

roadway. Auxiliary lanes may be tapered or parallel and shall be a minimum of 3.65 m wide.

Lane Reduction - The basic number of freeway lanes may be reduced if the exit volume is large enough to change the basic number of lanes required beyond the reduction point for the freeway as a whole.

The reduction may be made at a two-lane exit ramp or between interchanges. The lane-drop taper should be on a horizontal tangent on the approach side of a crest vertical curve, or on a sag vertical curve. The lane reduction shall be made on the right using a desirable taper rate of 70:1 (minimum taper rate of 50:1).

Weaving Sections - Weaving sections are roadway segments where vehicles entering and leaving at adjacent access points cross each others paths. Weaving sections reduce interchange capacity and should be eliminated from the main facility where feasible. Refer to the Highway Capacity Manual for further discussion on weaving sections.

507 RAMP DESIGN STANDARDS

General - A ramp is typically a one-way roadway connecting interchange legs. Ramps consist of three main parts. The ramp freeway entrance or exit, the ramp body and the ramp intersection with the cross road. The intersection with the freeway is called the ramp entrance or exit and the intersection with the cross roads is typically defined as the ramp terminal.

This section deals mainly with general ramp design criteria. Specific ramp entrance/exit and terminal designs are discussed separately in the following sections.

Design Speed - Ramp design speed varies based on location along the ramp. The freeway entrance or exit design speed approximates the freeway design speed. The ramp terminal design speed usually approximates that of the cross road if there is no stop condition. The design speed for the ramp body transitions from the freeway design speed to the terminal design speed. See typical examples in Table 500.01.

Table 500.01
Ramp Entrance/Exit Design Speed

<i>Freeway Design Speed</i> <i>kph</i>	<i>Ramp Design Speed</i> <i>kph</i>
140	100
120	85
100	70

These speeds do not apply to ramp terminals, which should be designed using the intersecting roadway speed.

Profile - A typical ramp profile consists of the ramp body on an appreciable grade, between vertical curves that connect to the intersection legs. The profile at the ramp terminal is generally determined by the cross road.

Ramp grades should be as flat as feasible. Down grades should be limited to 3 or 4 percent on ramps with sharp horizontal curvature and significant heavy truck or bus traffic. However, sight distance is more important than a specific gradient control and should be favored in design. As general criteria, it is desirable that ascending gradients on ramps be limited to:

Table 500.02
Ramp Grades

<i>Ramp Design Speed</i> <i>kph</i>	<i>Ramp Gradient</i> <i>%</i>
70-80	3-5
60	4-6
40-50	5-7
30-40	6-8

Curvature - The factors and assumptions of minimum-turning roadway curves for various speeds apply to ramps and are discussed in Section 200.

Sight Distance - The minimum sight distance provided anywhere along the ramp shall be stopping sight distance. See the sections on freeway entrance/exit ramp and ramp terminals for specific requirements at those areas.

Shoulder Width - Shoulder widths for ramps shall be as indicated in Part 2, Section 300, Geometric Cross Section.