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6.2 Guidance for Multilane Roundabouts

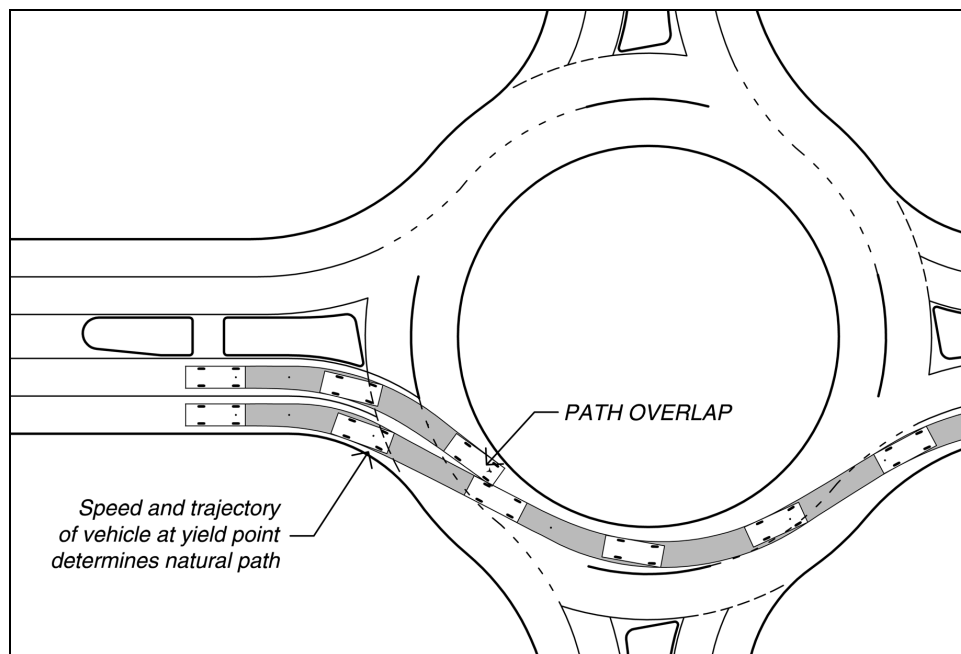
Designing multilane roundabouts is much more complex than single-lane roundabouts due to the additional conflicts present with multiple traffic streams entering, circulating, and exiting the roundabout in adjacent lanes. With single-lane roundabouts, the primary design objective is to ensure the fastest vehicular paths are sufficiently slow and relatively consistent. With multilane roundabouts, the designer must also consider the *natural paths* of vehicles. The natural path is the path a vehicle will naturally follow based on the speed and orientation imposed by the geometry. While the fastest path assumes a vehicle will intentionally cut across the lane markings to maximize speed, the natural path assumes there are other vehicles present and all vehicles will attempt to stay within the proper lane.

The natural path is drawn by assuming the vehicle stays within the center of the lane up to the entrance line. At the yield point, the vehicle will maintain its natural trajectory into the circulatory roadway. The vehicle will then continue into the circulatory roadway and exit with no sudden changes in curvature or speed. If the roundabout geometry tends to lead vehicles into the wrong lane, this can result in operational or safety deficiencies.

Path overlap

Path overlap occurs when the natural paths of vehicles in adjacent lanes overlap or cross one another. It occurs most commonly at entries, where the geometry of the right-hand lane tends to lead vehicles into the left-hand circulatory lane. Exhibit 6-19 illustrates an example of path overlap at a multilane roundabout entry.

