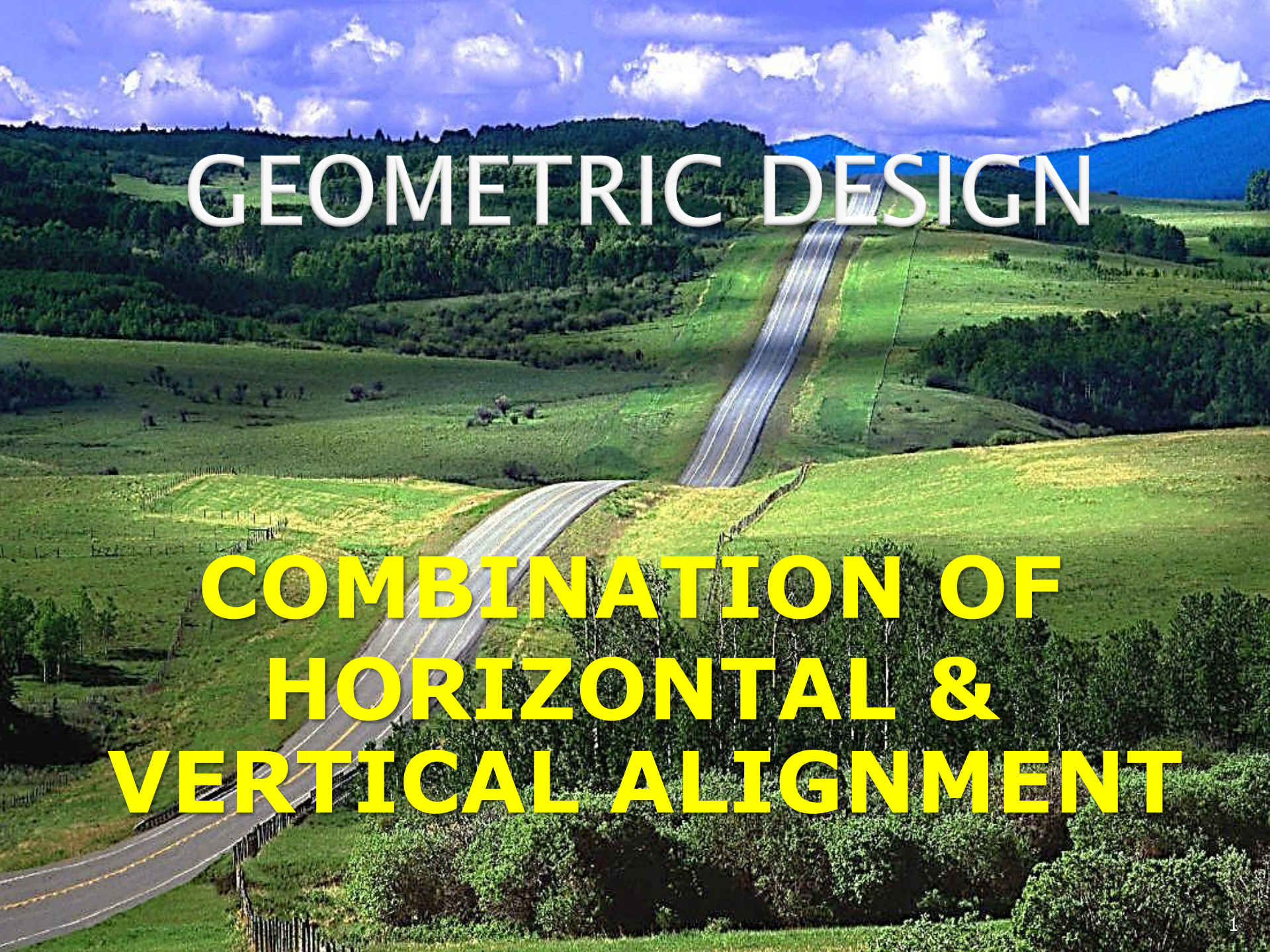
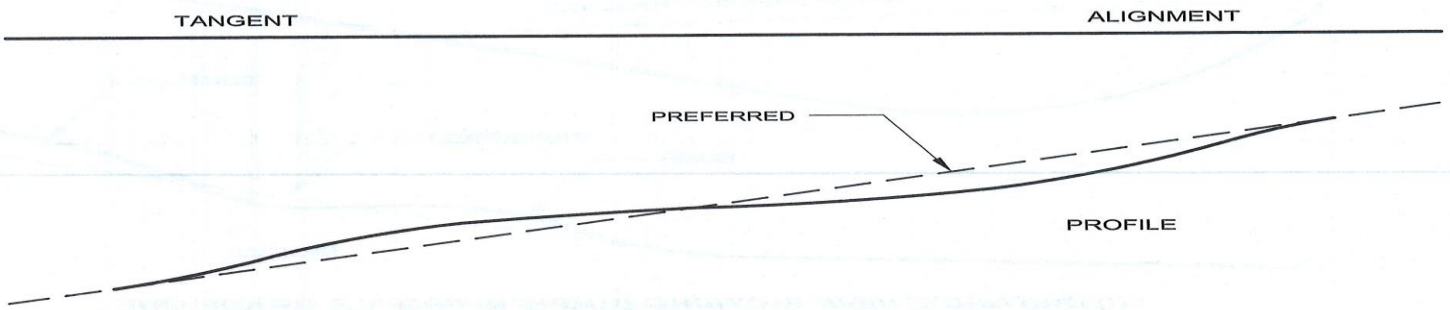

