

Important Steel Pipes Formulas PDF



Formulas Examples with Units

List of 14 Important Steel Pipes Formulas

1) Critical External Pressure Formula ↻

Formula

$$P_{\text{critical}} = \frac{20 \cdot E_{\text{pa}} \cdot I}{(D_{\text{pipe}})^3}$$

Example with Units

$$57.4544 \text{ Pa} = \frac{20 \cdot 1.64 \text{ Pa} \cdot 1.32 \text{ kg} \cdot \text{m}^2}{(0.91 \text{ m})^3}$$

Evaluate Formula ↻

2) Critical External Pressure given Thickness of Pipe Formula ↻

Formula

$$P_{\text{cr}} = \frac{5 \cdot E_{\text{pa}} \cdot (t_{\text{pipe}})^3}{3 \cdot D_{\text{pipe}}}$$

Example with Units

$$2.827 \text{ Pa} = \frac{5 \cdot 1.64 \text{ Pa} \cdot (0.98 \text{ m})^3}{3 \cdot 0.91 \text{ m}}$$

Evaluate Formula ↻

3) Diameter of Pipe given Critical External Pressure Formula ↻

Formula

$$D_{\text{pipe}} = \left(\frac{20 \cdot E_{\text{pa}} \cdot I}{P_{\text{critical}}} \right)^{\frac{1}{3}}$$

Example with Units

$$0.91 \text{ m} = \left(\frac{20 \cdot 1.64 \text{ Pa} \cdot 1.32 \text{ kg} \cdot \text{m}^2}{57.45 \text{ Pa}} \right)^{\frac{1}{3}}$$

Evaluate Formula ↻

4) Diameter of Pipe given Thickness of Pipe and Critical External Pressure Formula ↻

Formula

$$D_{\text{pipe}} = \frac{5 \cdot E_{\text{pa}} \cdot (t_{\text{pipe}})^3}{3 \cdot P_{\text{cr}}}$$

Example with Units

$$0.9123 \text{ m} = \frac{5 \cdot 1.64 \text{ Pa} \cdot (0.98 \text{ m})^3}{3 \cdot 2.82 \text{ Pa}}$$

Evaluate Formula ↻

5) Internal Pressure given Plate Thickness Formula ↻

Formula

$$P_i = \frac{p_t}{r} \cdot \frac{1}{\sigma_{tp} \cdot \eta}$$

Example with Units

$$75 \text{ MPa} = \frac{100.00 \text{ mm}}{\frac{200 \text{ mm}}{75 \text{ MPa} \cdot 2}}$$

Evaluate Formula ↻



6) Joint Efficiency given Plate Thickness Formula

Formula

$$\eta = \frac{P_i \cdot r}{\sigma_{tp} \cdot p_t}$$

Example with Units

$$1.9997 = \frac{74.99 \text{ MPa} \cdot 200 \text{ mm}}{75 \text{ MPa} \cdot 100.00 \text{ mm}}$$

Evaluate Formula 

7) Modulus of Elasticity of Metal given Critical External Pressure Formula

Formula

$$E_{pa} = \frac{P_{\text{critical}}}{\frac{20 \cdot I}{(D_{\text{pipe}})^3}}$$

Example with Units

$$1.6399 \text{ Pa} = \frac{57.45 \text{ Pa}}{\frac{20 \cdot 1.32 \text{ kg} \cdot \text{m}^2}{(0.91 \text{ m})^3}}$$

Evaluate Formula 

8) Modulus of Elasticity of Metal given Thickness of Pipe and critical external pressure Formula

Formula

$$E_{pa} = \frac{P_{cr} \cdot 3 \cdot D_{\text{pipe}}}{5 \cdot (t_{\text{pipe}})^3}$$

Example with Units

$$1.6359 \text{ Pa} = \frac{2.82 \text{ Pa} \cdot 3 \cdot 0.91 \text{ m}}{5 \cdot (0.98 \text{ m})^3}$$

