Important Parabolic Cable Tension and Length Formulas PDF

Formulas
Examples
with Units

List of 12
Important Parabolic Cable Tension and Length Formulas

1) Allowable Stress for Compression Elements for Highway Bridges Formula

Evaluate Formula

Formula

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

Example with Units

$$1.1E{+}8\,\text{N/m}^2 = 0.44 \cdot 250\,\text{MPa}$$

2) Length of Cable for UDL on Parabolic Cable Formula

Evaluate Formula

Formula

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

Example with Units

$$15.3686\,\text{m} = 15\,\text{m} + \left(8 \cdot \frac{1.44\,\text{m}^2}{3 \cdot 15\,\text{m}}\right)$$

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

Evaluate Formula

Formula

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

Example with Units

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

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

Evaluate Formula

Formula

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

Example with Units

$$1.4349\,\text{m} = 10.0\,\text{kN/m} \cdot \frac{15\,\text{m}^2}{8 \cdot 196\,\text{kN}}$$

5) Parabolic Equation for Cable Slope Formula

Evaluate Formula

Formula

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

Example with Units

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

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

Evaluate Formula

Formula

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

Example with Units

$$0.1107\,\text{m} = 1.5 \cdot 50\,\text{m} - \sqrt{\left(2.25 \cdot 50\,\text{m}^2\right) - 8 \cdot \left(1.44\,\text{m}^2\right)}$$

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

Evaluate Formula

Formula

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

Example with Units

$$15.0264\,\text{m} = \sqrt{8 \cdot 196\,\text{kN} \cdot \frac{1.44\,\text{m}}{10.0\,\text{kN/m}}}$$

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

Evaluate Formula

Formula

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

Example with Units

$$8.3985\,\text{m} = \frac{\sqrt{\left(210\,\text{kN}^2\right) - \left(4\,\text{kN}^2\right)} \cdot 2}{50.0\,\text{kN}}$$

9) Tension at Midspan for UDL on Parabolic Cable Formula

Evaluate Formula

Formula

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

Example with Units

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

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

Evaluate Formula

Formula

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

Example with Units

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

11) Tension at Supports for UDL on Parabolic Cable Formula

Evaluate Formula

Formula

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

Example with Units

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

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

Evaluate Formula

Formula

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

Example with Units

$$10.0523\,\text{kN/m} = \frac{\sqrt{\left(210\,\text{kN}^{2}\right) - \left(196\,\text{kN}^{2}\right)} \cdot 2}{15\,\text{m}}$$

Variables used in list of Parabolic Cable Tension and Length Formulas above

- **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 in list of Parabolic Cable Tension and Length 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: **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

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