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Stress and Strain Formulas

Calculators! Examples! Conversions!

List of 61 Stress and Strain Formulas

Stress and Strain

Bar of Uniform Strength

1) Area at Section 1 of Bars of Uniform Strength

Open Calculator

fx $$A_1 = A_2 \cdot e^{\gamma \cdot \frac{L_{Rod}}{\sigma_{Uniform}}}$$

ex $$0.001256\text{m}^2 = 0.001250\text{m}^2 \cdot e^{70\text{kN/m}^3 \cdot \frac{1.83\text{m}}{27\text{MPa}}}$$

2) Area at Section 2 of Bars of Uniform Strength

Open Calculator

fx $$A_2 = \frac{A_1}{e^{\gamma \cdot \frac{L_{Rod}}{\sigma_{Uniform}}}}$$

ex $$0.00125\text{m}^2 = \frac{0.001256\text{m}^2}{e^{70\text{kN/m}^3 \cdot \frac{1.83\text{m}}{27\text{MPa}}}}$$

3) Weight Density of Bar using Area at Section 1 of Bars of uniform Strength

Open Calculator

fx $$\gamma = \left(2.303 \cdot \log 10\left(\frac{A_1}{A_2}\right)\right) \cdot \frac{\sigma_{Uniform}}{L_{Rod}}$$

ex $$70.66298\text{kN/m}^3 = \left(2.303 \cdot \log 10\left(\frac{0.001256\text{m}^2}{0.001250\text{m}^2}\right)\right) \cdot \frac{27\text{MPa}}{1.83\text{m}}$$

Circular Tapering Rod

4) Diameter at One End of Circular Tapering Rod

Open Calculator

fx $$d_2 = 4 \cdot W_{\text{Applied load}} \cdot \frac{L}{\pi \cdot E \cdot \delta l \cdot d_1}$$

ex $$0.031831\text{m} = 4 \cdot 150\text{kN} \cdot \frac{3\text{m}}{\pi \cdot 20000\text{MPa} \cdot 0.020\text{m} \cdot 0.045\text{m}}$$

5) Diameter at Other End of Circular Tapering Rod

Open Calculator

fx $$d_1 = 4 \cdot W_{\text{Applied load}} \cdot \frac{L}{\pi \cdot E \cdot \delta l \cdot d_2}$$

ex $$0.040926\text{m} = 4 \cdot 150\text{kN} \cdot \frac{3\text{m}}{\pi \cdot 20000\text{MPa} \cdot 0.020\text{m} \cdot 0.035\text{m}}$$

6) Diameter of Circular Tapered Rod with Uniform Cross Section

Open Calculator

fx $$d = \sqrt{4 \cdot W_{\text{Applied load}} \cdot \frac{L}{\pi \cdot E \cdot \delta l}}$$

ex $$0.037847\text{m} = \sqrt{4 \cdot 150\text{kN} \cdot \frac{3\text{m}}{\pi \cdot 20000\text{MPa} \cdot 0.020\text{m}}}$$

7) Elongation of Circular Tapering Rod

Open Calculator

fx $$\delta l = 4 \cdot W_{\text{Applied load}} \cdot \frac{L}{\pi \cdot E \cdot d_1 \cdot d_2}$$

ex $$0.018189\text{m} = 4 \cdot 150\text{kN} \cdot \frac{3\text{m}}{\pi \cdot 20000\text{MPa} \cdot 0.045\text{m} \cdot 0.035\text{m}}$$

8) Elongation of Prismatic Rod

Open Calculator

fx $$\delta l = 4 \cdot W_{\text{Applied load}} \cdot \frac{L}{\pi \cdot E \cdot \left(d^2\right)}$$

ex $$0.001989\text{m} = 4 \cdot 150\text{kN} \cdot \frac{3\text{m}}{\pi \cdot 20000\text{MPa} \cdot \left((0.12\text{m})^2\right)}$$

9) Length of Circular Tapered Rod with Uniform Cross Section

Open Calculator

fx $$L = \frac{\delta l}{4 \cdot \frac{W_{\text{Applied load}}}{\pi \cdot E \cdot \left(d^2\right)}}$$

ex $$30.15929\text{m} = \frac{0.020\text{m}}{4 \cdot \frac{150\text{kN}}{\pi \cdot 20000\text{MPa} \cdot \left((0.12\text{m})^2\right)}}$$

