1) A horizontal curve with a PI Station at 596+87.00 with the associated deflection angle, \( \Delta = 20^\circ 30' \), requires that the beginning of the curve (PC Station) must start at 592+99.32. Find the PT Station, the Radius and Dc required for the curve to layout in this manner.

A crest vertical curve on the same horizontal alignment has a PVI Station of 596+00 at elevation 598.75. For a 500' length of curve, find the elevation and station of the high point of the curve if G1 = 2.5\% and G2 = -2.0\%.

Does the curve have the proper K for a 55 mph design speed?

What is the high superelevated edge of pavement elevation at the high point of the curve for a 55 mph design speed in a rural locale if there are two 12' wide lanes?

**Horizontal Curve**

\[
T = (596+87.00) - (592+99.32) = 387.68'
\]

\[
T = R \tan \frac{\Delta}{2} \quad \Rightarrow \quad R = \frac{T}{\tan \frac{\Delta}{2}} = \frac{387.68'}{\tan 10.25'} = 2143.90'
\]

\[
D_c = \frac{5729.56}{R} = \frac{5729.56}{2143.90} = 2.6725^\circ = 2^\circ 40' 21''
\]

\[
L = \frac{T \times R}{180} = \frac{387.68' \times 2143.90}{180} = 767.07'
\]

PT Sta = (592+99.32) + 767.07 = 600+66.39

**Vertical Curve**

\[
C = PVC Elev = 598.75 - (2.5)(25) = 592.50
\]

\[
b = G_1 = 2.5 \quad a = \frac{G_2 - G_1}{2L} = \frac{-2 - 2.5}{2.5} = -0.45
\]

**Hi Point**

\[
O = 2(-0.45)x + 2.5 \quad x = 2.7778 \quad Sta \quad (593+99.32) + 277.78' = 596+27.78
\]

**Hi Pt. Elev**

\[
y = -0.45(2.7778)^2 + 25(2.7778) + 592.50 = 595.97
\]

\[
k = \frac{L}{A} = \frac{500}{-2.25} = 111.11 \quad K_{reqd} = 114 \quad (203-3) \quad \text{Not Adequate}
\]

\[
Cd = 0.055 \quad \text{(202-7)} \quad \text{Hi Pt. Rod E} = \frac{595.97 + 0.055(12)}{598.83}
\]

\[
0.055 - 0.060
\]
2) What should the lane and shoulder widths be for a 2 lane rural collector with 1000 ADT and a 30 mph design speed? 8:1 slopes with no barrier.

10' Lanes — Shoulder 5' Gro. 4' Tans.

(301-2) (301-3)

3) If the road proceeds around an 11° curve what should be the total road width?

7' Extra Width Required (301-5c)

Total Width in Curve = (2 x 10) + 7 = 27'

4) What is the design superelevation for the curve?

Cd = 0.059 (202-7)

5) How long is the superelevation transition? (Hint: the width transitions over the same length that the superelevation does. See ODOT 301-5a for a visual.)

G = 152:1 (202-4)

\[ y_n = 10(0.016) = 0.16' \]

\[ y_d = 13.5(0.059) = 0.7965' \]

\[ L = (0.16 + 0.7965) \times 152 = 145.38' \]

Use 146'

6) What is the steepest (whole number) backslope that could be used along the road for a 3' flat bottomed ditch to be traversable?

(307-10) 8:1 Fences Slope Requires 4:1 Backslope For Traversability.

7) If there is no ditch, at what distance from the edge of the traveled way does a signal controller box need to be placed to not warrant guardrail to protect it?

(600-1) Clear Zone = 11' — Put Boy Farther Than 11'.

8) If the 4' depth (perpendicular to the road) controller box was at 8' from the edge of the travelled way, what is the length of need of a non-flared guardrail for the situation?

\[ L_R = 70' (602-1) \]

\[ L_2 = 4' (301-3) \]

\[ L_H = \text{Smaller of } C2 \text{ on Back of Feature} \]

\[ = \text{Smaller of } (11' \text{ on } 8' + 4' = 12') = 11' \]

\[ L_{GN} = X = \frac{11 - 4}{\frac{11}{10}} = 49.5' \]