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Transmission of Prestress Formulas

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List of 15 Transmission of Prestress Formulas

Transmission of Prestress ⬀

Post-Tensioned Members ⬀

1) Allowable Bearing Stress in Local Zone ⬀

Open Calculator ⬀

$$fx \quad F_p = 0.48 \cdot f_{ci} \cdot \sqrt{\frac{A_b}{A_{pun}}}$$

$$ex \quad 0.455605 MPa = 0.48 \cdot 15.5 N/mm^2 \cdot \sqrt{\frac{30mm^2}{0.008m^2}}$$

2) Allowable Stress given End Zone Reinforcement ⬀

Open Calculator ⬀

$$fx \quad \sigma_{al} = \frac{2.5 \cdot M_t}{A_{st} \cdot h}$$

$$ex \quad 0.013718 N/m^2 = \frac{2.5 \cdot 0.03 N*m}{0.272m^2 \cdot 20.1cm}$$

3) Bearing Stress in Local Zone ↗

Open Calculator ↗

$$fx \quad f_{br} = \frac{F}{A_{pun}}$$

$$ex \quad 50\text{N/mm}^2 = \frac{400\text{kN}}{0.008\text{m}^2}$$

4) Bursting Force for Square End Zone ↗

Open Calculator ↗

$$fx \quad F_{bst} = F \cdot \left(0.32 - 0.3 \cdot \left(\frac{Y_{po}}{Y_o} \right) \right)$$

$$ex \quad 68\text{kN} = 400\text{kN} \cdot \left(0.32 - 0.3 \cdot \left(\frac{5.0\text{cm}}{10\text{cm}} \right) \right)$$

5) Cube Strength at Transfer given Allowable Bearing Stress ↗

Open Calculator ↗

$$fx \quad f_{ci} = \frac{F_p}{0.48 \cdot \sqrt{\frac{A_b}{A_{pun}}}}$$

$$ex \quad 16.67014\text{N/mm}^2 = \frac{0.49\text{MPa}}{0.48 \cdot \sqrt{\frac{30\text{mm}^2}{0.008\text{m}^2}}}$$

6) End Zone Reinforcement along Transmission Length ↗

$$fx \quad A_{st} = \frac{2.5 \cdot M_t}{\sigma_{al} \cdot h}$$

$$ex \quad 0.000138 m^2 = \frac{2.5 \cdot 0.03 N*m}{27 N/m^2 \cdot 20.1 cm}$$

7) End Zone Reinforcement in each Direction ↗

$$fx \quad A_{st} = \frac{F_{bst}}{f_s}$$

$$ex \quad 0.272 m^2 = \frac{68 kN}{250 N/mm^2}$$

8) Length of Side of Bearing Plate given Bursting Force for Square End Zone ↗

$$fx \quad Y_{po} = -\left(\frac{\left(\frac{F_{bst}}{F} \right) - 0.32}{0.3} \right) \cdot Y_o$$

$$ex \quad 5 cm = -\left(\frac{\left(\frac{68 kN}{400 kN} \right) - 0.32}{0.3} \right) \cdot 10 cm$$

9) Prestress in Tendon given Bearing Stress ⤤

fx $F = f_{br} \cdot A_{pun}$

Open Calculator ⤤

ex $400 kN = 50 N/mm^2 \cdot 0.008 m^2$

10) Prestress in Tendon given Bursting Force for Square End Zone ⤤

fx $F = \dfrac{F_{bst}}{0.32 - 0.3 \cdot \left(\frac{Y_{po}}{Y_o}\right)}$

Open Calculator ⤤

ex $400 kN = \dfrac{68 kN}{0.32 - 0.3 \cdot \left(\frac{5.0 cm}{10 cm}\right)}$

11) Stress in Transverse Reinforcement given End Zone Reinforcement ⤤

fx $f_s = \dfrac{F_{bst}}{A_{st}}$

Open Calculator ⤤

ex $250 N/mm^2 = \dfrac{68 kN}{0.272 m^2}$

12) Transverse Dimension of End Zone given Bursting Force for Square End Zone ⤤

fx $Y_o = \dfrac{-0.3 \cdot Y_{po}}{\left(\frac{F_{bst}}{F}\right) - 0.32}$

Open Calculator ⤤

ex $10 cm = \dfrac{-0.3 \cdot 5.0 cm}{\left(\frac{68 kN}{400 kN}\right) - 0.32}$

Pre-Tensioned Members 🗗

13) Bond Length given Development Length of Section 🗗

fx $L_{bond} = Ld - L_t$

Open Calculator 🗗

ex $4.9cm = 550mm - 50.1cm$

14) Development Length of Section 🗗

fx $Ld = L_t + L_{bond}$

Open Calculator 🗗

ex $551mm = 50.1cm + 5cm$

15) Transmission Length given Development Length of Section 🗗

fx $L_t = Ld - L_{bond}$

Open Calculator 🗗

ex $50cm = 550mm - 5cm$

Variables Used

- A_b Bearing Area Between Screw and Nut *(Square Millimeter)*

- A_{pun} Punching Area *(Square Meter)*

- A_{st} End Zone Reinforcement *(Square Meter)*

- F Prestressing Force *(Kilonewton)*

- f_{br} Bearing Stress *(Newton per Square Millimeter)*

- F_{bst} Prestress Bursting force *(Kilonewton)*

- f_{ci} Cube Strength *(Newton per Square Millimeter)*

- F_p Allowable Bearing Stress in Members *(Megapascal)*

- f_s Stress in Transverse Reinforcement *(Newton per Square Millimeter)*

- h Total Depth *(Centimeter)*

- L_{bond} Bond Length *(Centimeter)*

- L_t Transmission Length *(Centimeter)*

- Ld Prestress Development Length *(Millimeter)*

- M_t Moment in Structures *(Newton Meter)*

- Y_o Traverse Dimension of End Zone *(Centimeter)*

- Y_{po} Side Length of Bearing Plate *(Centimeter)*

- σ_{al} Allowable Stress *(Newton per Square Meter)*

Constants, Functions, Measurements used

- Function: **sqrt**, sqrt(Number)
  Square root function
- Measurement: **Length** in Centimeter (cm), Millimeter (mm)
  Length Unit Conversion ⬀
- Measurement: **Area** in Square Millimeter (mm²), Square Meter (m²)
  Area Unit Conversion ⬀
- Measurement: **Pressure** in Megapascal (MPa), Newton per Square Millimeter (N/mm²), Newton per Square Meter (N/m²)
  Pressure Unit Conversion ⬀
- Measurement: **Energy** in Newton Meter (N*m)
  Energy Unit Conversion ⬀
- Measurement: **Force** in Kilonewton (kN)
  Force Unit Conversion ⬀

Check other formula lists

- **Analysis of Prestressing and Bending Stresses Formulas**
- **Crack Width and Deflection of Prestress Concrete Members Formulas**
- **General Principles of Prestressed Concrete Formulas**
- **Transmission of Prestress Formulas**

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