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Proof Load on Spring Formulas

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List of 18 Proof Load on Spring Formulas

Proof Load on Spring

Leaf Springs

1) Deflection given Proof Load on Leaf Spring

Open Calculator

fx $$\delta = \frac{3 \cdot W_{O\ (Leaf\ Spring)} \cdot L^3}{8 \cdot E \cdot n \cdot t^3 \cdot b}$$

ex $$3.404713\text{mm} = \frac{3 \cdot 585\text{kN} \cdot (4170\text{mm})^3}{8 \cdot 20000\text{MPa} \cdot 8 \cdot (460\text{mm})^3 \cdot 300\text{mm}}$$

2) Length given Proof Load on Leaf Spring

Open Calculator

fx $$L = \left(\frac{8 \cdot E \cdot n \cdot b \cdot t^3 \cdot \delta}{3 \cdot W_{O\ (Leaf\ Spring)}} \right)^{\frac{1}{3}}$$

ex $$4168.075\text{mm} = \left(\frac{8 \cdot 20000\text{MPa} \cdot 8 \cdot 300\text{mm} \cdot (460\text{mm})^3 \cdot 3.4\text{mm}}{3 \cdot 585\text{kN}} \right)^{\frac{1}{3}}$$

3) Modulus of Elasticity given Proof Load on Leaf Spring

Open Calculator

$$E = \frac{3 \cdot W_{O\ (Leaf\ Spring)} \cdot L^3}{8 \cdot n \cdot b \cdot t^3 \cdot \delta}$$

$$20027.73\text{MPa} = \frac{3 \cdot 585\text{kN} \cdot (4170\text{mm})^3}{8 \cdot 8 \cdot 300\text{mm} \cdot (460\text{mm})^3 \cdot 3.4\text{mm}}$$

4) Number of Plates given Proof Load on Leaf Spring

Open Calculator

$$n = \frac{3 \cdot W_{O\ (Leaf\ Spring)} \cdot L^3}{8 \cdot E \cdot b \cdot t^3 \cdot \delta}$$

$$8.01109 = \frac{3 \cdot 585\text{kN} \cdot (4170\text{mm})^3}{8 \cdot 20000\text{MPa} \cdot 300\text{mm} \cdot (460\text{mm})^3 \cdot 3.4\text{mm}}$$

5) Proof Load on Leaf Spring

Open Calculator

$$W_{O\ (Leaf\ Spring)} = \frac{8 \cdot E \cdot n \cdot b \cdot t^3 \cdot \delta}{3 \cdot L^3}$$

$$584.1901\text{kN} = \frac{8 \cdot 20000\text{MPa} \cdot 8 \cdot 300\text{mm} \cdot (460\text{mm})^3 \cdot 3.4\text{mm}}{3 \cdot (4170\text{mm})^3}$$

6) Thickness given Proof Load on Leaf Spring

Open Calculator

$$t = \left(\frac{3 \cdot W_{O\ (\text{Leaf Spring})} \cdot L^3}{8 \cdot E \cdot n \cdot \delta \cdot b} \right)^{\frac{1}{3}}$$

$$460.2125\text{mm} = \left(\frac{3 \cdot 585\text{kN} \cdot (4170\text{mm})^3}{8 \cdot 20000\text{MPa} \cdot 8 \cdot 3.4\text{mm} \cdot 300\text{mm}} \right)^{\frac{1}{3}}$$

7) Width given Proof Load on Leaf Spring

Open Calculator

$$b = \frac{3 \cdot W_{O\ (\text{Leaf Spring})} \cdot L^3}{8 \cdot E \cdot n \cdot t^3 \cdot \delta}$$

$$300.4159\text{mm} = \frac{3 \cdot 585\text{kN} \cdot (4170\text{mm})^3}{8 \cdot 20000\text{MPa} \cdot 8 \cdot (460\text{mm})^3 \cdot 3.4\text{mm}}$$

Quarter Elliptical Springs

8) Deflection given Proof Load in Quarter Elliptical Spring

Open Calculator

$$\delta = \frac{6 \cdot W_{O\ (\text{Elliptical Spring})} \cdot L^3}{E \cdot n \cdot t^3 \cdot b}$$

$$3.445454\text{mm} = \frac{6 \cdot 37\text{kN} \cdot (4170\text{mm})^3}{20000\text{MPa} \cdot 8 \cdot (460\text{mm})^3 \cdot 300\text{mm}}$$

9) Length given Proof Load in Quarter Elliptical Spring

Open Calculator

$$L = \left(\frac{E \cdot n \cdot b \cdot t^3 \cdot \delta}{6 \cdot W_{O\ (Elliptical\ Spring)}} \right)^{\frac{1}{3}}$$

$$4151.581mm = \left(\frac{20000MPa \cdot 8 \cdot 300mm \cdot (460mm)^3 \cdot 3.4mm}{6 \cdot 37kN} \right)^{\frac{1}{3}}$$