Exhibit 6-19
Path Overlap

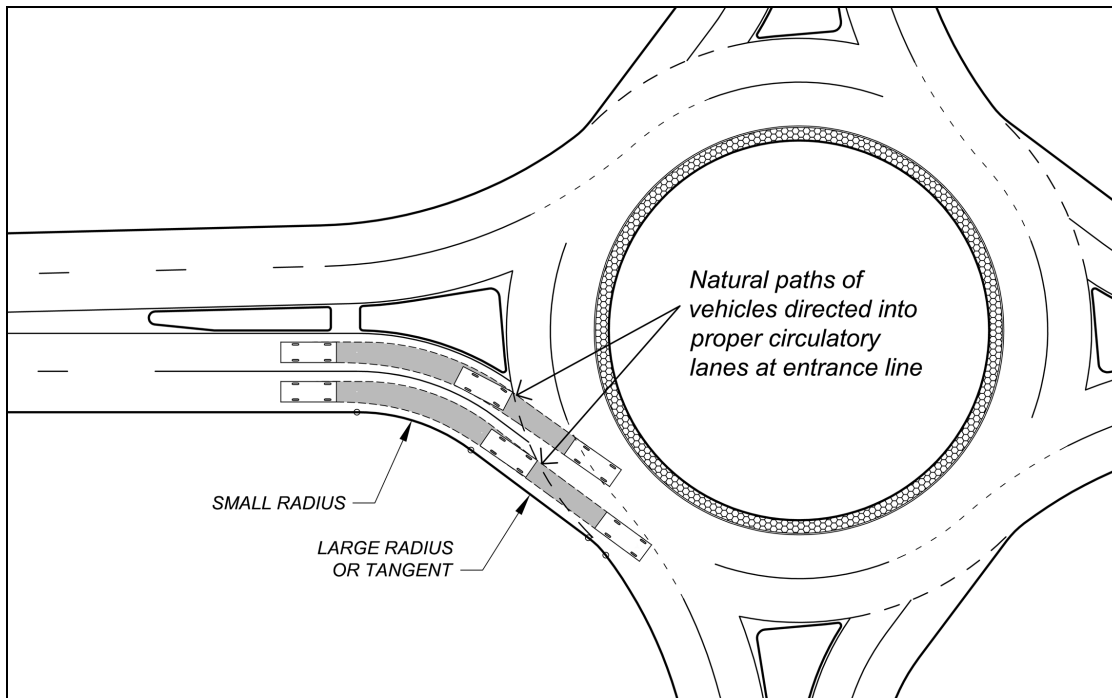


In the design shown in Exhibit 6-19, the geometry consists of a tight-radius entry curve located tangential to the outside edge of the circulatory roadway. At the entrance line, vehicles in the right-hand lane are oriented toward the inside lane of the circulatory roadway. If vehicles follow this natural path, they will cut off vehicles in the left lane, which must make a sharp turn within the circulatory roadway to avoid the central island.

Multilane Entry Design Technique

The preferred design technique for multilane entries is illustrated in Exhibit 6-20.

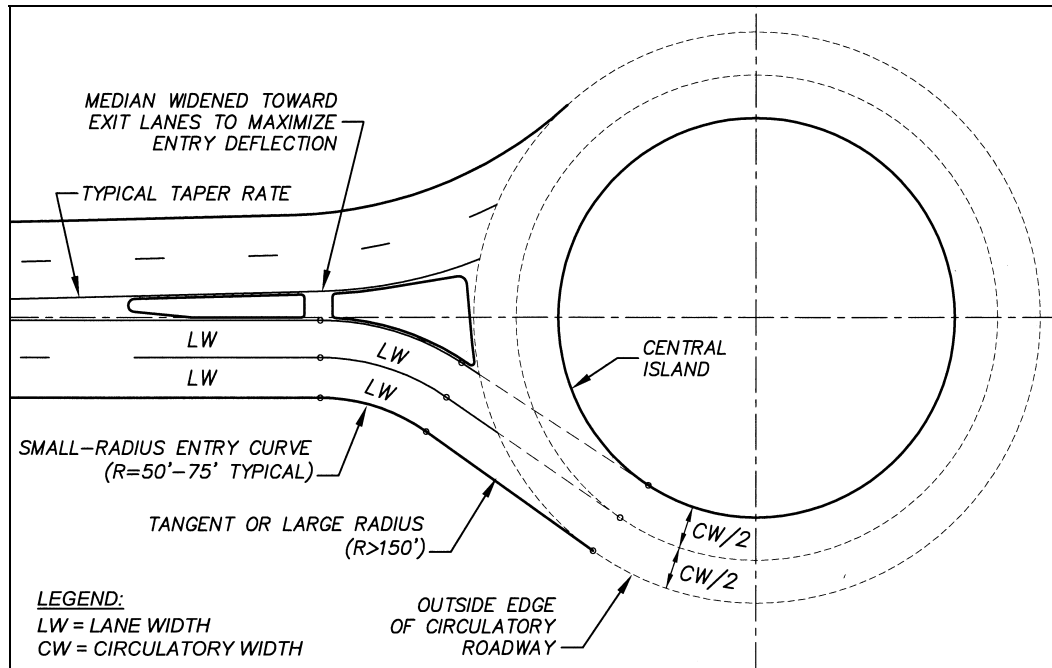
Exhibit 6-20
Design Technique to Avoid Path Overlap at Entry



As shown in Exhibit 6-20, the design consists of small-radius entry curve set back from the edge of the circulatory roadway. A short section of tangent is provided between the entry curve and the circulatory roadway to ensure vehicles are directed into the proper circulatory lane at the entrance line.