GEOMETRIC DESIGN
COMBINATION OF HORIZONTAL & VERTICAL ALIGNMENT

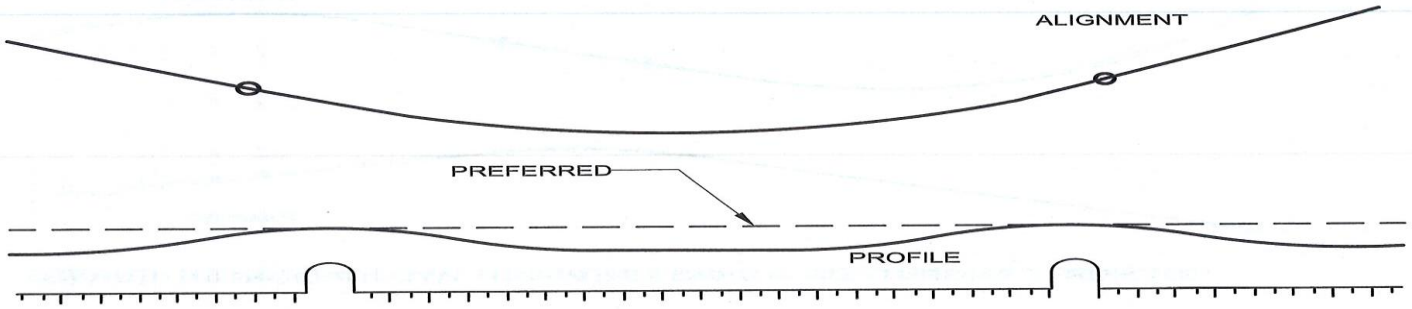
COMBINATION OF HORIZONTAL AND VERTICAL ALIGNMENT

- Horizontal and vertical should not be designed independently
- Excellence in their design and in the combination increases:
  - Utility and safety
  - Encourage uniform speed
  - Improve appearance
  - Without additional cost



