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Elasticity Formulas

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List of 13 Elasticity Formulas

Elasticity

Modulus of Elasticity

1) Young's Modulus

Open Calculator

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

ex $$3000\text{N/m} = \frac{1200\text{Pa}}{0.4}$$

2) Young's Modulus of Elasticity

Open Calculator

fx $$E = \frac{F_s \cdot d}{A_{elast} \cdot l}$$

ex $$3006.061\text{N/m} = \frac{1240000\text{N} \cdot 2\text{m}}{55\text{m}^2 \cdot 15\text{m}}$$

Strain

3) Change in Volume of Body given Volumetric Strain

Open Calculator

fx $$\Delta V = \varepsilon_v \cdot V_0$$

ex $$50\text{m}^3 = 2.5 \cdot 20\text{m}^3$$

4) Displacement of Upper Surface

Open Calculator

fx $l = \tan(Q) \cdot d$

ex $15.00928\text{m} = \tan(82.41^\circ) \cdot 2\text{m}$

5) Original Volume of Body given Volumetric Strain

Open Calculator

fx $V_0 = \frac{\Delta V}{\varepsilon_v}$

ex $20\text{m}^3 = \frac{50\text{m}^3}{2.5}$

6) Perpendicular Distance between Two Surfaces given Shear Angle

Open Calculator

fx $d = \frac{l}{\tan(Q)}$

ex $1.998763\text{m} = \frac{15\text{m}}{\tan(82.41^\circ)}$

7) Strain

Open Calculator

fx $\varepsilon = \frac{\Delta L}{L}$

ex $0.4 = \frac{2.2\text{m}}{5.5\text{m}}$

8) Volume Strain

Open Calculator

fx $$\varepsilon_v = \frac{\Delta V}{V_0}$$

ex $$2.5 = \frac{50\text{m}^3}{20\text{m}^3}$$

Stress

9) Area of Body given Stress

Open Calculator

fx $$A_{elast} = \frac{F}{\sigma}$$

ex $$55\text{m}^2 = \frac{66000\text{N}}{1200\text{Pa}}$$

10) Change in Length given Longitudinal Stress

Open Calculator

fx $$\Delta L = \varepsilon_l \cdot L_0$$

ex $$2.2\text{m} = 0.01 \cdot 220\text{m}$$

11) Normal Stress or Longitudinal Stress

Open Calculator

fx $$\sigma = \frac{F}{A_{elast}}$$

ex $$1200\text{Pa} = \frac{66000\text{N}}{55\text{m}^2}$$

12) Original Length given Longitudinal Stress

Open Calculator

fx $$L_0 = \frac{\Delta L}{\varepsilon_l}$$

ex $$220\text{m} = \frac{2.2\text{m}}{0.01}$$

13) Stress

Open Calculator

fx $$\sigma = \frac{F}{A_{elast}}$$

ex $$1200\text{Pa} = \frac{66000\text{N}}{55\text{m}^2}$$

Variables Used

- ΔV Change in Volume *(Cubic Meter)*
- A_{elast} Area *(Square Meter)*
- d Perpendicular Distance *(Meter)*
- E Young's Modulus *(Newton per Meter)*
- F Force *(Newton)*
- F_s Shear Force *(Newton)*
- l Displacement of Upper Surface *(Meter)*
- L Length *(Meter)*
- L_0 Initial Length *(Meter)*
- Q Angle of Shear *(Degree)*
- V_0 Original Volume *(Cubic Meter)*
- ΔL Change in Length *(Meter)*
- ε Strain
- ε_l Longitudinal Strain
- ε_v Volumetric Strain
- σ Stress *(Pascal)*

Constants, Functions, Measurements used

- Function: **tan**, tan(Angle)
  The tangent of an angle is a trigonometric ratio of the length of the side opposite an angle to the length of the side adjacent to an angle in a right triangle.
- Measurement: **Length** in Meter (m)
  Length Unit Conversion
- Measurement: **Volume** in Cubic Meter (m^3)
  Volume Unit Conversion
- Measurement: **Area** in Square Meter (m^2)
  Area Unit Conversion
- Measurement: **Force** in Newton (N)
  Force Unit Conversion
- Measurement: **Angle** in Degree (°)
  Angle Unit Conversion
- Measurement: **Stiffness Constant** in Newton per Meter (N/m)
  Stiffness Constant Unit Conversion
- Measurement: **Stress** in Pascal (Pa)
  Stress Unit Conversion

Check other formula lists

- **Elasticity Formulas**
- **Gravitation Formulas**

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