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Parabolic Cable Tension and Length Formulas

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List of 12 Parabolic Cable Tension and Length Formulas

Parabolic Cable Tension and Length

1) Allowable Stress for Compression Elements for Highway Bridges

Open Calculator

fx $\sigma_{allowable} = 0.44 \cdot f_y$

ex $1.1E\hat{}8N/m^2 = 0.44 \cdot 250MPa$

2) Length of Cable for UDL on Parabolic Cable

Open Calculator

fx $S_{cable} = L_{span} + \left(8 \cdot \frac{d^2}{3 \cdot L_{span}}\right)$

ex $15.36864m = 15m + \left(8 \cdot \frac{(1.44m)^2}{3 \cdot 15m}\right)$

3) Maximum Sag given Length of Cable for UDL on Parabolic Cable

Open Calculator

fx $d = \sqrt{(S_{cable} - L_{span}) \cdot \left(\frac{3}{8}\right) \cdot L_{span}}$

ex $12m = \sqrt{(40.6m - 15m) \cdot \left(\frac{3}{8}\right) \cdot 15m}$

4) Maximum Sag given Tension at Midspan for UDL on Parabolic Cable

Open Calculator

fx $$d = q \cdot \frac{L_{span}^2}{8 \cdot T_{mid}}$$

ex $$1.434949\text{m} = 10.0\text{kN/m} \cdot \frac{(15\text{m})^2}{8 \cdot 196\text{kN}}$$

5) Parabolic Equation for Cable Slope

Open Calculator

fx $$Y = q \cdot \frac{x^2}{2 \cdot T_m}$$

ex $$61.25 = 10.0\text{kN/m} \cdot \frac{(7\text{m})^2}{2 \cdot 4\text{kN}}$$

6) Span of Cable for Length of Cable for UDL on Parabolic Cable

Open Calculator

fx $$L_{cable\_span} = 1.5 \cdot L - \sqrt{\left(2.25 \cdot L^2\right) - 8 \cdot \left(d^2\right)}$$

ex $$0.110674\text{m} = 1.5 \cdot 50\text{m} - \sqrt{\left(2.25 \cdot (50\text{m})^2\right) - 8 \cdot \left((1.44\text{m})^2\right)}$$

7) Span of Cable given Tension at Midspan for UDL on Parabolic Cable

Open Calculator

fx $$L_{span} = \sqrt{8 \cdot T_{mid} \cdot \frac{d}{q}}$$

ex $$15.02638\text{m} = \sqrt{8 \cdot 196\text{kN} \cdot \frac{1.44\text{m}}{10.0\text{kN/m}}}$$

8) Span of Cable given Tension at Supports for UDL on Parabolic Cable

Open Calculator

fx $$L_{cable\_span} = \frac{\sqrt{\left(T_s^2\right) - \left(T_m^2\right)} \cdot 2}{W}$$

ex $$8.398476\text{m} = \frac{\sqrt{\left((210\text{kN})^2\right) - \left((4\text{kN})^2\right)} \cdot 2}{50.0\text{kN}}$$

9) Tension at Midspan for UDL on Parabolic Cable

Open Calculator

fx $$T_{mid} = \frac{q \cdot \left(L_{span}^2\right)}{8 \cdot d}$$

ex $$195.3125\text{kN} = \frac{10.0\text{kN/m} \cdot \left((15\text{m})^2\right)}{8 \cdot 1.44\text{m}}$$

10) Tension at Midspan given Tension at Supports for UDL on Parabolic Cable

Open Calculator

fx $$T_{mid} = \sqrt{\left(T_s^2\right) - \left(\left(\frac{q \cdot L_{span}}{2}\right)^2\right)}$$

ex $$196.1505\text{kN} = \sqrt{\left((210\text{kN})^2\right) - \left(\left(\frac{10.0\text{kN/m} \cdot 15\text{m}}{2}\right)^2\right)}$$

11) Tension at Supports for UDL on Parabolic Cable

Open Calculator

fx $$T_s = \sqrt{\left(T_{mid}^2\right) + \left(q \cdot \frac{L_{span}}{2}\right)^2}$$

ex $$209.8595\text{kN} = \sqrt{\left((196\text{kN})^2\right) + \left(10.0\text{kN/m} \cdot \frac{15\text{m}}{2}\right)^2}$$

12) UDL given Tension at Supports for UDL on Parabolic Cable

Open Calculator

fx $$q = \frac{\sqrt{\left(T_s^2\right) - \left(T_{mid}^2\right)} \cdot 2}{L_{span}}$$

ex $$10.05231\text{kN/m} = \frac{\sqrt{\left((210\text{kN})^2\right) - \left((196\text{kN})^2\right)} \cdot 2}{15\text{m}}$$

Variables Used

- **d** Maximum Sag *(Meter)*
- f_y Yield Strength of Steel *(Megapascal)*
- **L** Length of Cable *(Meter)*
- L_{cable_span} Length of Cable Span *(Meter)*
- L_{span} Cable Span *(Meter)*
- **q** Uniformly Distributed Load *(Kilonewton per Meter)*
- S_{cable} Cable Length *(Meter)*
- T_m Midspan Tension *(Kilonewton)*
- T_{mid} Tension at Midspan *(Kilonewton)*
- T_s Tension at Supports *(Kilonewton)*
- **W** Total UDL *(Kilonewton)*
- **x** Distance from Midpoint of Cable *(Meter)*
- **Y** Y Co-ordinate
- $\sigma_{allowable}$ Allowable Stress *(Newton per Square Meter)*

Constants, Functions, Measurements used

- Function: **sqrt**, sqrt(Number)
  Square root function
- Measurement: **Length** in Meter (m)
  Length Unit Conversion
- Measurement: **Pressure** in Newton per Square Meter (N/m²)
  Pressure Unit Conversion
- Measurement: **Force** in Kilonewton (kN)
  Force Unit Conversion
- Measurement: **Surface Tension** in Kilonewton per Meter (kN/m)
  Surface Tension Unit Conversion
- Measurement: **Stress** in Megapascal (MPa)
  Stress Unit Conversion

Check other formula lists

- **Cable System, Sag and Drainage on Bridges Formulas**
- **General Relation for Suspension Cables Formulas**
- **Parabolic Cable Tension and Length Formulas**

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