10) Length of Circular Tapering rod

Open Calculator

fx $$L = \frac{\delta l}{4 \cdot \frac{W_{\text{Applied load}}}{\pi \cdot E \cdot d_1 \cdot d_2}}$$

ex $$3.298672\text{m} = \frac{0.020\text{m}}{4 \cdot \frac{150\text{kN}}{\pi \cdot 20000\text{MPa} \cdot 0.045\text{m} \cdot 0.035\text{m}}}$$

11) Load at End with known Extension of Circular Tapering Rod

Open Calculator

fx $$W_{\text{Applied load}} = \frac{\delta l}{4 \cdot \frac{L}{\pi \cdot E \cdot d_1 \cdot d_2}}$$

ex $$164.9336\text{kN} = \frac{0.020\text{m}}{4 \cdot \frac{3\text{m}}{\pi \cdot 20000\text{MPa} \cdot 0.045\text{m} \cdot 0.035\text{m}}}$$

12) Modulus of Elasticity of Circular Tapering Rod with Uniform Cross Section Section

Open Calculator

fx $$E = 4 \cdot W_{\text{Applied load}} \cdot \frac{L}{\pi \cdot \delta l \cdot \left(d^2\right)}$$

ex $$1989.437\text{MPa} = 4 \cdot 150\text{kN} \cdot \frac{3\text{m}}{\pi \cdot 0.020\text{m} \cdot \left((0.12\text{m})^2\right)}$$

13) Modulus of Elasticity using Elongation of Circular Tapering Rod

Open Calculator

fx $$E = 4 \cdot W_{\text{Applied load}} \cdot \frac{L}{\pi \cdot \delta l \cdot d_1 \cdot d_2}$$

ex $$18189.14\text{MPa} = 4 \cdot 150\text{kN} \cdot \frac{3\text{m}}{\pi \cdot 0.020\text{m} \cdot 0.045\text{m} \cdot 0.035\text{m}}$$

Elongation due to Self weight

14) Cross Sectional Area with known Elongation of Tapering Bar due to Self Weight

Open Calculator

fx $$A = W_{\text{Load}} \cdot \frac{L}{6 \cdot \delta l \cdot E}$$

ex $$2187.5\text{mm}^2 = 1750\text{kN} \cdot \frac{3\text{m}}{6 \cdot 0.020\text{m} \cdot 20000\text{MPa}}$$

15) Elongation due to Self Weight in Prismatic Bar

Open Calculator

fx $$\delta l = \gamma_{\text{Rod}} \cdot L \cdot \frac{L}{E \cdot 2}$$

ex $$0.001109\text{m} = 4930.96\text{kN/m}^3 \cdot 3\text{m} \cdot \frac{3\text{m}}{20000\text{MPa} \cdot 2}$$

16) Elongation due to Self Weight in Prismatic Bar using Applied Load

Open Calculator

$$\delta l = W_{Load} \cdot \frac{L}{2 \cdot A \cdot E}$$

$$0.023438\text{m} = 1750\text{kN} \cdot \frac{3\text{m}}{2 \cdot 5600\text{mm}^2 \cdot 20000\text{MPa}}$$

17) Elongation of Truncated Conical Rod due to Self Weight

Open Calculator

$$\delta l = \frac{\left(\gamma_{Rod} \cdot l^2\right) \cdot (d_1 + d_2)}{6 \cdot E \cdot (d_1 - d_2)}$$

$$0.02\text{m} = \frac{\left(4930.96\text{kN/m}^3 \cdot (7.8\text{m})^2\right) \cdot (0.045\text{m} + 0.035\text{m})}{6 \cdot 20000\text{MPa} \cdot (0.045\text{m} - 0.035\text{m})}$$

18) Length of Bar using Elongation due to Self Weight in Prismatic bar

Open Calculator

$$L = \sqrt{\frac{\delta l}{\frac{\gamma_{Rod}}{E \cdot 2}}}$$

$$12.73736\text{m} = \sqrt{\frac{0.020\text{m}}{\frac{4930.96\text{kN/m}^3}{20000\text{MPa} \cdot 2}}}$$