(A) PROFILE WITH TANGENT ALIGNMENT

Notes : Avoid designing little local dips in an otherwise long uniform grade



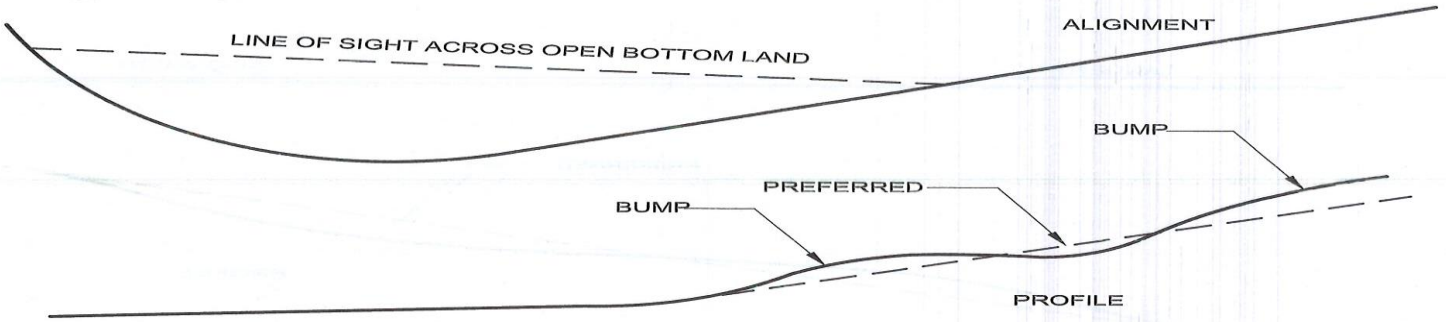
(B) PROFILE WITH TANGENT ALIGNMENT

Notes : Short humps in the grade should be avoided.

Source : REAM GL 2/2002 A Guide on Geometric Design of Roads, Figure 4-6

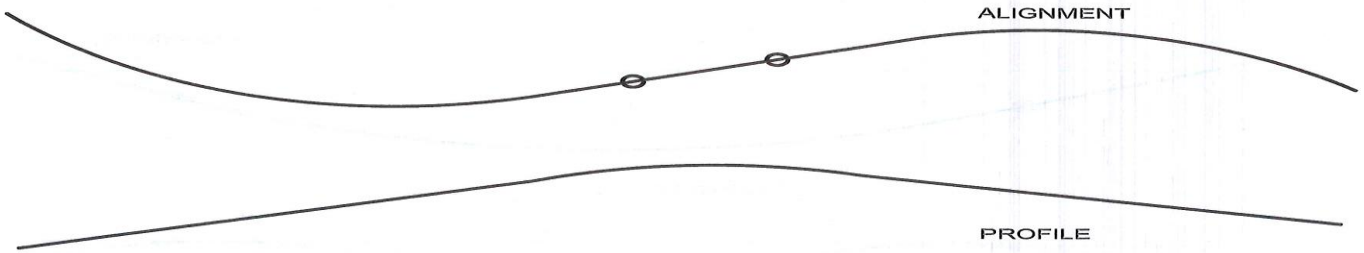
FIGURE 4.8A: A & B

Scale : Not to scale



(C) DISTANCE VIEW SHOWING BUMPS IN PROFILE GRADE LINE

Notes : A distant side view of a long grade tangent will reveal every bump on it



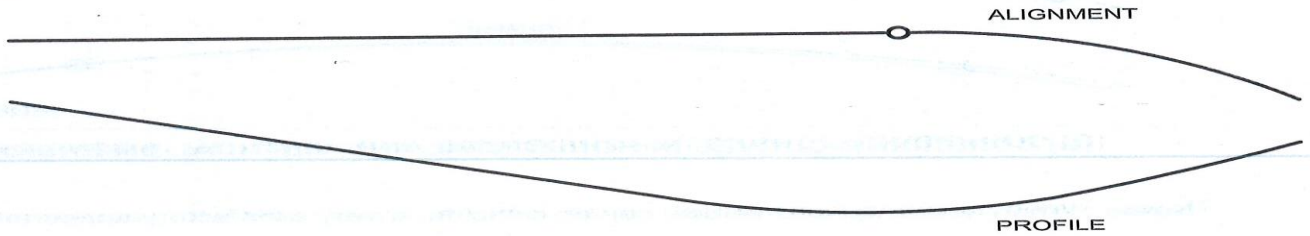
(D) SHORT TANGENT ON A CREST BETWEEN TWO HORIZONTAL CURVES

Notes : This combination is deficient for two reasons. The tangent between the curves is too short, and the reverse occurs on a crest.

