calculatoratoz.com

unitsconverters.com

Estimation of Effective Length of Columns Formulas

Calculators! Examples! Conversions!

Bookmark **calculatoratoz.com**, **unitsconverters.com**

Widest Coverage of Calculators and Growing - **30,000+ Calculators!**
Calculate With a Different Unit for Each Variable - **In built Unit Conversion!**
Widest Collection of Measurements and Units - **250+ Measurements!**

Feel free to SHARE this document with your friends!

Please leave your feedback here...

List of 18 Estimation of Effective Length of Columns Formulas

Estimation of Effective Length of Columns

1) Actual Length given Slenderness Ratio

fx $L = \lambda \cdot r$

Open Calculator

ex $5000\text{mm} = 100 \cdot 50\text{mm}$

2) Actual Length of Column given Effective Length if Both Ends of Column are Fixed

fx $L = 2 \cdot L_e$

Open Calculator

ex $5000\text{mm} = 2 \cdot 2500\text{mm}$

3) Actual Length of Column given Effective Length if One End is Fixed Other is Free

fx $L = \frac{L_e}{2}$

Open Calculator

ex $1250\text{mm} = \frac{2500\text{mm}}{2}$

4) Actual Length of Column given Effective Length if One End is Fixed Other is Hinged

Open Calculator

fx $$L = \sqrt{2} \cdot L_e$$

ex $$3535.534\text{mm} = \sqrt{2} \cdot 2500\text{mm}$$

5) Effective Length of Column given Actual Length if Both Ends of Column are Fixed

Open Calculator

fx $$L_e = \frac{L}{2}$$

ex $$2500\text{mm} = \frac{5000\text{mm}}{2}$$

6) Effective Length of Column given Actual Length if One End is Fixed Other is Free

Open Calculator

fx $$L_e = 2 \cdot L$$

ex $$10000\text{mm} = 2 \cdot 5000\text{mm}$$

7) Effective Length of Column given Actual Length if One End is Fixed Other is Hinged

Open Calculator

fx $$L_e = \frac{L}{\sqrt{2}}$$

ex $$3535.534\text{mm} = \frac{5000\text{mm}}{\sqrt{2}}$$

8) Effective Length of Column given Crippling Load for any type of End Condition

Open Calculator

fx $$L_e = \sqrt{\frac{\pi^2 \cdot \varepsilon_c \cdot I}{P_{cr}}}$$

ex $$2500.676\text{mm} = \sqrt{\frac{\pi^2 \cdot 10.56\text{MPa} \cdot 60000\text{cm}^4}{10000\text{N}}}$$

9) Effective Length of Column given Crippling Stress

Open Calculator

fx $$L_e = \sqrt{\frac{\pi^2 \cdot \varepsilon_c \cdot r^2}{\sigma_{crippling}}}$$

ex $$3609.415\text{mm} = \sqrt{\frac{\pi^2 \cdot 10.56\text{MPa} \cdot (50\text{mm})^2}{0.02\text{MPa}}}$$

10) Least Radius of Gyration given Slenderness Ratio

Open Calculator

fx $$r = \frac{L}{\lambda}$$

ex $$50\text{mm} = \frac{5000\text{mm}}{100}$$

11) Modulus of Elasticity given Crippling Load for any type of End Condition

Open Calculator

$$\varepsilon_c = \frac{P_{cr} \cdot L_e^2}{\pi^2 \cdot I}$$

$$10.55429\text{MPa} = \frac{10000\text{N} \cdot (2500\text{mm})^2}{\pi^2 \cdot 60000\text{cm}^4}$$

12) Modulus of Elasticity of Column given Crippling Stress

Open Calculator

$$\varepsilon_c = \frac{\sigma_{crippling} \cdot L_e^2}{\pi^2 \cdot r^2}$$

$$5.066059\text{MPa} = \frac{0.02\text{MPa} \cdot (2500\text{mm})^2}{\pi^2 \cdot (50\text{mm})^2}$$

