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Parabolic and Transition Curves Formulas

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List of 11 Parabolic and Transition Curves Formulas

Parabolic and Transition Curves

Parabolic Curves

1) Distance from Point of Vertical Curve to Lowest Point on Sag Curve

Open Calculator

fx $$X_s = -\left(\frac{G_I}{R_g}\right)$$

ex $$-0.19802\text{m} = -\left(\frac{10}{50.5\text{m}^{-1}}\right)$$

2) Elevation of Lowest Point on Sag Curve

Open Calculator

fx $$E_s = E_0 - \left(\frac{G_I^2}{2 \cdot R_g}\right)$$

ex $$49.0099\text{m} = 50\text{m} - \left(\frac{(10)^2}{2 \cdot 50.5\text{m}^{-1}}\right)$$

3) Elevation of Point of Vertical Curvature

Open Calculator

fx $$E_0 = V - \left(\left(\frac{1}{2}\right) \cdot (L_c \cdot G_I)\right)$$

ex $$50\text{m} = 750\text{m} - \left(\left(\frac{1}{2}\right) \cdot (140\text{m} \cdot 10)\right)$$

4) Elevation of Point of Vertical Intersection

Open Calculator

fx $$V = E_0 + \left(\frac{1}{2}\right) \cdot (L_c \cdot G_I)$$

ex $$750\text{m} = 50\text{m} + \left(\frac{1}{2}\right) \cdot (140\text{m} \cdot 10)$$

5) Elevation of PVC given Elevation of Lowest Point on Sag Curve

Open Calculator

fx $$E_0 = E_s + \left(\frac{G_I^2}{2 \cdot R_g}\right)$$

ex $$49.9901\text{m} = 49\text{m} + \left(\frac{(10)^2}{2 \cdot 50.5\text{m}^{-1}}\right)$$

6) Length of Curve using Rate of change of Grade in Parabolic Curves

Open Calculator

$$L_{Pc} = \frac{G_2 - (-G_I)}{R_g}$$

ex $$0.356436\text{m} = \frac{8 - (-10)}{50.5\text{m}^{-1}}$$

7) Rate of Change of Grade given Distance from PVC to Lowest Point on Sag Curve

Open Calculator

$$R_g = -\left(\frac{G_I}{X_s}\right)$$

ex $$50\text{m}^{-1} = -\left(\frac{10}{\text{-}0.2\text{m}}\right)$$

Transition (Spiral) Curves

8) Minimum Length of Spiral

Open Calculator

$$L = \frac{3.15 \cdot \left(V_v^3\right)}{R_t \cdot a_c}$$

ex $$361.8352\text{m} = \frac{3.15 \cdot \left((41\text{km/h})^3\right)}{300\text{m} \cdot 2}$$

9) Radius of Circular Curve Minimum Length

Open Calculator

fx $$R_t = \frac{3.15 \cdot \left(V_v^3\right)}{L \cdot a_c}$$

ex $$300.0044\text{m} = \frac{3.15 \cdot \left((41\text{km/h})^3\right)}{361.83\text{m} \cdot 2}$$

10) Rate of Increase of Radial Acceleration

Open Calculator

fx $$a_c = \frac{3.15 \cdot (V_v)^3}{L \cdot R_t}$$

ex $$2.000029 = \frac{3.15 \cdot (41\text{km/h})^3}{361.83\text{m} \cdot 300\text{m}}$$

11) Vehicle Velocity given Minimum Length of Spiral

Open Calculator

fx $$V_v = \left(\frac{L \cdot R_t \cdot a_c}{3.15}\right)^{\frac{1}{3}}$$

ex $$40.9998\text{km/h} = \left(\frac{361.83\text{m} \cdot 300\text{m} \cdot 2}{3.15}\right)^{\frac{1}{3}}$$

Variables Used

- a_c Rate of Increase of Radial Acceleration
- E_0 Elevation of Point of Vertical Curve *(Meter)*
- E_s Elevation of Lowest Point on a Sag Curve *(Meter)*
- G_2 Grade at End of Curve
- G_1 Grade at Beginning of Curve
- L Minimum Length of Spiral *(Meter)*
- L_c Length of Curve *(Meter)*
- L_{Pc} Length of Parabolic Curves *(Meter)*
- R_g Rate of Change of Grade *(Per Meter)*
- R_t Radius of Curve *(Meter)*
- V Elevation of Point of Vertical Intersection *(Meter)*
- V_v Vehicle Velocity *(Kilometer per Hour)*
- X_s Distance from PVC to Lowest Point on a Sag Curve *(Meter)*

Constants, Functions, Measurements used

- Measurement: **Length** in Meter (m)
  Length Unit Conversion
- Measurement: **Speed** in Kilometer per Hour (km/h)
  Speed Unit Conversion
- Measurement: **Linear Atomic Density** in Per Meter (m^{-1})
  Linear Atomic Density Unit Conversion

Check other formula lists

- **Circular Curves on Highways and Roads Formulas**
- **Parabolic and Transition Curves Formulas**
- **Structural Numbers for Flexible Pavements Formulas**

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