calculatoratoz.com

unitsconverters.com

General Principles of Prestressed Concrete Formulas

Calculators! Examples! Conversions!

Bookmark **calculatoratoz.com**, **unitsconverters.com**

Widest Coverage of Calculators and Growing - **30,000+ Calculators!**
Calculate With a Different Unit for Each Variable - **In built Unit Conversion!**
Widest Collection of Measurements and Units - **250+ Measurements!**

Feel free to SHARE this document with your friends!

Please leave your feedback here...

List of 19 General Principles of Prestressed Concrete Formulas

General Principles of Prestressed Concrete

1) Compressive Stress due to External Moment

Open Calculator

fx $$f = M_b \cdot \left(\frac{y}{I_a} \right)$$

ex $$166.6667\text{MPa} = 4\text{kN*m} \cdot \left(\frac{30\text{mm}}{720000\text{mm}^4} \right)$$

2) Cross Sectional Area given Compressive Stress

Open Calculator

fx $$A = \frac{F}{\sigma_c}$$

ex $$200\text{mm}^2 = \frac{400\text{kN}}{2\text{Pa}}$$

3) External Moment with Known Compressive Stress

Open Calculator

fx $$M = f \cdot \frac{I_a}{y}$$

ex $$4.00008\text{kN*m} = 166.67\text{MPa} \cdot \frac{720000\text{mm}^4}{30\text{mm}}$$

4) Length of Span given Uniform Load

Open Calculator

fx $$L = \sqrt{8 \cdot L_s \cdot \frac{F}{w_b}}$$

ex $$5.09902\text{m} = \sqrt{8 \cdot 5.2\text{m} \cdot \frac{400\text{kN}}{0.64\text{kN/m}}}$$

5) Prestressing Force given Compressive Stress

Open Calculator

fx $$F = A \cdot \sigma_c$$

ex $$400\text{kN} = 200\text{mm}^2 \cdot 2\text{Pa}$$

6) Prestressing Force given Uniform Load

Open Calculator

fx $$F = w_b \cdot \frac{L^2}{8 \cdot L_s}$$

ex $$384.6154\text{kN} = 0.64\text{kN/m} \cdot \frac{(5\text{m})^2}{8 \cdot 5.2\text{m}}$$

7) Resulting Stress due to Moment and Prestress and Eccentric Strands

Open Calculator

fx $$\sigma_c = \frac{F}{A} + \left(M \cdot \frac{y}{I_a}\right) + \left(F \cdot e \cdot \frac{y}{I_a}\right)$$

ex $$2.000833\text{Pa} = \frac{400\text{kN}}{200\text{mm}^2} + \left(20\text{kN*m} \cdot \frac{30\text{mm}}{720000\text{mm}^4}\right) + \left(400\text{kN} \cdot 5.01\text{mm} \cdot \frac{30\text{mm}}{720000\text{mm}^4}\right)$$

8) Resulting Stress due to Moment and Prestressing Force

Open Calculator

fx $$\sigma_c = \frac{F}{A} + \left(M_b \cdot \frac{y}{I_a}\right)$$

ex $$2\text{Pa} = \frac{400\text{kN}}{200\text{mm}^2} + \left(4\text{kN*m} \cdot \frac{30\text{mm}}{720000\text{mm}^4}\right)$$

9) Sag of Parabola given Uniform Load

Open Calculator

fx $$L_s = w_b \cdot \frac{L^2}{8 \cdot F}$$

ex $$5\text{m} = 0.64\text{kN/m} \cdot \frac{(5\text{m})^2}{8 \cdot 400\text{kN}}$$

10) Stress due to Prestress Moment

Open Calculator

$$f = F \cdot e \cdot \frac{y}{I_a}$$

$$83.5\text{MPa} = 400\text{kN} \cdot 5.01\text{mm} \cdot \frac{30\text{mm}}{720000\text{mm}^4}$$

11) Uniform Compressive Stress due to Prestress

Open Calculator

$$\sigma_c = \frac{F}{A}$$

$$2\text{Pa} = \frac{400\text{kN}}{200\text{mm}^2}$$

12) Upward Uniform Load using Load Balancing Method

Open Calculator

$$w_b = 8 \cdot F \cdot \frac{L_s}{L^2}$$

$$0.6656\text{kN/m} = 8 \cdot 400\text{kN} \cdot \frac{5.2\text{m}}{(5\text{m})^2}$$

