

## **204.07 SEPARATE PROFILE GRADE LINES**

Separate grade lines should be considered for all divided roadways. The use of separate grade lines provides the opportunity to optimize the vertical alignment, drainage features, and provide a safer more economical design.

They are not normally considered appropriate where medians are less than 18 m wide. Exceptions to this may be minor differences between opposing grade lines in special situations.

In addition, for either interim or ultimate expressways, any appreciable grade differential between roadbeds should be avoided in the vicinity of at-grade intersections. For traffic entering from the crossroad, confusion and wrong-way movements could result if the pavement of the far roadway is obscured because of excessive differential.

## **205 COORDINATION OF HORIZONTAL AND VERTICAL ALIGNMENTS**

The coordination, of horizontal and vertical alignments is based on experience and engineering judgment. Successful coordination is essential for a safe well balanced design. The following are guidelines to be used, where possible.

- Vertical curves should be superimposed on horizontal curves. This reduces the number of sight restrictions, makes profile changes less apparent, and results in a pleasing appearance. However, when superimposed, the superelevation and profile grade combination may distort the outer pavement edges, confusing drivers at night. In such situations edge of pavement profiles should be plotted and smooth curves introduced to eliminate distortion.
- Avoid sharp horizontal curvature at or near the top of a crest vertical curve. This condition makes it difficult for the driver to perceive the curve, especially at night when headlights do not illuminate the curve.
- Avoid sharp horizontal curvature at or near the low point of a sag vertical curve. Foreshortening of the horizontal curve and

high approach speeds may result in erratic operation, especially at night.

- For moderate changes in horizontal alignment at grade summits, the horizontal curve should overlap the vertical curve.
- Avoid successive changes in profile which are not associated with horizontal curves. The succession of humps is unattractive.
- Horizontal and vertical curvature at intersections should be as flat as physical conditions permit.
- Avoid excessive curvature to obtain flat grades and tangent alignment or flat curves at the expense of steep or long grades. It is better to balance horizontal and vertical alignments.
- In general, alignments should be designed to take full advantage of scenic opportunities.

## **206 PAVEMENT TRANSITIONS**

### **206.01 GENERAL**

A pavement transition occurs when changing from one roadway cross section to another. If feasible, the transition should occur on a tangent section. And be entirely visible to the driver. Avoid locations with sight distance restrictions. Transitions should not occur within at-grade intersections. Decision sight distance shall be provided at all lane drops.

### **206.02 TRANSITIONS FOR MULTILANE ROADWAYS**

**Four Lanes to Two Lanes** - A typical transition between 4 lanes and 2 lanes is shown in Figure 200.10. The alignment and the unspecified radius of curvature varies depending on median width and other site considerations.

**Lane Drop** - The minimum taper length for a lane drop should be equal to  $0.6WV$ , where  $W$  = Dropped Lane Width (m), and  $V$  = Design Speed (kph). The transition should be on the right so that traffic merges left.

**Lane Addition** - The minimum taper rate to add a lane should be 25:1 but in no case shall the taper length be less than 50 m.