Typically, the entry curve radius is approximately 50 to 100 ft (15 to 30 m) and set back approximately 10 to 20 ft (3 to 6 m) from the edge of the circulatory roadway. A tangent or large-radius (greater than 150 ft [45 m]) curve is then fitted between the entry curve and the outside edge of the circulatory roadway. Exhibit 6-21 illustrates the entry design technique in greater detail.

Exhibit 6-21
Multilane Entry Design Details



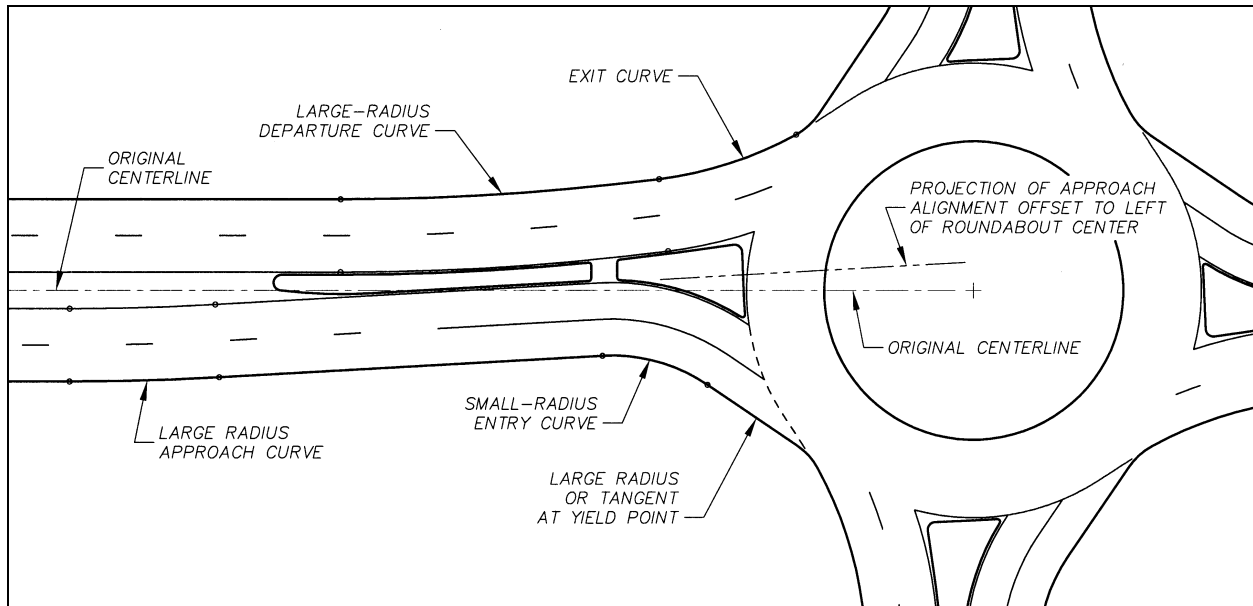
The primary objective of this design technique is to locate the entry curve at the optimal placement so that the projection of the inside entry lane at the entrance line forms a line tangential to the central island, as shown in Exhibit 6-21. Care should be taken in determining the optimal location of the entry curve. If it is located too close to the circulatory roadway, it can result in path overlap issues. However, if it is located too far away from the circulatory roadway, it can result in inadequate deflection (i.e. entry speeds too fast).

Design Techniques to Increase Entry Deflection

Designing multilane roundabouts without path overlap issues while achieving adequate deflection to control entry speeds can be difficult. The same measures that improve path overlap issues generally result in increased fastest path speeds. When the entry speed of a multilane roundabout is too fast, one technique for reducing the entry speed without creating path overlap is to increase the inscribed circle diameter of the roundabout. Often the inscribed circle of a double-lane roundabout must be 175 to 200 ft (53 to 60 m) in diameter, or more, to achieve a satisfactory entry design. However, increasing the diameter will result in slightly faster circulatory speeds. Therefore, care should be exercised to balance the entry speeds and circulatory speeds.

In cases where right-of-way or other physical constraints restrict the size of a multilane roundabout, the technique shown in Exhibit 6-22 may be used.

Exhibit 6-22
Approach Offset to Increase Entry Deflection



In the design shown in Exhibit 6-22, the entry deflection is enhanced by shifting the approach alignment slightly towards the left of the roundabout center. This technique of offsetting the approach alignment left of the roundabout center is effective at increasing entry deflection. However, it also reduces the deflection of the exit on the same leg. In general, it is important to maintain a level of deflection at exits to keep speeds relatively low within the pedestrian crosswalk location. Therefore, the distance of the approach offset from the roundabout center should generally be kept to a minimum to maximize safety for pedestrians.