Important Surveying Vertical Curves Formulas PDF



Formulas Examples with Units

List of 19

Important Surveying Vertical Curves Formulas

1) Allowable Centrifugal Acceleration given Length Formula 🕝



$$f = ((g_1) - (g_2)) \cdot \frac{V^2}{100 \cdot L_c}$$

Example with Units

2) Change of Grade given Length Formula C

Example with Units $N = L \cdot P_{N} \qquad 1.4 = 20 \,\mathrm{m} \cdot 0.07$

Evaluate Formula

Evaluate Formula (

Evaluate Formula

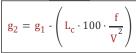
Evaluate Formula [

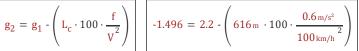
Evaluate Formula [

Evaluate Formula (

3) Downgrade given Length based on Centrifugal Ratio Formula 🕝

Formula





4) Length given S is Less than L and Change of Grade Formula 🕝

$$L_{c} = N \cdot \frac{SD^{2}}{800 \cdot h}$$

$$L_{c} = N \cdot \frac{SD^{2}}{800 \cdot h} \qquad 635.5588_{m} = 3.6 \cdot \frac{490_{m}^{2}}{800 \cdot 1.7_{m}}$$

5) Length of Curve Based on Centrifugal Ratio Formula C

$$L_{c} = \left(\left(g_{1} \right) \cdot \left(g_{2} \right) \right) \cdot \frac{V^{2}}{100 \cdot f}$$

Example with Units

$$L_{c} = ((g_{1}) - (g_{2})) \cdot \frac{V^{2}}{100 \cdot f}$$

$$616.6667 \text{ m} = ((2.2) - (-1.5)) \cdot \frac{100 \text{ km/h}^{2}}{100 \cdot 0.6 \text{ m/s}^{2}}$$

6) Length of Curve given Change in Grade where S is more than L Formula 🗂

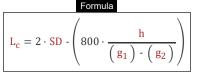
$$L_{c} = 2 \cdot SD - \left(800 \cdot \frac{h}{N}\right)$$

Example with Units

$$L_{c} = 2 \cdot SD - \left(800 \cdot \frac{h}{N}\right)$$

$$602.2222 m = 2 \cdot 490 m - \left(800 \cdot \frac{1.7 m}{3.6}\right)$$

7) Length of Curve when Height of Observer and Object are Same Formula 🕝



Example with Units $612.4324_{\rm m} = 2 \cdot 490_{\rm m} - \left(800 \cdot \frac{1.7_{\rm m}}{(2.2) - (-1.5)}\right)$

8) Length of Curve when S is Less than L Formula [7]

Example with Units $L_{c} = SD^{2} \cdot \frac{\left(g_{1}\right) \cdot \left(g_{2}\right)}{200 \cdot \left(\boxed{H} + \boxed{h_{2}}\right)^{2}} \left| 705.2362_{m} = 490_{m}^{2} \cdot \frac{\left(2.2\right) \cdot \left(-1.5\right)}{200 \cdot \left(\boxed{1.2_{m}} + \boxed{2_{m}}\right)^{2}} \right|$

9) Length of Curve when S is Less than L and h1 and h2 are same Formula 🕝

Formula

Example with Units $L_{c} = ((g_{1}) - (g_{2})) \cdot \frac{SD^{2}}{800 \cdot h} \bigg| \bigg| 653.2132_{m} = ((2.2) - (-1.5)) \cdot \frac{490_{m}^{2}}{800 \cdot 1.7_{m}}$

10) Length of Curve when Sight Distance is More Formula [7]

Formula $L_{c} = 2 \cdot SD - \frac{200 \cdot \left(\sqrt{H} + \sqrt{h_{2}}\right)^{2}}{\left(\sigma_{c}\right) \cdot \left(\sigma_{c}\right)}$

> Example with Units $639.5467 \,\mathrm{m} = 2 \cdot 490 \,\mathrm{m} - \frac{200 \cdot \left(\sqrt{1.2 \,\mathrm{m}} + \sqrt{2 \,\mathrm{m}}\right)^2}{\left(2.2 \,\mathrm{m} + \sqrt{2.2 \,\mathrm{m}}\right)^2}$

