



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

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Loss due to Anchorage Slip, Friction Loss and General Geometric Properties C

Force Variation Diagram and Loss Due to Anchorage Slip C

1) Anchorage Slip given Settling Length 🗹

fx
$$\Delta = 0.5 \cdot \Delta \mathrm{f_p} \cdot rac{\mathrm{l_{set}}}{\mathrm{A_p} \cdot \mathrm{E_s}}$$

ex 4.16mm = $0.5 \cdot 10$ MPa $\cdot \frac{41.6$ m}{0.25mm² $\cdot 200000$ MPa

2) Area of Prestressing Steel given Settling Length

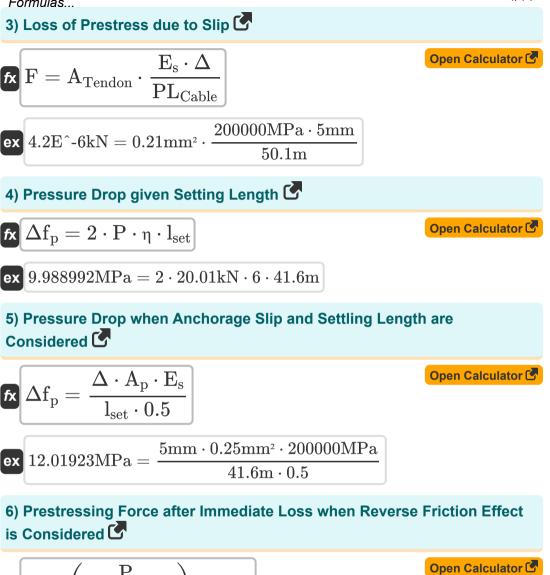
fx
$$\mathrm{A_p} = 0.5 \cdot \Delta \mathrm{f_p} \cdot rac{\mathrm{l_{set}}}{\Delta \cdot \mathrm{E_s}}$$

ex
$$0.208 \mathrm{mm^2} = 0.5 \cdot 10 \mathrm{MPa} \cdot rac{41.6 \mathrm{m}}{5 \mathrm{mm} \cdot 200000 \mathrm{MPa}}$$



Open Calculator 🕑

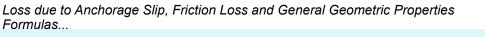
Open Calculator

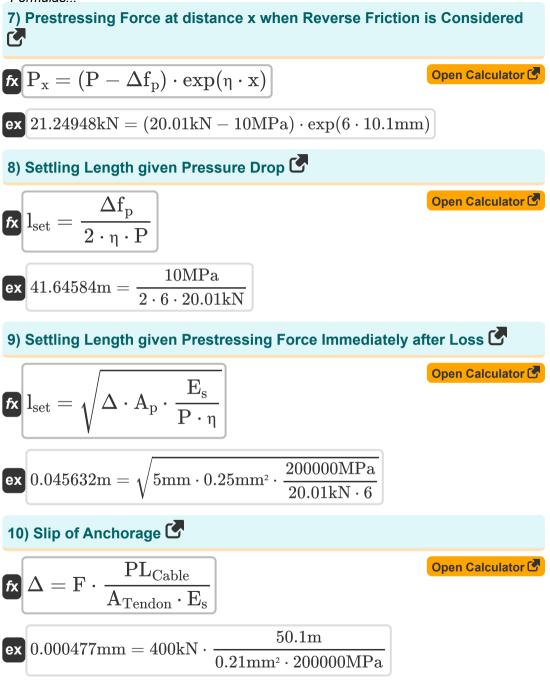


fx
$$P = \left(\frac{P_x}{\exp(\eta \cdot x)}\right) + \Delta f_p$$

ex 0.01 kN $= \left(\frac{96$ kN}{\exp(6 \cdot 10.1mm)}\right) + 10MPa











Friction Loss

11) Coefficient of Friction given Px 🕑



14) Prestressing Force at Distance x from Stretching End for Known Resultant

$$P_{x} = \frac{N}{2 \cdot \sin\left(\frac{\theta}{2}\right)}$$

$$ex \quad 96.59258 \text{kN} = \frac{50 \text{kN}}{2 \cdot \sin\left(\frac{30^{\circ}}{2}\right)}$$

$$15) \text{ Resultant of Vertical Reaction from Concrete on Tendon }$$

$$N = 2 \cdot P_{x} \cdot \sin\left(\frac{\theta}{2}\right)$$

$$Open Calculator$$

ex $49.69326 \mathrm{kN} = 2 \cdot 96 \mathrm{kN} \cdot \mathrm{sin} \left(\frac{30^{\circ}}{2} \right)$

16) Subtended Angle given Resultant Reaction 🕑

fx
$$\theta = 2 \cdot a \sin\left(\frac{N}{2 \cdot P_x}\right)$$

ex $30.18957^{\circ} = 2 \cdot a \sin\left(\frac{50 \text{kN}}{2 \cdot 96 \text{kN}}\right)$





Open Calculator

17) Wobble Coefficient k given Px 🖸

$$\mathbf{fx} \mathbf{k} = \left(\frac{1}{\mathbf{x}}\right) \cdot \left(1 - \left(\mu_{\text{friction}} \cdot \mathbf{a}\right) - \left(\frac{\mathbf{P}_{\mathbf{x}}}{\mathbf{P}_{\text{End}}}\right)\right) \quad \text{Open Calculator } \mathbf{fx}$$

$$\mathbf{ex} \quad 0.01957 = \left(\frac{1}{10.1 \text{mm}}\right) \cdot \left(1 - \left(0.067 \cdot 2^{\circ}\right) - \left(\frac{96 \text{kN}}{120 \text{kN}}\right)\right)$$