Evaluate Formula 

9) Moment of Inertia given Thickness of Pipe Formula

Formula

$$I = \frac{(t_{\text{pipe}})^3}{12}$$

Example with Units

$$0.0784 \text{ kg} \cdot \text{m}^2 = \frac{(0.98 \text{ m})^3}{12}$$

Evaluate Formula 

10) Permissible Tensile Stress given Plate Thickness Formula

Formula

$$\sigma_{tp} = \frac{P_i \cdot r}{p_t \cdot \eta}$$

Example with Units

$$74.99 \text{ MPa} = \frac{74.99 \text{ MPa} \cdot 200 \text{ mm}}{100.00 \text{ mm} \cdot 2}$$

Evaluate Formula 

11) Plate Thickness Required to Resist Internal Pressure Formula

Formula

$$p_t = \frac{P_i \cdot r}{\sigma_{tp} \cdot \eta}$$

Example with Units

$$99.9867 \text{ mm} = \frac{74.99 \text{ MPa} \cdot 200 \text{ mm}}{75 \text{ MPa} \cdot 2}$$

Evaluate Formula 

12) Radius of Pipe given Plate Thickness Formula

Formula

$$r = \frac{p_t}{\frac{P_i}{\sigma_{tp} \cdot \eta}}$$

Example with Units

$$200.0267 \text{ mm} = \frac{100.00 \text{ mm}}{\frac{74.99 \text{ MPa}}{75 \text{ MPa} \cdot 2}}$$

Evaluate Formula 



13) Thickness of Pipe given Critical External Pressure Formula

Formula

$$t_{\text{pipe}} = \frac{P_{\text{cr}}}{\left(\frac{5 \cdot E_{\text{pa}}}{3 \cdot D_{\text{pipe}}} \right)^{\frac{1}{3}}}$$

Example with Units

$$1.9545 \text{ m} = \frac{2.82 \text{ Pa}}{\left(\frac{5 \cdot 1.64 \text{ Pa}}{3 \cdot 0.91 \text{ m}} \right)^{\frac{1}{3}}}$$

Evaluate Formula 

14) Thickness of Pipe given Moment of Inertia Formula

Formula

$$t_{\text{pipe}} = \left(12 \cdot I \right)^{\frac{1}{3}}$$

Example with Units

$$2.5114 \text{ m} = \left(12 \cdot 1.32 \text{ kg} \cdot \text{m}^2 \right)^{\frac{1}{3}}$$

Evaluate Formula 



Variables used in list of Steel Pipes Formulas above

- D_{pipe} Diameter of Pipe (Meter)
- E_{pa} Modulus of Elasticity (Pascal)
- I Moment of Inertia (Kilogram Square Meter)
- I_{pipe} Moment of Inertia of Pipe (Kilogram Square Meter)
- P_{cr} Critical Pressure (Pascal)
- P_{critical} Critical Pressure in Pipe (Pascal)
- P_i Internal Pressure of Pipe (Megapascal)
- p_t Plate Thickness in Millimeter (Millimeter)
- r Pipe Radius in Millimeter (Millimeter)
- t_{pipe} Thickness of Pipe (Meter)
- η Joint Efficiency of Pipe
- σ_{tp} Permissible Tensile Stress (Megapascal)

Constants, Functions, Measurements used in list of Steel Pipes Formulas above

- **Measurement: Length** in Meter (m), Millimeter (mm)
[Length Unit Conversion](#) 
- **Measurement: Pressure** in Pascal (Pa), Megapascal (MPa)
[Pressure Unit Conversion](#) 
- **Measurement: Moment of Inertia** in Kilogram Square Meter ($\text{kg} \cdot \text{m}^2$)
[Moment of Inertia Unit Conversion](#) 
- **Measurement: Stress** in Megapascal (MPa)
[Stress Unit Conversion](#) 



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