidelines.

30%), if there is a high volume of pedestrians, or if there are other geometric considerations that warrant additional analysis such as nearby driveways or intersections.

3. If a capacity analysis is required, the roundabout and each approach leg of the roundabout shall be designed to operate at no more than 85% of capacity (0.85 maximum degree of saturation). For single-lane roundabouts, recommended maximum volumes are 1800 veh/hr entry and circulating flow and 1200 veh/hr exit flows.

## GEOMETRIC DESIGN

*This section presents specific parameters and guidelines for the design of various geometric elements of a roundabout. The designer must keep in mind, however, that these components are not independent of each other. The process of designing roundabouts requires a considerable amount of iteration among geometric layout, operational analysis, and safety evaluation. The interaction between the components of the geometry is far more important than the individual pieces. Care must be taken to ensure that the geometric elements are all compatible with each other so that the overall safety and capacity objectives are met.*

1. Maximum design speeds shall be 20 mph for single-lane roundabouts and 25 mph for two-lane roundabouts. Lower design speeds in the range of 15 mph to 20 mph are encouraged in residential areas. All movements must be checked for design speed and speed consistency per Section 6.2.1.5 of the FHWA Guide.
2. The roundabout shall be designed to accommodate a WB-50 truck.
3. The inscribed circle diameter should be within the following ranges: 100' to 130' for a single-lane roundabout and 150' to 180' for a two-lane roundabout. The inscribed circle diameter shall not exceed 200'.
4. Entry widths should be no greater than the minimum necessary for capacity and accommodation of the design vehicle. Entry widths for single-lane entrances typically range from 14' to 16'.
5. The circulatory roadway width is typically 20' for single-lane roundabouts and 32' for two-lane roundabouts and should be 100% to 120% as wide as the upstream entry.
6. Truck aprons may be used in the central island when the turning requirements of the design vehicle dictate that the circulatory roadway be so wide that the amount of deflection necessary to slow passenger vehicles is compromised. Because truck aprons generally provide a lower level of operation, can result in load shifting, and can jostle passengers on school buses and transit buses, they should only be used when there is no other means of providing adequate deflection while accommodating the design vehicle. The roundabout shall be designed so buses do not have to traverse the truck apron.

7. Where truck aprons are used, the mountable curb should be approximately 3" high. The apron should generally be 3' to 13' wide and shall be constructed of colored and/or textured paving to differentiate it from the circulatory roadway.
8. Radii of entry curves along the right curb line of the entry roadway should range between 30' and 100' for a single-lane roundabout to achieve desired design speed.
9. Radii of exit curves along the right curb line of the exit should be no less than 50' for a single-lane roundabout, but should not exceed a design speed of 25 mph.
10. Pedestrian crossings should be located one car length (approximately 25') away from the inscribed circle for a single-lane roundabout and two car lengths (approximately 50') away for two-lane roundabouts. The crossings shall not be any closer than 20' or further than 50' from the inscribed circle.
11. Pedestrian refuge areas within the splitter island shall be 6'x6' minimum.
12. The pedestrian refuge area within the splitter island shall include a detectable warning surface similar to that shown on Caltrans Standard Plan A88B for a Type A Passageway.
13. Length of splitter island is typically 3 to 5 times its width, and should be a minimum of 50' long.
14. Splitter islands shall be outlined with non-mountable curbs.
15. The design engineer shall submit supporting documentation demonstrating that stopping and intersection sight distance requirements are met. Sight distance triangles may be required to be shown on the plans to ensure no tall landscaping, walls, parking, or other features that could inhibit sight distance are allowed within the sight triangles.
16. Stopping sight distance shall be provided at every point on the circulatory roadway and on each entering and exiting approach.
17. Intersection Sight Distance (ISD) shall be provided at all entries. A 6.5 second critical gap value should be used in determining ISD for the roundabout. If there are design speed or right-of-way issues related to the 6.5 second critical gap value, the City Engineer may approve use of a shorter critical gap value, but no less than 5.0 seconds. (Ref. Attachment A of Caltrans Design Information Bulletin #80-01)
18. A cross-slope of 2 percent away from the central island should be used for the circulatory roadway. Truck aprons should be sloped 3% to 4% away from the center.
19. Roundabouts should not be located on vertical grades greater than 3%.

20. Bicycle ramps and an 8' shared-use path shall be installed per Caltrans Design Information Bulletin #80-01.
21. Sidewalks should be set back from the edge of the circulatory roadway in order to provide a landscaped buffer to discourage pedestrians from crossing to the central island. A recommended setback distance of 5' should be used.

#### TRAFFIC DELINEATION, LIGHTING, AND LANDSCAPING

1. "No parking" signs shall be installed on the approaches to the roundabout and within the roundabout to maintain adequate sight distance, improve pedestrian visibility, and to allow for proper operation of the roundabout.
2. Refer to the FHWA Guide and Section 3B.24 of the MUTCD for signing and striping of roundabouts.
3. Lanelines within the circulatory roadway of two-lane roundabouts are typically not marked.
4. Crosswalk markings shall be provided at all pedestrian crossings. Markings shall be the ladder-style crosswalk markings.
5. Lighting shall consist of a minimum of one HPS Caltrans-standard cobra-head light in each quadrant of the roundabout. If special lighting fixtures are proposed, the design engineer shall submit documentation showing that IES standards for illuminance at intersections is met.
6. Landscaping as approved by the City Engineer should be installed within the central island. Landscaping shall consist of a vertical element in the central island for long-range visibility approaching the roundabout and low-level vegetation to discourage pedestrians from crossing to the central island.
7. Uplighting of the vertical landscape element in the central island is highly recommended to improve visibility for drivers approaching the roundabout at night.
8. The slope of the central island should not exceed 6:1.
9. Landscaping not exceeding 2' in height may be installed in the splitter island if size permits.
10. The area between the sidewalk and curb should be densely planted with low shrubs not exceeding 2' in height.