



Loss due to Elastic Shortening Formulas

Calculators!

Examples!

Conversions!

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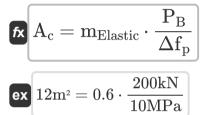


List of 22 Loss due to Elastic Shortening Formulas



Post-Tensioned Members 🕑





2) Average Stress for Parabolic Tendons

ex 9.981mm = 20.001mm - 10.02mm

$$f_{x} f_{c,avg} = f_{c1} + \frac{2}{3} \cdot (f_{c2} - f_{c1})$$

$$e_{x} 10.202 MPa = 10.006 MPa + \frac{2}{3} \cdot (10.3 MPa - 10.006 MPa)$$

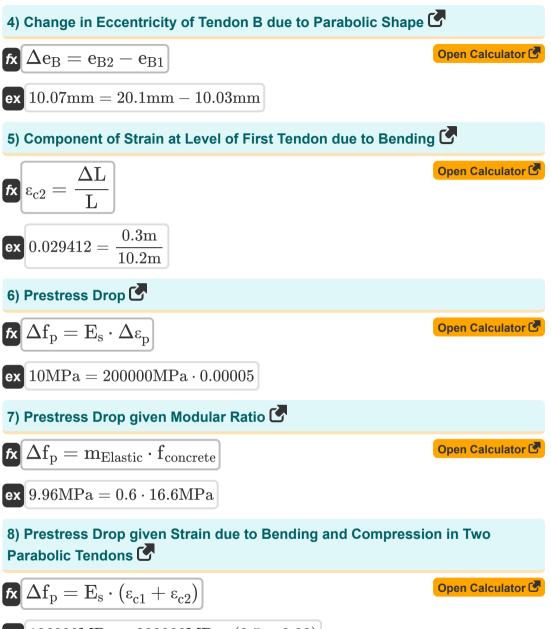
$$f_{x} \Delta e_{A} = e_{A2} - e_{A1}$$

$$Open Calculator$$

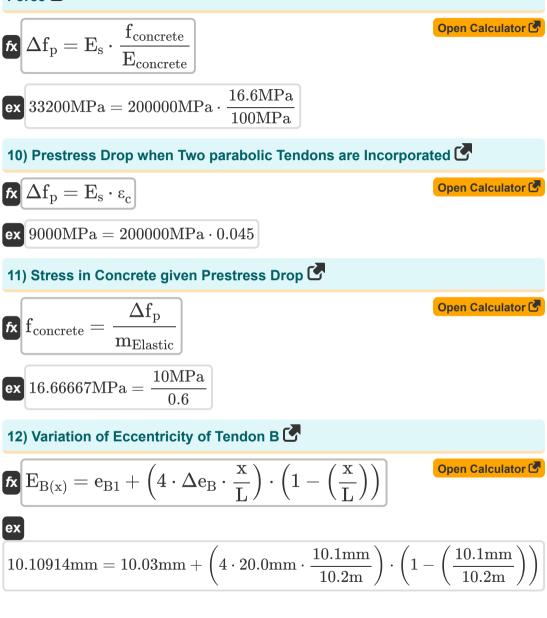


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Open Calculator



9) Prestress Drop given Stress in concrete at Same Level due to Prestressing Force







13) Variation of Eccentricity on Tendon A
(a) Variation of Eccentricity on Tendon A
(b) E_{A(x)} = e_{A1} +
$$\left(4 \cdot \Delta e_A \cdot \frac{x}{L}\right) \cdot \left(1 - \left(\frac{x}{L}\right)\right)$$

(c) Open Calculator (c)
(c) E_{A(x)} = e_{A1} + $\left(4 \cdot \Delta e_A \cdot \frac{x}{L}\right) \cdot \left(1 - \left(\frac{10.1 \text{mm}}{10.2 \text{m}}\right)\right)$
(c) E_{A(x)} = e_{A1} + $\left(4 \cdot 10.0 \text{mm} \cdot \frac{10.1 \text{mm}}{10.2 \text{m}}\right) \cdot \left(1 - \left(\frac{10.1 \text{mm}}{10.2 \text{m}}\right)\right)$
(c) Pre-Tensioned Members (c)
(c) Pre-Tensioned Members (