19) Length of Bar using its Uniform Strength

Open Calculator

fx $$L = \left(2.303 \cdot \log 10\left(\frac{A_1}{A_2}\right)\right) \cdot \left(\frac{\sigma_{Uniform}}{\gamma_{Rod}}\right)$$

ex $$0.026225\text{m} = \left(2.303 \cdot \log 10\left(\frac{0.001256\text{m}^2}{0.001250\text{m}^2}\right)\right) \cdot \left(\frac{27\text{MPa}}{4930.96\text{kN/m}^3}\right)$$

20) Length of Rod of Truncated Conical Section

Open Calculator

fx $$l = \sqrt{\frac{\delta l}{\frac{(\gamma_{Rod}) \cdot (d_1 + d_2)}{6 \cdot E \cdot (d_1 - d_2)}}}$$

ex $$7.800005\text{m} = \sqrt{\frac{0.020\text{m}}{\frac{(4930.96\text{kN/m}^3) \cdot (0.045\text{m} + 0.035\text{m})}{6 \cdot 20000\text{MPa} \cdot (0.045\text{m} - 0.035\text{m})}}}$$

21) Modulus of Elasticity of Bar with known elongation of Truncated Conical Rod due to Self Weight

Open Calculator

fx $$E = \frac{\left(\gamma_{Rod} \cdot l^2\right) \cdot (d_1 + d_2)}{6 \cdot \delta l \cdot (d_1 - d_2)}$$

ex $$19999.97\text{MPa} = \frac{\left(4930.96\text{kN/m}^3 \cdot (7.8\text{m})^2\right) \cdot (0.045\text{m} + 0.035\text{m})}{6 \cdot 0.020\text{m} \cdot (0.045\text{m} - 0.035\text{m})}$$

22) Modulus of Elasticity of Rod using Extension of Truncated Conical Rod due to Self Weight

Open Calculator

$$E = \frac{\left(\gamma_{Rod} \cdot l^2\right) \cdot (d_1 + d_2)}{6 \cdot \delta l \cdot (d_1 - d_2)}$$

$$19999.97\text{MPa} = \frac{\left(4930.96\text{kN/m}^3 \cdot (7.8\text{m})^2\right) \cdot (0.045\text{m} + 0.035\text{m})}{6 \cdot 0.020\text{m} \cdot (0.045\text{m} - 0.035\text{m})}$$

23) Specific weight of Truncated Conical Rod using its elongation due to Self Weight

Open Calculator

$$\gamma_{Rod} = \frac{\delta l}{\frac{\left(l^2\right) \cdot (d_1 + d_2)}{6 \cdot E \cdot (d_1 - d_2)}}$$

$$4930.966\text{kN/m}^3 = \frac{0.020\text{m}}{\frac{\left((7.8\text{m})^2\right) \cdot (0.045\text{m} + 0.035\text{m})}{6 \cdot 20000\text{MPa} \cdot (0.045\text{m} - 0.035\text{m})}}$$

24) Uniform Stress on Bar due to Self-Weight

Open Calculator

$$\sigma_{Uniform} = \frac{L}{\frac{2.303 \cdot \log 10\left(\frac{A_1}{A_2}\right)}{\gamma_{Rod}}}$$

$$3088.684\text{MPa} = \frac{3\text{m}}{\frac{2.303 \cdot \log 10\left(\frac{0.001256\text{m}^2}{0.001250\text{m}^2}\right)}{4930.96\text{kN/m}^3}}$$

Elongation of Tapering Bar due to Self Weight

25) Elongation of Conical bar due to Self Weight

Open Calculator

fx $$\delta l = \frac{\gamma \cdot L_{Taperedbar}^2}{6 \cdot E}$$

ex $$0.019965\text{m} = \frac{70\text{kN/m}^3 \cdot (185\text{m})^2}{6 \cdot 20000\text{MPa}}$$

26) Elongation of Conical Bar due to Self Weight with known Cross-sectional area

Open Calculator

fx $$\delta l = W_{Load} \cdot \frac{l}{6 \cdot A \cdot E}$$

ex $$0.020312\text{m} = 1750\text{kN} \cdot \frac{7.8\text{m}}{6 \cdot 5600\text{mm}^2 \cdot 20000\text{MPa}}$$