Source : REAM GL 2/2002 A Guide on Geometric Design of Roads, Figure 4-6

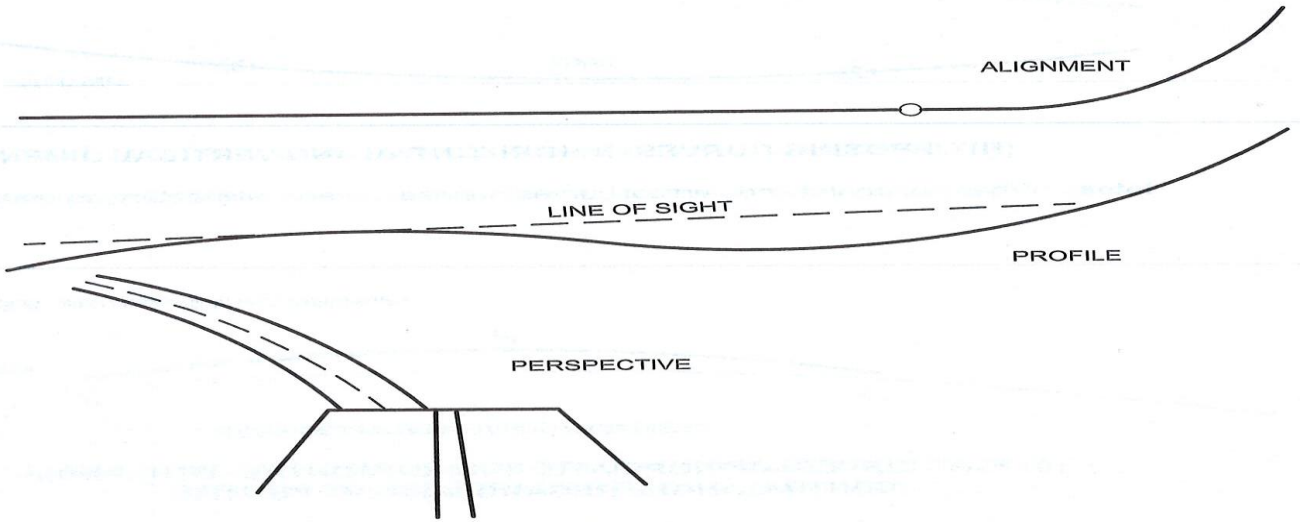
FIGURE 4.8B: C & D

Scale : Not to scale



(E) SHARP ANGLE APPEARANCE

Notes :- This combination presents a poor appearance. The horizontal curve looks like a sharp angle.



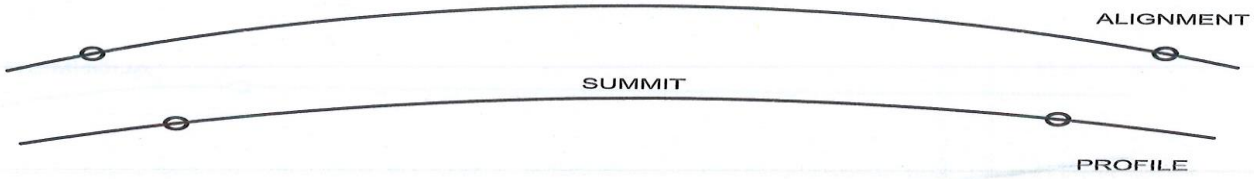
(F) DISJOINTED EFFECT

Notes : A disjointed effect occurs when the beginning of a horizontal curve is hidden from the driver by an intervening crest while the continuation of the curve is visible in the distance beyond the intervening crest.