11) Length of Vertical Curve Formula C

Example with Units Evaluate Formula (

Evaluate Formula

Evaluate Formula [

Evaluate Formula (

Evaluate Formula 🕝

12) Permissible Grade given Length Formula 🕝

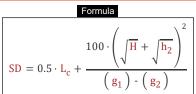
Formula Example w
$$P_{N} = \frac{N}{L}$$

$$0.18 =$$

Evaluate Formula (

Formula Example with Units
$$P_N = \frac{N}{L} \qquad 0.18 = \frac{3.6}{20 \, \text{m}}$$

13) Sight Distance when Length of Curve is Less Formula [



Evaluate Formula

Example with Units
$$\frac{100 \cdot \left(\sqrt{1.2\,\text{m}} + \sqrt{2\,\text{m}}\right)^2}{\left(2.2\,\right) \cdot \left(-1.5\,\right)}$$

14) Sight Distance when Length of Curve is Less and Both Height of Observer and Object is Same Formula

Formula $SD = \left(\frac{L_c}{2}\right) + \left(400 \cdot \frac{h}{\left(g_1\right) - \left(g_2\right)}\right)$ Evaluate Formula (

Example with Units
$$491.7838_{m} = \left(\frac{616_{m}}{2}\right) + \left(400 \cdot \frac{1.7_{m}}{(2.2) - (-1.5)}\right)$$

15) Sight Distance when S is Less than L Formula C

Formula

Formula Example with Units
$$S = \left(\frac{1}{c}\right) \cdot \left(\sqrt{H} + \sqrt{h_2}\right)$$

$$5.0193 \, \text{m} = \left(\frac{1}{0.5}\right) \cdot \left(\sqrt{1.2 \, \text{m}} + \sqrt{2 \, \text{m}}\right)$$

Evaluate Formula 🕝

Evaluate Formula (

16) Sight Distance when S is Less than L and h1 and h2 are same Formula [7]

Example with Units

$$SD = \sqrt{\frac{800 \cdot h \cdot L_c}{(g_1) \cdot (g_2)}} \sqrt{\frac{475.8378 \, m}{(2.2) \cdot (-1.5)}}$$

17) Tangential Correction Formula



$$c = \frac{g_1 - g_2}{\cdots} \cdot n$$

$$c = \frac{g_1 - g_2}{4} \cdot n \qquad 0.4162 = \frac{2.2 - -1.5}{4} \cdot 0.45$$

18) Upgrade given Length based on Centrifugal Ratio Formula 🕝

Formula

$$g_1 = \left(L_c \cdot 100 \cdot \frac{f}{v^2}\right) + \left(g_2\right)$$

Example with Units

Evaluate Formula (

Evaluate Formula (

Evaluate Formula

$$g_{1} = \left(L_{c} \cdot 100 \cdot \frac{f}{V^{2}}\right) + \left(g_{2}\right) \left[2.196 = \left(616 \text{ m} \cdot 100 \cdot \frac{0.6 \text{ m/s}^{2}}{100 \text{ km/h}^{2}}\right) + \left(-1.5\right)\right]$$

19) Velocity given Length Formula 🕝

Formula

$$V = \sqrt{\frac{L_c \cdot 100 \cdot f}{C}}$$

Example with Units

$$V = \begin{bmatrix} \frac{L_c \cdot 100 \cdot f}{g_1 - (g_2)} \end{bmatrix} = 99.9459 \, \text{km/h} = \sqrt{\frac{616 \, \text{m} \cdot 100 \cdot 0.6 \, \text{m/s}^2}{2.2 - (-1.5)}}$$

Variables used in list of Surveying Vertical Curves Formulas above

- **c** Tangential Correction
- f Allowable Centrifugal Acceleration (Meter per Square Second)
- g₁ Upgrade
- g₂ Downgrade
- h Height of Vertical Curves (Meter)
- **H** Height of Observer (*Meter*)
- h₂ Height of Object (Meter)
- L Length of Vertical Curve (Meter)
- Lc Length of Curve (Meter)
- n Number of Chords
- N Change in Grade
- P_N Permissible Rate
- S Sight Distance (Meter)
- SD Sight Distance SSD (Meter)
- **V** Vehicle Velocity (Kilometer per Hour)

Constants, Functions, Measurements used in list of Surveying Vertical Curves Formulas above

- Functions: sqrt, sqrt(Number)
 A square root function is a function that takes a non-negative number as an input and returns the square root of the given input number.
- Measurement: Length in Meter (m)
 Length Unit Conversion
- Measurement: Speed in Kilometer per Hour (km/h)
 Speed Unit Conversion
- Measurement: Acceleration in Meter per Square Second (m/s²)

 Acceleration Unit Conversion

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