27) Length of Bar given Elongation of Conical Bar due to Self Weight

Open Calculator

fx $$L_{Taperedbar} = \sqrt{\frac{\delta l}{\frac{\gamma}{6 \cdot E}}}$$

ex $$185.164\text{m} = \sqrt{\frac{0.020\text{m}}{\frac{70\text{kN/m}^3}{6 \cdot 20000\text{MPa}}}}$$

28) Length of Bar using Elongation of Conical Bar with Cross-sectional area

Open Calculator

fx $$l = \frac{\delta l}{\frac{W_{Load}}{6 \cdot A \cdot E}}$$

ex $$7.68\text{m} = \frac{0.020\text{m}}{\frac{1750\text{kN}}{6 \cdot 5600\text{mm}^2 \cdot 20000\text{MPa}}}$$

29) Length of Circular Tapering Rod when deflection due to load

Open Calculator

fx $$L = \frac{\delta l}{4 \cdot \frac{W_{Load}}{\pi \cdot E \cdot (d_1 \cdot d_2)}}$$

ex $$0.282743\text{m} = \frac{0.020\text{m}}{4 \cdot \frac{1750\text{kN}}{\pi \cdot 20000\text{MPa} \cdot (0.045\text{m} \cdot 0.035\text{m})}}$$

30) Length of Prismatic Rod given Elongation due to Self Weight in Uniform Bar

Open Calculator

fx $$L = \frac{\delta l}{\frac{W_{Load}}{2 \cdot A \cdot E}}$$

ex $$2.56\text{m} = \frac{0.020\text{m}}{\frac{1750\text{kN}}{2 \cdot 5600\text{mm}^2 \cdot 20000\text{MPa}}}$$

31) Load on Conical Bar with known Elongation due to Self Weight

Open Calculator

fx $$W_{Load} = \frac{\delta l}{\frac{l}{6 \cdot A \cdot E}}$$

ex $$1723.077\text{kN} = \frac{0.020\text{m}}{\frac{7.8\text{m}}{6 \cdot 5600\text{mm}^2 \cdot 20000\text{MPa}}}$$

32) Load on Prismatic Bar with known Elongation due to Self Weight

Open Calculator

fx $$W_{Load} = \frac{\delta l}{\frac{L}{2 \cdot A \cdot E}}$$

ex $$1493.333\text{kN} = \frac{0.020\text{m}}{\frac{3\text{m}}{2 \cdot 5600\text{mm}^2 \cdot 20000\text{MPa}}}$$

33) Modulus of Elasticity of Bar given Elongation of Conical Bar due to Self Weight

Open Calculator

fx $$E = \gamma \cdot \frac{L_{Taperedbar}^2}{6 \cdot \delta l}$$

ex $$19964.58\text{MPa} = 70\text{kN/m}^3 \cdot \frac{(185\text{m})^2}{6 \cdot 0.020\text{m}}$$

34) Modulus of Elasticity of Conical Bar with known Elongation and Cross-sectional area

Open Calculator

$$E = W_{Load} \cdot \frac{l}{6 \cdot A \cdot \delta l}$$

$$20312.5\text{MPa} = 1750\text{kN} \cdot \frac{7.8\text{m}}{6 \cdot 5600\text{mm}^2 \cdot 0.020\text{m}}$$

35) Modulus of Elasticity of Prismatic Bar with known Elongation due to Self Weight

Open Calculator

$$E = \gamma \cdot L \cdot \frac{L}{\delta l \cdot 2}$$

$$15.75\text{MPa} = 70\text{kN/m}^3 \cdot 3\text{m} \cdot \frac{3\text{m}}{0.020\text{m} \cdot 2}$$

36) Self Weight of Conical section with known Elongation

Open Calculator

$$\gamma = \frac{\delta l}{\frac{L_{Taperedbar}^2}{6 \cdot E}}$$

$$70.12418\text{kN/m}^3 = \frac{0.020\text{m}}{\frac{(185\text{m})^2}{6 \cdot 20000\text{MPa}}}$$