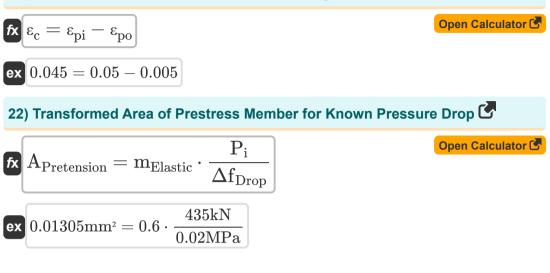
17) Prestress Drop given Initial Prestress Force
$$\checkmark$$

(A $\Delta f_{Drop} = P_i \cdot \frac{m_{Elastic}}{A_{Pretension}}$
(Q $0.01044MPa = 435kN \cdot \frac{0.6}{0.025mm^2}$
18) Prestress Drop given Pressure after Immediate Loss (\checkmark
(A $f_{Drop} = \left(\frac{P_o}{A_{Pretension}}\right) \cdot m_{Elastic}$
(A $\Delta f_{Drop} = \left(\frac{P_o}{A_{Pretension}}\right) \cdot m_{Elastic}$
(A $0.0048MPa = \left(\frac{96000kN}{12mm^2}\right) \cdot 0.6$
19) Prestressing Force after Immediate Loss given Initial Prestress (\checkmark
(A $P_o = P_i \cdot \frac{A_{Pretension}}{A_{Pretension}}$
(A $P_o = P_i \cdot \frac{A_{Pretension}}{A_{Pretension}}$
(A $208800kN = 435kN \cdot \frac{12mm^2}{0.025mm^2}$
20) Residual Strain in Steel for Known Strain due to Elastic Shortening (\checkmark
(A $P_o = P_i - \varepsilon_c$
(D $P_o = 0.05 - 0.045$



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21) Strain in Concrete due to Elastic Shortening 🖸







Variables Used

- A_c Concrete Occupied Area (Square Meter)
- Apre tension Pre-Tensioned Area of Concrete (Square Millimeter)
- Apretension Transformed Section Area of Prestress (Square Millimeter)
- EA(x) Eccentricity Variation of Tendon A (Millimeter)
- **e**A1 Eccentricity at End for A (*Millimeter*)
- **e**_{A2} Eccentricity at Midspan for A (Millimeter)
- EB(x) Eccentricity Variation of Tendon B (Millimeter)
- **e**B1 Eccentricity at End for B (*Millimeter*)
- **e**B2 Eccentricity at Midspan B (Millimeter)
- Econcrete Modulus of Elasticity Concrete (Megapascal)
- Es Modulus of Elasticity of Steel Reinforcement (Megapascal)
- fc,avg Average Stress (Megapascal)
- fc1 Stress at End (Megapascal)
- fc2 Stress at Midspan (Megapascal)
- fconcrete Stress in Concrete Section (Megapascal)
- L Length of Beam in Prestress (Meter)
- m_{Elastic} Modular Ratio for Elastic Shortening
- **P**_B Prestress Force (Kilonewton)
- P_i Initial Prestress Force (Kilonewton)
- **P**o Prestressing Force after Loss (Kilonewton)
- X Distance from Left End (Millimeter)
- Δe_A Change in Eccentricity at A (*Millimeter*)

- Δe_B Change in Eccentricity B (Millimeter)
- Δf_{Drop} Drop in Prestress (Megapascal)
- Δf_p Prestress Drop (Megapascal)
- **ΔL** Change in Length Dimension (*Meter*)
- $\Delta \epsilon_p$ Change in Strain
- ε_c Concrete Strain
- ε_{c1} Strain due to Compression
- ε_{c2} Strain due to Bending
- ε_{pi} Initial Strain
- ε_{po} Residual Strain





Constants, Functions, Measurements used

- Measurement: Length in Millimeter (mm), Meter (m) Length Unit Conversion
- Measurement: Area in Square Meter (m²), Square Millimeter (mm²) Area Unit Conversion
- Measurement: Pressure in Megapascal (MPa) Pressure Unit Conversion
- Measurement: Force in Kilonewton (kN) Force Unit Conversion



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Check other formula lists

- Loss due to Anchorage Slip, Friction Loss and General Geometric Properties Formulas
- Loss due to Elastic Shortening Formulas

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