Source : REAM GL 2/2002 A Guide on Geometric Design of Roads, Figure 4-6

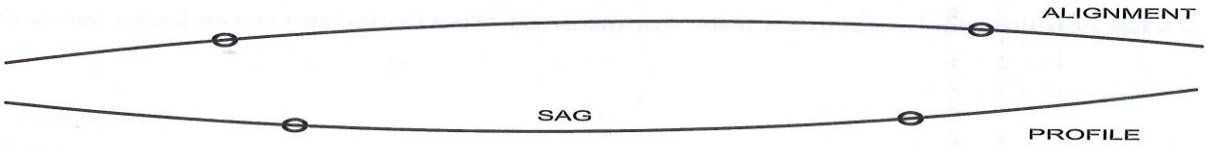
FIGURE 4.8C : E & F

Scale : Not to scale



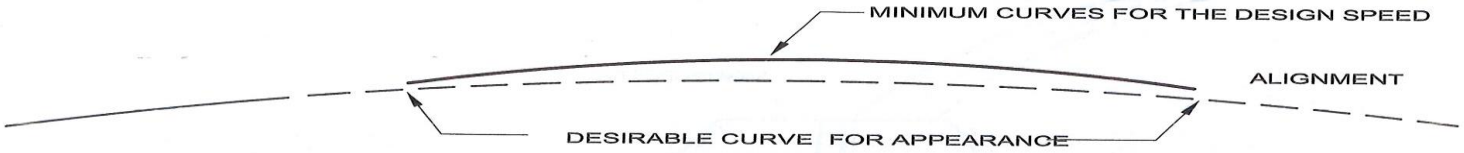
(G) COINCIDING CURVES IN HORIZONTAL AND VERTICAL DIMENSIONS

Notes : When horizontal and vertical curves coincide, a very satisfactory appearance results.



(H) OPPOSING CURVES IN HORIZONTAL AND VERTICAL DIMENSIONS

Notes : When horizontal and vertical curves oppose, a very satisfactory appearance result.



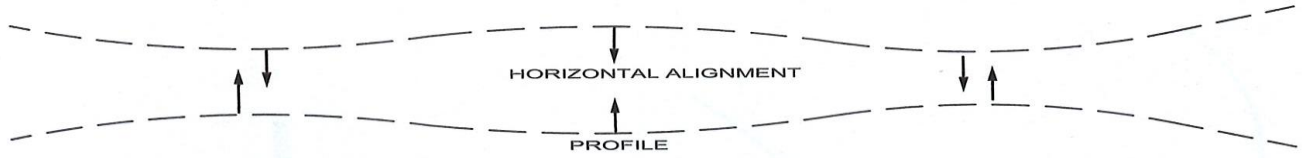
(I) FLAT CURVES APPROPRIATE FOR HORIZONTAL WITH SMALL CENTRAL ANGLE REGARDLESS OF PROFILE

Notes : Very long flat curves, even where not required by the design speed, also have a pleasing appearance when the central angle is very small.

