

### **Crossing Angle\***

The crossing angle is the acute angle between lanes of opposing traffic within the crossover with optimum crossing angles ranging from 40-50°. The approach angle for cross-over intersections of a DDI should be 30° or greater. A recommended approach is to use the largest crossing angle possible while balancing each of the horizontal geometric crossover aspects. However care should be exercised in choosing a larger crossing angle, which could cause drivers to perceive it as a “normal” intersection. Larger crossing angles in combination with sharper reverse curves can increase potential for overturning and excessive driver discomfort due to centrifugal forces acting on the driver. Cargo may also shift back and forth depending on speed. Another crossing angle factor that compounds driver discomfort is when the length of roadway between crossovers and/or approaching crossovers is limited. The appropriate geometry of a DDI should be analyzed and modeled ahead for traffic operational behavior

### **Superelevation Design / Curve Radii**

The curves approaching and following the crossover should allow the design vehicle to navigate the interchange at the design speed as well as accommodate the turning movements to and from the ramps. In most instances, an urban low speed design ( $\leq 45$  mph) should be used on the roadway containing the DDI and adhere to VDOT’s TC-5.11ULS superelevation criteria. The design vehicle, a WB-67 as shown in 2011 AASHTO Greenbook Figure 2-15, should be able to operate through the DDI at 20 mph and make all turning movements to and from the ramps. A vehicle classification count should be done to determine the vehicle composition in the area and AutoTurn should be used to make sure the angles proposed are negotiable by the most restrictive vehicle. In addition, the urban low speed design should encompass the footprint (See RDM Appendix F, Figures 4-2A and 4-3) of the intersecting ramps. The remaining entrance ramp and exit ramp design (Standard GS-R) should continue with VDOT’s TC-5.11 rural superelevation between the major roadway and the functional area limits of the minor crossroad (See Figure 2-16).

Urban design criteria shall be used within the DDI. For entrance ramps to the major roadway, the urban designation ends at the gore area (See Figure 2-16).

Each curve along the minor roadway should transition to and from the tangents of the crossover. Curve radii used along the crossroad in DDI designs generally range from 150-400 feet depending on chosen design speed.

\* Added 7/14