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Length of Valley Curve Formulas

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List of 20 Length of Valley Curve Formulas

Length of Valley Curve

Design of Valley Curve

1) Design Speed given Length of Valley Curve

$$fx \quad v = (L_s \cdot R \cdot C_a)^{\frac{1}{3}}$$

Open Calculator 

$$ex \quad 4.09752m/s = (7m \cdot 2.34m \cdot 4.2m/s)^{\frac{1}{3}}$$

2) Design Speed given Length of Valley Curve and Time

$$fx \quad v = \frac{L_s}{t}$$

Open Calculator 

$$ex \quad 1.75m/s = \frac{7m}{4s}$$

3) Design Speed given Total Length of Valley Curve

$$fx \quad v = \left(\left(\frac{L_s}{2} \right)^2 \cdot \frac{C_a}{N} \right)^{\frac{1}{3}}$$

Open Calculator 

$$ex \quad 3.881214m/s = \left(\left(\frac{7m}{2} \right)^2 \cdot \frac{4.2m/s}{0.88rad} \right)^{\frac{1}{3}}$$



4) Deviation Angle given Total Length of Valley Curve

$$\text{fx } N = \left(\frac{L_s}{2} \right)^2 \cdot \frac{C_a}{v^3}$$

[Open Calculator !\[\]\(cbe80b694ebd74fcfe136a095b608235_img.jpg\)](#)

$$\text{ex } 0.4116\text{rad} = \left(\frac{7\text{m}}{2} \right)^2 \cdot \frac{4.2\text{m/s}}{(5\text{m/s})^3}$$

5) Length of Valley Curve

$$\text{fx } L_s = \frac{v^3}{R \cdot C_a}$$

[Open Calculator !\[\]\(3e2231b1ad3ca8da8658228c00dd08e0_img.jpg\)](#)

$$\text{ex } 12.71876\text{m} = \frac{(5\text{m/s})^3}{2.34\text{m} \cdot 4.2\text{m/s}}$$

6) Length of Valley Curve given Time and Design Speed

$$\text{fx } L_s = v \cdot t$$

[Open Calculator !\[\]\(0d5ec72f61334709c3fc9450209b754f_img.jpg\)](#)

$$\text{ex } 20\text{m} = 5\text{m/s} \cdot 4\text{s}$$

7) Radius of Curve given Length of Valley Curve

$$\text{fx } R = \frac{v^3}{L_s \cdot C_a}$$

[Open Calculator !\[\]\(b64b40baaee5acddc1eab8538ba84754_img.jpg\)](#)

$$\text{ex } 4.251701\text{m} = \frac{(5\text{m/s})^3}{7\text{m} \cdot 4.2\text{m/s}}$$



8) Rate of Change of Acceleration

$$\text{fx } C_a = \frac{v^3}{L_s \cdot R}$$

[Open Calculator !\[\]\(e78f798d4ea5c530c9db49e7d26e6b95_img.jpg\)](#)

$$\text{ex } 7.631258\text{m/s} = \frac{(5\text{m/s})^3}{7\text{m} \cdot 2.34\text{m}}$$

9) Rate of Change of Acceleration given Total Length of Valley Curve

$$\text{fx } C_a = \left(\frac{L_s}{2}\right)^2 \cdot N \cdot v^3$$

[Open Calculator !\[\]\(05be7c7a8995decd503647c99211f7c2_img.jpg\)](#)

$$\text{ex } 1347.5\text{m/s} = \left(\frac{7\text{m}}{2}\right)^2 \cdot 0.88\text{rad} \cdot (5\text{m/s})^3$$

10) Time given Length of Valley Curve and Design Speed

$$\text{fx } t = \frac{L_s}{v}$$

[Open Calculator !\[\]\(fe3aebe81acea8d45108cd2768939da7_img.jpg\)](#)

$$\text{ex } 1.4\text{s} = \frac{7\text{m}}{5\text{m/s}}$$



11) Time given Rate of Change of Acceleration

$$\text{fx } t = \frac{\frac{v^2}{R}}{C_a}$$

[Open Calculator !\[\]\(e2376d476d06eb31946dc01a69a4403a_img.jpg\)](#)

$$\text{ex } 2.543753\text{s} = \frac{\frac{(5\text{m/s})^2}{2.34\text{m}}}{4.2\text{m/s}}$$

12) Total Length of Valley Curve

$$\text{fx } L_s = 2 \cdot \sqrt{\frac{N \cdot v^3}{C_a}}$$

[Open Calculator !\[\]\(0b5e7e25e8775f7e7e80906ada4f0021_img.jpg\)](#)

$$\text{ex } 10.23533\text{m} = 2 \cdot \sqrt{\frac{0.88\text{rad} \cdot (5\text{m/s})^3}{4.2\text{m/s}}}$$

Length of Valley Curve greater than Stopping Sight Distance

13) Deviation Angle given Length of Valley Curve Greater than Stopping Sight Distance

$$\text{fx } N = \frac{L_s \cdot (2 \cdot h_1 + 2 \cdot S \cdot \tan(\alpha_{\text{angle}}))}{S^2}$$

[Open Calculator !\[\]\(0fb13ad0bfa3d86868cdd3883e5665b3_img.jpg\)](#)

$$\text{ex } 0.965823\text{rad} = \frac{7\text{m} \cdot (2 \cdot 0.75\text{m} + 2 \cdot 3.56\text{m} \cdot \tan(2^\circ))}{(3.56\text{m})^2}$$