Source : REAM GL 2/2002 A Guide on Geometric Design of Roads, Figure 4-6

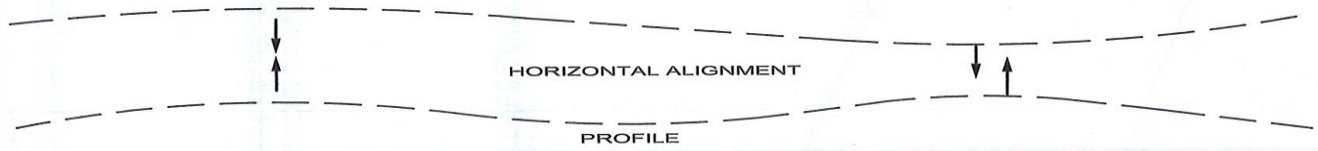
FIGURE 4.78D G , H & I

Scale : Not to scale



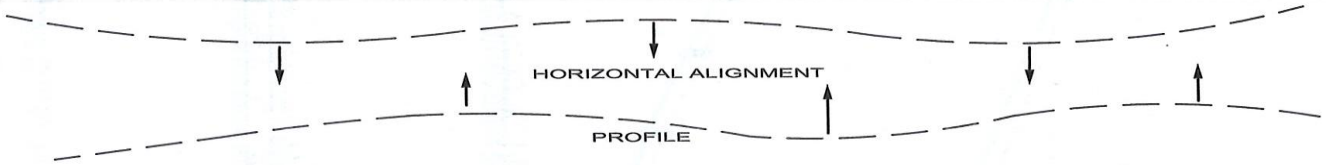
(J) COINCIDING CURVES VERTICES IN HORIZONTAL AND VERTICAL DIMENSIONS

Notes : The classic case of coordination between horizontal and vertical alignment in which the vertices of horizontal and vertical curves coincide, creating a rich effect of three-dimensional s-curves, composed of convex and concave helixes



(K) COINCIDING VERTICES WITH SINGLE-PHASE SKIP

Notes : A legitimate case of coordination : one phase is skipped in the horizontal plane, but vertices still coincide. The long tangent in plane is softened by vertical curvature.



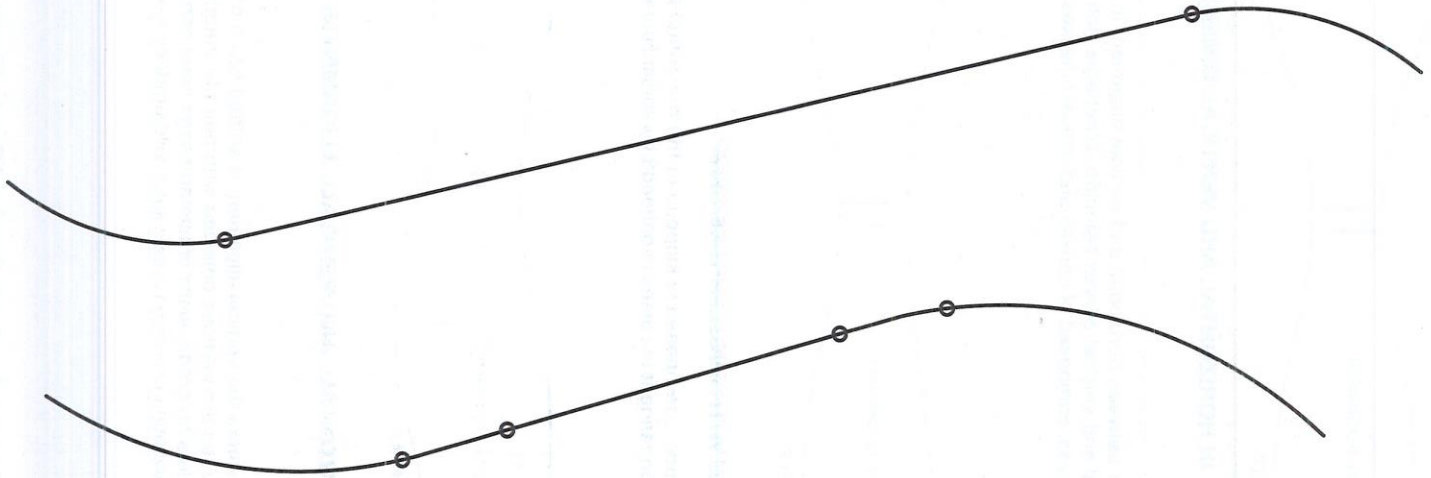
(L) WEAK COORDINATION OF HORIZONTAL AND VERTICAL ALIGNMENTS

Notes : A case with weak coordination where the vertical alignment is shifted half a phase with respect to horizontal alignment so the vertices coincide with point of inflection. The superelevation in this case occurs on grade, while crests and sags have normal cross sections in the first case, superelevation occurs on crests sags, while grades have normal cross sections.