37) Self Weight of Prismatic Bar with known Elongation

Open Calculator

fx $$\gamma = \frac{\delta l}{L \cdot \frac{L}{E \cdot 2}}$$

ex $$88888.89 \mathrm{kN/m^3} = \frac{0.020 \mathrm{m}}{3 \mathrm{m} \cdot \frac{3 \mathrm{m}}{20000 \mathrm{MPa} \cdot 2}}$$

Hoop Stress due to Temperature Fall

38) Diameter of Tyre given Hoop Stress due to Temperature Fall

Open Calculator

fx $$d_{tyre} = \frac{D_{wheel}}{\left(\frac{\sigma_h}{E}\right) + 1}$$

ex $$0.230286 \mathrm{m} = \frac{0.403 \mathrm{m}}{\left(\frac{15000 \mathrm{MPa}}{20000 \mathrm{MPa}}\right) + 1}$$

39) Diameter of Wheel given Hoop Stress due to Temperature Fall

Open Calculator

fx $$D_{wheel} = \left(1 + \left(\frac{\sigma_h}{E}\right)\right) \cdot d_{tyre}$$

ex $$0.4025 \mathrm{m} = \left(1 + \left(\frac{15000 \mathrm{MPa}}{20000 \mathrm{MPa}}\right)\right) \cdot 0.230 \mathrm{m}$$

40) Hoop Stress due to Temperature Fall

Open Calculator

fx $$\sigma_h = \left(\frac{D_{wheel} - d_{tyre}}{d_{tyre}} \right) \cdot E$$

ex $$15043.48\text{MPa} = \left(\frac{0.403\text{m} - 0.230\text{m}}{0.230\text{m}} \right) \cdot 20000\text{MPa}$$

41) Hoop Stress due to Temperature Fall given Strain

Open Calculator

fx $$\sigma_h = \varepsilon \cdot E$$

ex $$15000\text{MPa} = 0.75 \cdot 20000\text{MPa}$$

42) Modulus of Elasticity given Hoop Stress due to Temperature Fall with Strain

Open Calculator

fx $$E = \frac{\sigma_h}{\varepsilon}$$

ex $$20000\text{MPa} = \frac{15000\text{MPa}}{0.75}$$

43) Strain for Hoop Stress due to Temperature Fall

Open Calculator

fx $$\varepsilon = \frac{\sigma_h}{E}$$

ex $$0.75 = \frac{15000\text{MPa}}{20000\text{MPa}}$$

Temperature Stresses and Strains

44) Change in Temperature using Temperature Stress for Tapering Rod

Open Calculator

fx $$\Delta t = \frac{\sigma}{t \cdot E \cdot \alpha \cdot \frac{D_2 - h_1}{\ln\left(\frac{D_2}{h_1}\right)}}$$

ex $$13.5155\,^\circ C = \frac{20\text{MPa}}{0.006\text{m} \cdot 20000\text{MPa} \cdot 0.001\,^\circ C^{-1} \cdot \frac{15\text{m} - 10\text{m}}{\ln\left(\frac{15\text{m}}{10\text{m}}\right)}}$$

45) Coefficient of Thermal Expansion given Temperature Stress for Tapering Rod Section

Open Calculator

fx $$\alpha = \frac{W}{t \cdot E \cdot \Delta t \cdot \frac{D_2 - h_1}{\ln\left(\frac{D_2}{h_1}\right)}}$$

ex $$0.001\,^\circ C^{-1} = \frac{18497\text{kN}}{0.006\text{m} \cdot 20000\text{MPa} \cdot 12.5\,^\circ C \cdot \frac{15\text{m} - 10\text{m}}{\ln\left(\frac{15\text{m}}{10\text{m}}\right)}}$$

46) Diameter of Tyre given Temperature Strain

Open Calculator

fx $$d_{tyre} = \left(\frac{D_{wheel}}{\varepsilon + 1}\right)$$

ex $$0.230286\text{m} = \left(\frac{0.403\text{m}}{0.75 + 1}\right)$$

47) Diameter of Wheel given Temperature Strain

Open Calculator

fx $$D_{wheel} = d_{tyre} \cdot (\varepsilon + 1)$$

ex $$0.4025\text{m} = 0.230\text{m} \cdot (0.75 + 1)$$

48) Modulus of Elasticity given Temperature Stress for Tapering Rod Section

Open Calculator

fx $$E = \frac{\sigma}{t \cdot \alpha \cdot \Delta t \cdot \frac{D_2 - h_1}{\ln\left(\frac{D_2}{h_1}\right)}}$$

ex $$21624.81\text{MPa} = \frac{20\text{MPa}}{0.006\text{m} \cdot 0.001\,^{\circ}\text{C}^{-1} \cdot 12.5\,^{\circ}\text{C} \cdot \frac{15\text{m} - 10\text{m}}{\ln\left(\frac{15\text{m}}{10\text{m}}\right)}}$$