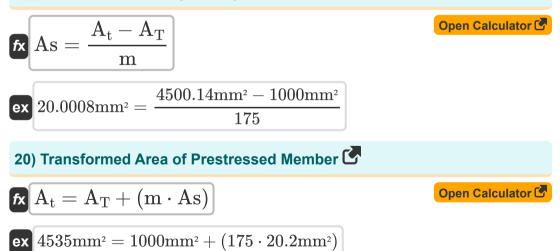
General Geometric Properties 🕑



fx
$$\mathbf{A}_{\mathrm{T}} = \mathbf{A}_{\mathrm{t}} - (\mathrm{m} \cdot \mathrm{As})$$

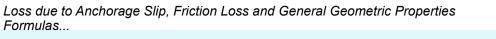
ex
$$965.14 \mathrm{mm^2} = 4500.14 \mathrm{mm^2} - (175 \cdot 20.2 \mathrm{mm^2})$$

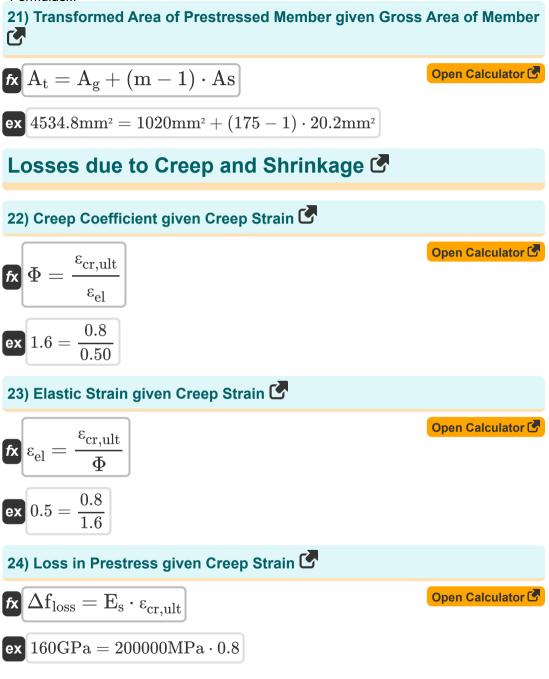
19) Area of Prestressing Steel given Transformed Area 🕑





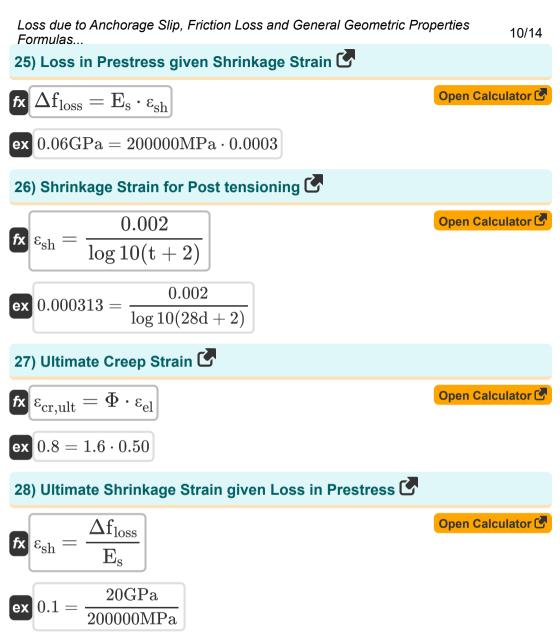
Open Calculator















Variables Used

- **a** Cumulative Angle (Degree)
- A_g Gross Area of Cross-Section (Square Millimeter)
- A_p Steel Area in Prestress (Square Millimeter)
- At Transformed Area of Prestressed Member (Square Millimeter)
- **A_T** Transformed Area of Concrete (Square Millimeter)
- ATendon Tendon Area (Square Millimeter)
- As Area of Prestressing Steel (Square Millimeter)
- Es Modulus of Elasticity of Steel Reinforcement (Megapascal)
- F Prestressing Force (Kilonewton)
- k Wobble Coefficient
- Iset Settling Length (Meter)
- **m** Modular Ratio
- N Vertical Resultant (Kilonewton)
- P Prestressing force after Immediate Losses (Kilonewton)
- PEnd End Prestress Force (Kilonewton)
- **P_x** Prestress Force at a Distance (*Kilonewton*)
- PL_{Cable} Cable Length (Meter)
- **t** Age of Concrete (Day)
- X Distance from Left End (Millimeter)
- Δ Slip of Anchorage (Millimeter)
- Δf_{loss} Loss in Prestress (Gigapascal)
- Δf_p Prestress Drop (Megapascal)





- εcr.ult Ultimate Creep Strain
- ε_{el} Elastic Strain
- ε_{sh} Shrinkage Strain
- **η** Simplified Term
- **θ** Subtended Angle in Degrees (*Degree*)
- **µ**friction Prestress Friction Coefficient
- **Φ** Creep Coefficient of Prestress





Constants, Functions, Measurements used

- Function: asin, asin(Number) Inverse trigonometric sine function
- Function: **exp**, exp(Number) Exponential function
- Function: log10, log10(Number) Common logarithm function (base 10)
- Function: **sin**, sin(Angle) *Trigonometric sine function*
- Function: **sqrt**, sqrt(Number) Square root function
- Measurement: Length in Millimeter (mm), Meter (m)
 Length Unit Conversion
- Measurement: Time in Day (d) Time Unit Conversion
- Measurement: Area in Square Millimeter (mm²) Area Unit Conversion
- Measurement: **Pressure** in Megapascal (MPa), Gigapascal (GPa) *Pressure Unit Conversion*
- Measurement: Force in Kilonewton (kN) Force Unit Conversion
- Measurement: Angle in Degree (°) Angle Unit Conversion



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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