Source : REAM GL 2/2002 A Guide on Geometric Design of Roads, Figure 4-6

FIGURE 4.8E: J, K & L

Scale : Not to scale



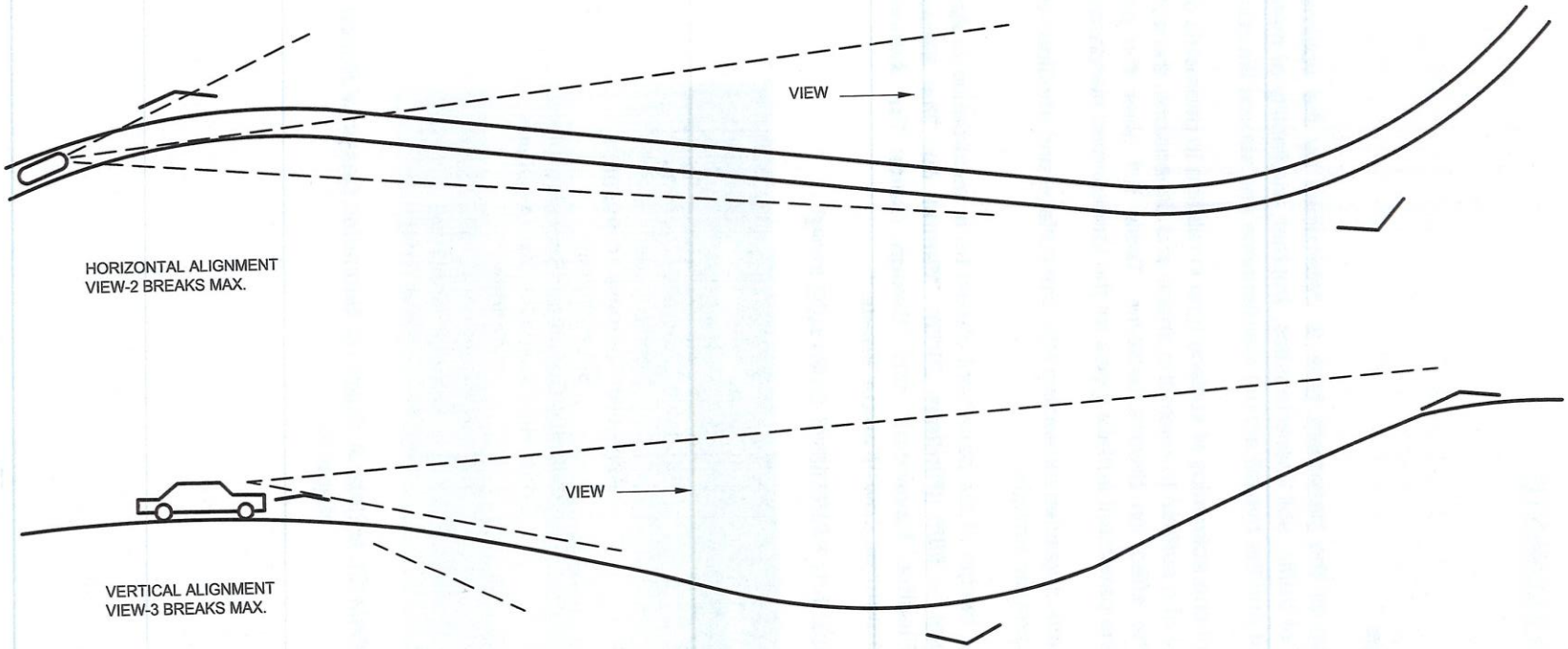
(M) HORIZONTAL ALIGNMENT SHOULD BE BALANCE

Notes : The upper line is an example of poor design because the alignment consists of a long tangent with short curves, where as the balance between the curves and tangents in the lower alignment is the preferred design.

Source : REAM GL 2/2002 A Guide on Geometric Design of Roads, Figure 4-6

FIGURE 4.8F : M

Scale : Not to scale



(N) GOOD COORDINATION OF HORIZONTAL AND VERTICAL ALIGNMENT

Notes: Guideline to be used for coordination of horizontal and vertical alignment reverse occurs on a crest

Source : REAM GL 2/2002 A Guide on Geometric Design of Roads, Figure 4-6

FIGURE 4.8G : N

Scale : Not to scale

THANK YOU