49) Modulus of Elasticity using Hoop Stress due to Temperature Fall

Open Calculator

fx $$E = \frac{\sigma_h \cdot d_{tyre}}{D_{wheel} - d_{tyre}}$$

ex $$19942.2\text{MPa} = \frac{15000\text{MPa} \cdot 0.230\text{m}}{0.403\text{m} - 0.230\text{m}}$$

50) Temperature Strain

Open Calculator

fx $$\varepsilon = \left(\frac{D_{wheel} - d_{tyre}}{d_{tyre}}\right)$$

ex $$0.752174 = \left(\frac{0.403\text{m} - 0.230\text{m}}{0.230\text{m}}\right)$$

51) Temperature Stress for Tapering Rod Section

Open Calculator

fx $$W = t \cdot E \cdot \alpha \cdot \Delta t \cdot \frac{D_2 - h_1}{\ln\left(\frac{D_2}{h_1}\right)}$$

ex $$18497.28\text{kN} = 0.006\text{m} \cdot 20000\text{MPa} \cdot 0.001{}^\circ\text{C}^{-1} \cdot 12.5{}^\circ\text{C} \cdot \frac{15\text{m} - 10\text{m}}{\ln\left(\frac{15\text{m}}{10\text{m}}\right)}$$

52) Thickness of Tapered Bar using Temperature Stress

Open Calculator

fx $$t = \frac{\sigma}{E \cdot \alpha \cdot \Delta t \cdot \frac{D_2 - h_1}{\ln\left(\frac{D_2}{h_1}\right)}}$$

ex $$0.006487\text{m} = \frac{20\text{MPa}}{20000\text{MPa} \cdot 0.001{}^\circ\text{C}^{-1} \cdot 12.5{}^\circ\text{C} \cdot \frac{15\text{m} - 10\text{m}}{\ln\left(\frac{15\text{m}}{10\text{m}}\right)}}$$

