Bridge Design Details 2D October 2019

To find the elevation at any given station on a vertical curve, use data given on the PROFILE GRADE and the following equation:

$$(5)\ (Elev\_PG)_D = (Elev\_BVC) + (D \times G_1) \times \frac{D^2 + \frac{R}{C}}{2}$$

Figure 2A.D.1 Vertical Curve Definition

Where:

D = Distance from BVC to a point in stations

$$(6)\ (Elev\_tan) = (Elev\_BVC) + (D \times G_1)$$

H = Rise from Profile Grade to (Elev_tan): $H = \dfrac{D^2 + \frac{R}{C}}{2}$

Example:

Find: Elevation at Sta 12 + 00.00

Thus: Elev PG (12 +60.00) = 122.63 + (8.60)(2.00) + $\dfrac{(8.60)^2(-0.19)}{2}$

= 122.63 + 17.20 - 7.03

= 132.80

Figure 2A.D.2 Vertical Curve Example Calculations

Example:

The "Brownell" method for calculating elevations at given stations along a vertical curve.
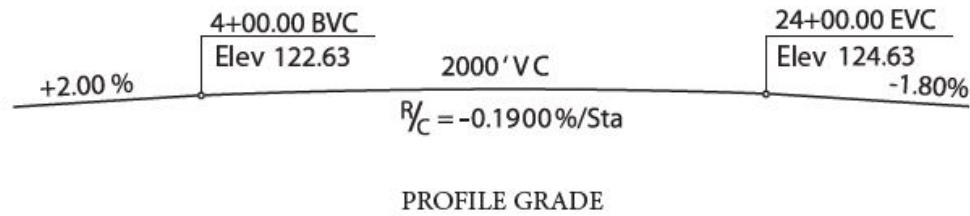
Given:

Figure 2A.D.3 Vertical Curve "Brownell" Example Calculations

Find elevations at: Abutment 1 at 11+50

Bent 2 at 12+60

Abutment 3 at 13+70

Station	$^R/_C$ (% / Station)	G (Grade at Station)
4+00.00 BVC	-0.1900	+2.00
11+50.00 Abut 1	-0.1900	+0.5750
12+60.00 Bent 2	-0.1900	+0.3660
13+70.00 Abut 3	-0.1900	+0.1570
24+00.00 EVC	-0.1900	-1.80

Distance	L (Length - Stations)	$^R/_C$ × L (Change in Grade)	L × Avg G (Change in Elevation)
4+00.00 BVC to Abut 1	7.50	-1.4250	+9.6562
Abutment 1 to Bent 2	1.10	-0.2090	+0.5175
Bent 2 to Abut 3	1.10	-0.2090	+0.2876
Abutment 3 to 24+00.00 EVC	10.30	-1.9750	-8.4614

Station	Elevation
4+00.00 BVC	122.63
11+50.00 Abut 1	**132.28**
12+60.00 Bent 2	**132.80**
13+70.00 Abut 3	**133.09**
24+00.00 EVC (Calculated)	124.63
24+00.00 EVC (Given)	124.63