10) Modulus of Elasticity given Proof Load in Quarter Elliptical Spring

Open Calculator

$$E = \frac{6 \cdot W_{O\ (Elliptical\ Spring)} \cdot L^3}{n \cdot b \cdot t^3 \cdot \delta}$$

$$20267.37MPa = \frac{6 \cdot 37kN \cdot (4170mm)^3}{8 \cdot 300mm \cdot (460mm)^3 \cdot 3.4mm}$$

11) Number of Plates given Proof Load in Quarter Elliptical Spring

Open Calculator

$$n = \frac{6 \cdot W_{O\ (Elliptical\ Spring)} \cdot L^3}{E \cdot b \cdot t^3 \cdot \delta}$$

$$8.10695 = \frac{6 \cdot 37kN \cdot (4170mm)^3}{20000MPa \cdot 300mm \cdot (460mm)^3 \cdot 3.4mm}$$

12) Proof Load in Quarter Elliptical Spring

Open Calculator

$$W_{O\ (\text{Elliptical Spring})} = \frac{E \cdot n \cdot b \cdot t^3 \cdot \delta}{6 \cdot L^3}$$

$$36.51188\text{kN} = \frac{20000\text{MPa} \cdot 8 \cdot 300\text{mm} \cdot (460\text{mm})^3 \cdot 3.4\text{mm}}{6 \cdot (4170\text{mm})^3}$$

13) Thickness given Proof Load in Quarter Elliptical Spring

Open Calculator

$$t = \left(\frac{6 \cdot W_{O\ (\text{Elliptical Spring})} \cdot L^3}{E \cdot n \cdot \delta \cdot b} \right)^{\frac{1}{3}}$$

$$462.0408\text{mm} = \left(\frac{6 \cdot 37\text{kN} \cdot (4170\text{mm})^3}{20000\text{MPa} \cdot 8 \cdot 3.4\text{mm} \cdot 300\text{mm}} \right)^{\frac{1}{3}}$$

14) Width given Proof Load in Quarter Elliptical Spring

Open Calculator

$$b = \frac{6 \cdot W_{O\ (\text{Elliptical Spring})} \cdot L^3}{E \cdot n \cdot t^3 \cdot \delta}$$

$$304.0106\text{mm} = \frac{6 \cdot 37\text{kN} \cdot (4170\text{mm})^3}{20000\text{MPa} \cdot 8 \cdot (460\text{mm})^3 \cdot 3.4\text{mm}}$$

Springs in Parallel and Series Load

15) Springs in Parallel - Load

Open Calculator

fx $W_{load} = W_1 + W_2$

ex $85N = 35N + 50N$

16) Springs in Parallel - Spring Constant

Open Calculator

fx $K = K_1 + K_2$

ex $100N/mm = 49N/mm + 51N/mm$

17) Springs in Series- Deflection

Open Calculator

fx $\delta = \delta_1 + \delta_2$

ex $179mm = 36mm + 143mm$

18) Springs in Series- Spring Constant

Open Calculator

fx $K = \frac{K_1 \cdot K_2}{K_1 + K_2}$

ex $24.99N/mm = \frac{49N/mm \cdot 51N/mm}{49N/mm + 51N/mm}$

Variables Used

- **b** Width of Cross Section *(Millimeter)*
- **E** Young's Modulus *(Megapascal)*
- **K** Stiffness of Spring *(Newton per Millimeter)*
- K_1 Stiffness of Spring 1 *(Newton per Millimeter)*
- K_2 Stiffness of Spring 2 *(Newton per Millimeter)*
- **L** Length in Spring *(Millimeter)*
- **n** Number of Plates
- **t** Thickness of Section *(Millimeter)*
- W_1 Load 1 *(Newton)*
- W_2 Load 2 *(Newton)*
- W_{load} Spring Load *(Newton)*
- W_O **(Elliptical Spring)** Proof Load on Elliptical Spring *(Kilonewton)*
- W_O **(Leaf Spring)** Proof Load on Leaf Spring *(Kilonewton)*
- **δ** Deflection of Spring *(Millimeter)*
- δ_1 Deflection 1 *(Millimeter)*
- δ_2 Deflection 2 *(Millimeter)*

Constants, Functions, Measurements used

- Measurement: **Length** in Millimeter (mm)
  Length Unit Conversion
- Measurement: **Force** in Kilonewton (kN), Newton (N)
  Force Unit Conversion
- Measurement: **Stiffness Constant** in Newton per Millimeter (N/mm)
  Stiffness Constant Unit Conversion
- Measurement: **Stress** in Megapascal (MPa)
  Stress Unit Conversion

Check other formula lists

- **Deflection in Spring Formulas**
- **Maximum Bending Stress in Spring Formulas**
- **Proof Load on Spring Formulas**
- **Stiffness Formulas**

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