13) Moment of Inertia given Crippling Load for any type of End Condition

Open Calculator

$$I = \frac{P_{cr} \cdot L_e^2}{\pi^2 \cdot \varepsilon_c}$$

$$59967.56\text{cm}^4 = \frac{10000\text{N} \cdot (2500\text{mm})^2}{\pi^2 \cdot 10.56\text{MPa}}$$

14) Radius of Gyration given Effective Length and Crippling Load

Open Calculator

fx $$r = \sqrt{\frac{P_{cr} \cdot L_e^2}{\pi^2 \cdot \varepsilon_c \cdot A}}$$

ex $$9.79531\text{mm} = \sqrt{\frac{10000\text{N} \cdot (2500\text{mm})^2}{\pi^2 \cdot 10.56\text{MPa} \cdot 6.25\text{m}^2}}$$

Crippling Load

15) Crippling Load for any type of End Condition

Open Calculator

fx $$P_{cr} = \frac{\pi^2 \cdot \varepsilon_c \cdot I}{L_e^2}$$

ex $$10005.41\text{N} = \frac{\pi^2 \cdot 10.56\text{MPa} \cdot 60000\text{cm}^4}{(2500\text{mm})^2}$$

16) Crippling Load given Effective Length and Radius of Gyration

Open Calculator

fx $$P_{cr} = \frac{\pi^2 \cdot \varepsilon_c \cdot A \cdot r^2}{L_e^2}$$

ex $$260557.6\text{N} = \frac{\pi^2 \cdot 10.56\text{MPa} \cdot 6.25\text{m}^2 \cdot (50\text{mm})^2}{(2500\text{mm})^2}$$

17) Crippling Stress

Open Calculator

fx $$\sigma_{crippling} = \frac{\pi^2 \cdot \varepsilon_c \cdot r^2}{L_e^2}$$

ex $$0.041689\text{MPa} = \frac{\pi^2 \cdot 10.56\text{MPa} \cdot (50\text{mm})^2}{(2500\text{mm})^2}$$

18) Crippling Stress given Crippling Load

Open Calculator

fx $$\sigma_{crippling} = \frac{P_{cr}}{A}$$

ex $$0.0016\text{MPa} = \frac{10000\text{N}}{6.25\text{m}^2}$$

Variables Used

- **A** Column Cross-Sectional Area *(Square Meter)*
- **I** Moment of Inertia Column *(Centimeter⁴)*
- **L** Length of Column *(Millimeter)*
- L_e Effective Length of Column *(Millimeter)*
- P_{cr} Column Crippling Load *(Newton)*
- **r** Least Radius of Gyration of Column *(Millimeter)*
- ε_c Modulus of Elasticity of Column *(Megapascal)*
- λ Slenderness Ratio
- $\sigma_{crippling}$ Crippling Stress *(Megapascal)*

Constants, Functions, Measurements used

- Constant: **pi**, 3.14159265358979323846264338327950288
  Archimedes' constant
- Function: **sqrt**, sqrt(Number)
  A square root function is a function that takes a non-negative number as an input and returns the square root of the given input number.
- Measurement: **Length** in Millimeter (mm)
  Length Unit Conversion
- Measurement: **Area** in Square Meter (m²)
  Area Unit Conversion
- Measurement: **Pressure** in Megapascal (MPa)
  Pressure Unit Conversion
- Measurement: **Force** in Newton (N)
  Force Unit Conversion
- Measurement: **Second Moment of Area** in Centimeter⁴ (cm⁴)
  Second Moment of Area Unit Conversion

Check other formula lists

- **Estimation of Effective Length of Columns Formulas**
- **Short Columns Formulas**

Feel free to SHARE this document with your friends!

PDF Available in

English Spanish French German Russian Italian Portuguese Polish Dutch

10/15/2024 | 9:25:18 AM UTC *Please leave your feedback here...*