Volumetric Strain of a Rectangular Bar

53) Strain along Breadth given Volumetric Strain of Rectangular Bar

Open Calculator

fx $$\varepsilon_b = \varepsilon_v - (\varepsilon_l + \varepsilon_d)$$

ex $$-0.0052 = 0.0001 - (0.002 + 0.0033)$$

54) Strain along Depth given Volumetric Strain of Rectangular Bar

Open Calculator

fx $\varepsilon_{d} = \varepsilon_{v} - (\varepsilon_{l} + \varepsilon_{b})$

ex $-0.0266 = 0.0001 - (0.002 + 0.0247)$

55) Strain along Length given Volumetric Strain of Rectangular Bar

Open Calculator

fx $\varepsilon_{l} = \varepsilon_{v} - (\varepsilon_{b} + \varepsilon_{d})$

ex $-0.0279 = 0.0001 - (0.0247 + 0.0033)$

56) Volumetric Strain of Rectangular Bar

Open Calculator

fx $\varepsilon_{v} = \varepsilon_{l} + \varepsilon_{b} + \varepsilon_{d}$

ex $0.03 = 0.002 + 0.0247 + 0.0033$

Volumetric Strain of Sphere

57) Change in Diameter given Volumetric Strain of Sphere

Open Calculator

fx $\delta_{dia} = \varepsilon_{v} \cdot \frac{\Phi}{3}$

ex $0.000168\text{m} = 0.0001 \cdot \frac{5.05\text{m}}{3}$

58) Diameter of Sphere using Volumetric Strain of sphere

Open Calculator

fx $$\Phi = 3 \cdot \frac{\delta_{dia}}{\varepsilon_v}$$

ex $$1515\text{m} = 3 \cdot \frac{0.0505\text{m}}{0.0001}$$

59) Strain given Volumetric Strain of Sphere

Open Calculator

fx $$\varepsilon_L = \frac{\varepsilon_v}{3}$$

ex $$3.3\text{E\^{}-5} = \frac{0.0001}{3}$$

60) Volumetric Strain of sphere

Open Calculator

fx $$\varepsilon_v = 3 \cdot \frac{\delta_{dia}}{\Phi}$$

ex $$0.03 = 3 \cdot \frac{0.0505\text{m}}{5.05\text{m}}$$

61) Volumetric Strain of Sphere given Lateral Strain

Open Calculator

fx $$\varepsilon_v = 3 \cdot \varepsilon_L$$

ex $$0.06 = 3 \cdot 0.02$$

Variables Used

- **A** Area of Cross-Section *(Square Millimeter)*
- **A_1** Area 1 *(Square Meter)*
- **A_2** Area 2 *(Square Meter)*
- **d** Diameter of Shaft *(Meter)*
- **d_1** Diameter1 *(Meter)*
- **d_2** Diameter2 *(Meter)*
- **D_2** Depth of Point 2 *(Meter)*
- **d_{tyre}** Diameter of Tyre *(Meter)*
- **D_{wheel}** Wheel Diameter *(Meter)*
- **E** Young's Modulus *(Megapascal)*
- **h_1** Depth of Point 1 *(Meter)*
- **l** Length of Tapered Bar *(Meter)*
- **L** Length *(Meter)*
- **L_{Rod}** Length of Rod *(Meter)*
- **$L_{Taperedbar}$** Tapered Bar Length *(Meter)*
- **t** Section Thickness *(Meter)*
- **W** Load Applied KN *(Kilonewton)*
- **$W_{Applied\ load}$** Applied Load *(Kilonewton)*
- **W_{Load}** Applied Load SOM *(Kilonewton)*
- **α** Coefficient of Linear Thermal Expansion *(Per Degree Celsius)*
- **γ** Specific Weight *(Kilonewton per Cubic Meter)*
- **γ_{Rod}** Specific Weight of Rod *(Kilonewton per Cubic Meter)*

- δ_{dia} Change in Diameter *(Meter)*
- δl Elongation *(Meter)*
- Δt Change in Temperature *(Degree Celsius)*
- ε Strain
- ε_b Strain along Breadth
- ε_d Strain along Depth
- ε_l Strain along Length
- ε_L Lateral Strain
- ε_v Volumetric Strain
- σ Thermal Stress *(Megapascal)*
- σ_h Hoop Stress SOM *(Megapascal)*
- $\sigma_{Uniform}$ Uniform Stress *(Megapascal)*
- Φ Diameter of Sphere *(Meter)*

Constants, Functions, Measurements used

- Constant: **pi**, 3.14159265358979323846264338327950288
  Archimedes' constant
- Constant: **e**, 2.71828182845904523536028747135266249
  Napier's constant
- Function: **ln**, ln(Number)
  Natural logarithm function (base e)
- Function: **log10**, log10(Number)
  Common logarithm function (base 10)
- Function: **sqrt**, sqrt(Number)
  Square root function
- Measurement: **Length** in Meter (m)
  Length Unit Conversion
- Measurement: **Area** in Square Meter (m²), Square Millimeter (mm²)
  Area Unit Conversion
- Measurement: **Force** in Kilonewton (kN)
  Force Unit Conversion
- Measurement: **Temperature Difference** in Degree Celsius (°C)
  Temperature Difference Unit Conversion
- Measurement: **Temperature Coefficient of Resistance** in Per Degree Celsius ($°C^{-1}$)
  Temperature Coefficient of Resistance Unit Conversion
- Measurement: **Specific Weight** in Kilonewton per Cubic Meter (kN/m³)
  Specific Weight Unit Conversion
- Measurement: **Stress** in Megapascal (MPa)
  Stress Unit Conversion

Check other formula lists

- Mohr's Circle of Stresses Formulas
- Beam Moments Formulas
- Bending Stress Formulas
- Combined Axial and Bending Loads Formulas
- Elastic Stability of Columns Formulas
- Principal Stress Formulas
- Shear Stress Formulas
- Slope and Deflection Formulas
- Strain Energy Formulas
- Stress and Strain Formulas
- Torsion Formulas

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