14) Driver Eye Height given Length of Valley Curve Greater than Stopping Sight Distance

$$\text{fx } h_1 = \frac{N \cdot S^2 - 2 \cdot L_s \cdot S \cdot \tan(\alpha_{\text{angle}})}{2 \cdot L_s}$$

[Open Calculator !\[\]\(d3fb9f94af8b26d1c844efa9a98805b0_img.jpg\)](#)

$$\text{ex } 0.672308\text{m} = \frac{0.88\text{rad} \cdot (3.56\text{m})^2 - 2 \cdot 7\text{m} \cdot 3.56\text{m} \cdot \tan(2^\circ)}{2 \cdot 7\text{m}}$$

15) Inclination Angle given Length of Valley Curve Greater than Stopping Sight Distance

$$\text{fx } \alpha_{\text{angle}} = a \tan\left(\frac{N \cdot S^2 - 2 \cdot h_1}{2 \cdot S \cdot L_s}\right)$$

[Open Calculator !\[\]\(e1d6102fe77919492c04879c8450f1f5_img.jpg\)](#)

$$\text{ex } 10.96106^\circ = a \tan\left(\frac{0.88\text{rad} \cdot (3.56\text{m})^2 - 2 \cdot 0.75\text{m}}{2 \cdot 3.56\text{m} \cdot 7\text{m}}\right)$$

16) Length of Valley Curve Greater than Stopping Sight Distance

$$\text{fx } L_s = \frac{N \cdot S^2}{2 \cdot h_1 + 2 \cdot S \cdot \tan(\alpha_{\text{angle}})}$$

[Open Calculator !\[\]\(ab4e2b3fc7e7887b7a72f548aa6f5e60_img.jpg\)](#)

$$\text{ex } 6.377982\text{m} = \frac{0.88\text{rad} \cdot (3.56\text{m})^2}{2 \cdot 0.75\text{m} + 2 \cdot 3.56\text{m} \cdot \tan(2^\circ)}$$



Length of Valley Curve Less than Stopping Sight Distance

17) Deviation Angle Given Length of Valley Curve Less than Stopping Sight Distance

$$\text{fx } N = (2 \cdot S) - \frac{2 \cdot h_1 + (2 \cdot S \cdot \tan(\alpha_{\text{angle}}))}{L_s}$$

[Open Calculator !\[\]\(83f22ed94ec5517769dd76d702c6bfd8_img.jpg\)](#)

$$\text{ex } 6.870195\text{rad} = (2 \cdot 3.56\text{m}) - \frac{2 \cdot 0.75\text{m} + (2 \cdot 3.56\text{m} \cdot \tan(2^\circ))}{7\text{m}}$$

18) Driver Sight Height given Length of Valley Curve Less than Stopping Sight Distance

$$\text{fx } h_1 = \frac{(L_s - 2 \cdot S) \cdot N + 2 \cdot S \cdot \tan(\alpha_{\text{angle}})}{2}$$

[Open Calculator !\[\]\(3cb60d42b10e53f9522bb0b392c1c4cd_img.jpg\)](#)

$$\text{ex } 0.071518\text{m} = \frac{(7\text{m} - 2 \cdot 3.56\text{m}) \cdot 0.88\text{rad} + 2 \cdot 3.56\text{m} \cdot \tan(2^\circ)}{2}$$

19) Inclination Angle given Length of Valley Curve Less than Stopping Sight Distance

$$\text{fx } \alpha_{\text{angle}} = a \tan\left(\frac{(L_s - 2 \cdot S) \cdot N + 2 \cdot h_1}{2 \cdot S}\right)$$

[Open Calculator !\[\]\(0d7ca0919e6c47bbd874bfa0189fe22e_img.jpg\)](#)

$$\text{ex } 11.08072^\circ = a \tan\left(\frac{(7\text{m} - 2 \cdot 3.56\text{m}) \cdot 0.88\text{rad} + 2 \cdot 0.75\text{m}}{2 \cdot 3.56\text{m}}\right)$$



20) Length of Valley Curve Less than Stopping Sight Distance

[Open Calculator !\[\]\(3d8c13c92b853674f749aac6fa869926_img.jpg\)](#)

$$\text{fx } L_s = 2 \cdot S - \frac{2 \cdot h_1 + (2 \cdot S \cdot \tan(\alpha_{\text{angle}}))}{N}$$

$$\text{ex } 5.132914\text{m} = 2 \cdot 3.56\text{m} - \frac{2 \cdot 0.75\text{m} + (2 \cdot 3.56\text{m} \cdot \tan(2^\circ))}{0.88\text{rad}}$$







Variables Used

- **C_a** Rate of Change of Acceleration (Meter per Second)
- **h_1** Driver Sight Height (Meter)
- **L_s** Length of Curve (Meter)
- **N** Deviation Angle (Radian)
- **R** Radius of Curve (Meter)
- **S** Sight Distance (Meter)
- **t** Time (Second)
- **v** Design Speed (Meter per Second)
- **α_{angle}** Inclination (Degree)



Constants, Functions, Measurements used

- **Function:** **atan**, atan(Number)
Inverse trigonometric tangent function
- **Function:** **sqrt**, sqrt(Number)
Square root function
- **Function:** **tan**, tan(Angle)
Trigonometric tangent function
- **Measurement:** **Length** in Meter (m)
Length Unit Conversion 
- **Measurement:** **Time** in Second (s)
Time Unit Conversion 
- **Measurement:** **Speed** in Meter per Second (m/s)
Speed Unit Conversion 
- **Measurement:** **Angle** in Radian (rad), Degree (°)
Angle Unit Conversion 



Check other formula lists

- [Length of Valley Curve Formulas](#) 

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