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Joint Analysis Formulas

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List of 8 Joint Analysis Formulas

Joint Analysis 🔗

1) Amount of Compression in Parts Joined by Bolt 🔗

Open Calculator 🔗

$$fx \quad \delta_c = \frac{P_i}{k}$$

$$ex \quad 11mm = \frac{16500N}{1500N/mm}$$

2) Elongation of Bolt under Action of Pre Load 🔗

Open Calculator 🔗

$$fx \quad \delta_b = \frac{P_i}{k_b},$$

$$ex \quad 0.05205mm = \frac{16500N}{3.17E^5N/mm}$$

3) Factor of Safety given Tensile Force on Bolt in Tension 🔗

Open Calculator 🔗

$$fx \quad f_s = \frac{\pi}{4} \cdot d_c^2 \cdot \frac{S_{yt}}{P_{tb}}$$

$$ex \quad 3.00574 = \frac{\pi}{4} \cdot (12mm)^2 \cdot \frac{265.5N/mm^2}{9990N}$$

4) Maximum Tensile Stress in Bolt 🔗

Open Calculator 🔗

$$fx\quad \sigma t_{max} = \frac{P_{tb}}{\frac{\pi}{4} \cdot d_c^2}$$

$$ex\quad 88.33099 \text{N/mm}^2 = \frac{9990\text{N}}{\frac{\pi}{4} \cdot (12\text{mm})^2}$$

5) Primary Shear Force of Eccentrically Loaded Bolted Connection 🔗

Open Calculator 🔗

$$fx\quad (P_1') = \frac{P}{n}$$

$$ex\quad 3000\text{N} = \frac{12000\text{N}}{4}$$

6) Yield Strength of Bolt in Shear given Tensile Force on Bolt in Shear 🔗

Open Calculator 🔗

$$fx\quad S_{sy} = P_{tb} \cdot \frac{f_s}{\pi \cdot d_c \cdot h}$$

$$ex\quad 132.4965 \text{N/mm}^2 = 9990\text{N} \cdot \frac{3}{\pi \cdot 12\text{mm} \cdot 6\text{mm}}$$

7) Yield Strength of Bolt in Tension given Tensile Force on Bolt in Shear 🔗

Open Calculator 🔗

$$fx\quad S_{yt} = \frac{2 \cdot P_{tb} \cdot f_s}{\pi \cdot d_c \cdot h}$$

$$ex\quad 264.993 \text{N/mm}^2 = \frac{2 \cdot 9990\text{N} \cdot 3}{\pi \cdot 12\text{mm} \cdot 6\text{mm}}$$

8) Yield Strength of Bolt in Tension given Tensile Force on Bolt in Tension ↗

fx $S_{yt} = 4 \cdot P_{tb} \cdot \dfrac{f_s}{\pi \cdot d_c^2}$

ex $264.993 \text{N/mm}^2 = 4 \cdot 9990\text{N} \cdot \dfrac{3}{\pi \cdot (12\text{mm})^2}$

Variables Used

- d_c Core Diameter of Bolt *(Millimeter)*

- δ_b Elongation of Bolt *(Millimeter)*

- f_s Factor of Safety of Bolted Joint

- h Height of Nut *(Millimeter)*

- k Combined Stiffness of Bolt *(Newton per Millimeter)*

- k_b' Stiffness of Bolt *(Newton per Millimeter)*

- n Number of Bolts in Bolted Joint

- P Imaginary Force on Bolt *(Newton)*

- P_1' Primary Shear Force on Bolt *(Newton)*

- P_i Pre Load in Bolt *(Newton)*

- P_{tb} Tensile Force in Bolt *(Newton)*

- S_{sy} Shear Yield Strength of Bolt *(Newton per Square Millimeter)*

- S_{yt} Tensile Yield Strength of Bolt *(Newton per Square Millimeter)*

- δ_c Amount of Compression of Bolted Joint *(Millimeter)*

- σt_{max} Maximum Tensile Stress in Bolt *(Newton per Square Millimeter)*

Constants, Functions, Measurements used

- Constant: **pi**, 3.14159265358979323846264338327950288
  Archimedes' constant
- Measurement: **Length** in Millimeter (mm)
  Length Unit Conversion ⬈
- Measurement: **Force** in Newton (N)
  Force Unit Conversion ⬈
- Measurement: **Stiffness Constant** in Newton per Millimeter (N/mm)
  Stiffness Constant Unit Conversion ⬈
- Measurement: **Stress** in Newton per Square Millimeter (N/mm²)
  Stress Unit Conversion ⬈

Check other formula lists

- **Joint Analysis Formulas** ⬀

- **Load and Strength Characteristics Formulas** ⬀

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7/18/2024 | 5:35:34 AM UTC

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