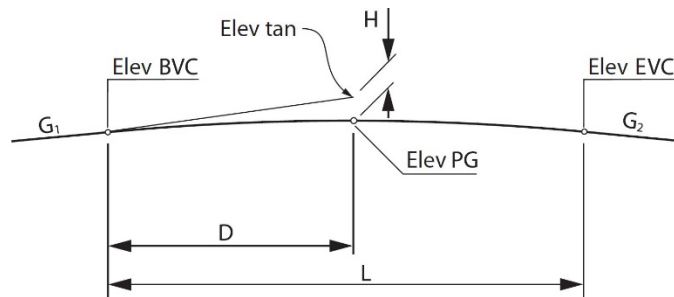


## Bridge Design Details 2D June 2025

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

$$(5) \quad (\text{Elev}_{PG})_D = (\text{Elev}_{BVC}) + (D \times G_1) + \frac{D^2 \times (R/C)}{2}$$



**Figure 2A.D.1 Vertical Curve Definition**

Where:

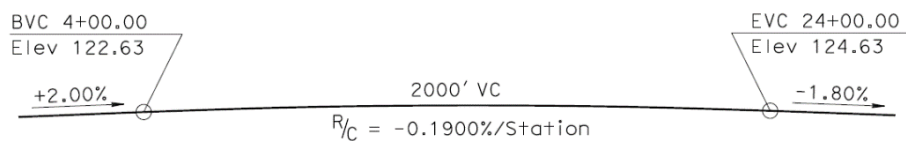
$D$  = Distance from BVC to a point in stations

$$(6) \quad (\text{Elev}_{tan}) = (\text{Elev}_{BVC}) + (D \times G_1)$$

$H$  = Rise from Profile Grade to (Elev<sub>tan</sub>):  $H = \frac{D^2 \times R/C}{2}$

**Example:**

EXAMPLE:



**PROFILE GRADE**  
NO SCALE

Find: Elevation at Station 12+60.00

$$\begin{aligned} \text{Thus: } \text{Elev PG}(12+60.00) &= 122.63 + (8.60)(2.00) + \frac{(8.60)^2(-0.19)}{2} \\ &= 122.63 + 17.20 - 7.03 \\ &= 132.80 \end{aligned}$$

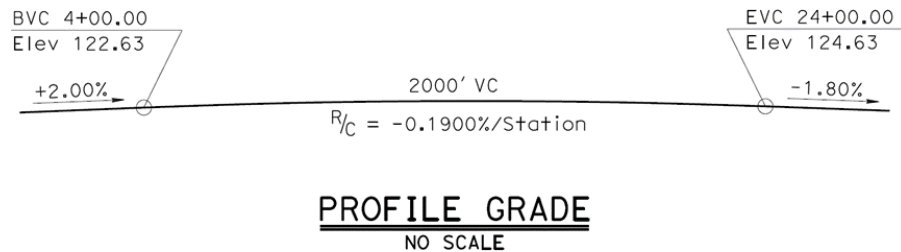
**Figure 2A.D.2 Vertical Curve Example Calculations**



### 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+50.00

Bent 2 at 12+60.00

Abutment 3 at 13+70.00

Station	R/C (% / Station)	G (Grade at Station)
BVC 4+00.00	-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
EVC 24+00.00	-0.1900	-1.80

Distance	L (Length - Stations)	R/C × L (Change in Grade)	L × Avg G (Change in Elevation)
BVC 4+00.00 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 EVC 24+00.00	10.30	-1.9570	-8.4614

Station	Elevation
4+00.00 BVC	122.63
<b>11+50.00 Abut 1</b>	<b>132.29</b>
<b>12+60.00 Bent 2</b>	<b>132.80</b>
<b>13+70.00 Abut 3</b>	<b>133.09</b>
24+00.00 EVC (Calculated)	124.63
24+00.00 EVC (Given)	124.63