Materials

13) Creep Coefficient in European Code

Open Calculator

$$\Phi = \frac{\delta_t}{\delta_i}$$

$$1.6 = \frac{0.2}{0.125}$$

14) Empirical Formula for Secant Modulus Proposed by Hognestad in ACI Code

Open Calculator

$$E_c = 1800000 + (460 \cdot f_{c'})$$

$$300.8\text{MPa} = 1800000 + (460 \cdot 0.65\text{MPa})$$

15) Empirical Formula for Secant Modulus Proposed by Jensen

Open Calculator

fx $$E_c = \frac{6 \cdot 10^6}{1 + \left(\frac{2000}{f_{c'}}\right)}$$

ex $$1949.366\text{MPa} = \frac{6 \cdot 10^6}{1 + \left(\frac{2000}{0.65\text{MPa}}\right)}$$

16) Empirical Formula for Secant Modulus using ACI Code Provisions

Open Calculator

fx $$E_c = w_m^{1.5} \cdot 33 \cdot \sqrt{f_{c'}}$$

ex $$9690.047\text{MPa} = (5.1\text{kN/m}^3)^{1.5} \cdot 33 \cdot \sqrt{0.65\text{MPa}}$$

17) Instantaneous Strain given Cc

Open Calculator

fx $$\delta_i = \frac{\delta_t}{\Phi}$$

ex $$0.125 = \frac{0.2}{1.6}$$

18) Total Strain

Open Calculator

fx $$\delta_t = \delta_i + \delta_c$$

ex $$0.625 = 0.125 + 0.5$$

19) Total Strain given Creep Coefficient

Open Calculator

fx $$\delta_t = \delta_i \cdot \Phi$$

ex $$0.2 = 0.125 \cdot 1.6$$

Variables Used

- **A** Area of Beam Section *(Square Millimeter)*
- **e** Distance from Centroidal Geometric Axis *(Millimeter)*
- E_c Secant Modulus *(Megapascal)*
- **f** Bending Stress in Section *(Megapascal)*
- **F** Prestressing Force *(Kilonewton)*
- $f_{c'}$ Cylinder Strength *(Megapascal)*
- I_a Moment of Inertia of Section *(Millimeter^4)*
- **L** Span Length *(Meter)*
- L_s Sag Length of Cable *(Meter)*
- **M** External Moment *(Kilonewton Meter)*
- M_b Bending Moment in Prestress *(Kilonewton Meter)*
- w_b Uniform Load *(Kilonewton per Meter)*
- w_m Unit Weight of Material *(Kilonewton per Cubic Meter)*
- **y** Distance from Centroidal Axis *(Millimeter)*
- δ_c Creep Strain
- δ_i Instantaneous Strain
- δ_t Total Strain
- σ_c Compressive Stress in Prestress *(Pascal)*
- Φ Creep Coefficient

Constants, Functions, Measurements used

- Function: **sqrt**, sqrt(Number)
  Square root function
- Measurement: **Length** in Millimeter (mm), Meter (m)
  Length Unit Conversion
- Measurement: **Area** in Square Millimeter (mm^2)
  Area Unit Conversion
- Measurement: **Pressure** in Megapascal (MPa), Pascal (Pa)
  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: **Moment of Force** in Kilonewton Meter (kN*m)
  Moment of Force Unit Conversion
- Measurement: **Specific Weight** in Kilonewton per Cubic Meter (kN/m^3)
  Specific Weight Unit Conversion
- Measurement: **Second Moment of Area** in Millimeter^4 (mm^4)
  Second Moment of Area Unit Conversion

Check other formula lists

- **General Principles of Prestressed Concrete Formulas**
- **Transmission of Prestress Formulas**

Feel free to SHARE this document with your friends!

PDF Available in

English Spanish French German Russian Italian Portuguese Polish Dutch

9/29/2023 | 10:05:46 PM UTC

Please leave your feedback here...