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Steel Pipes Formulas

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List of 14 Steel Pipes Formulas

Steel Pipes

1) Critical External Pressure

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

[Open Calculator !\[\]\(a870788d6ed9b8fd294b7654a8c8526b_img.jpg\)](#)

$$\text{ex } 57.45444\text{Pa} = \frac{20 \cdot 1.64\text{Pa} \cdot 1.32\text{kg}\cdot\text{m}^2}{(0.91\text{m})^3}$$

2) Critical External Pressure given Thickness of Pipe

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

[Open Calculator !\[\]\(c50c8b7b2cc2cf9ff925edec0ee94c0d_img.jpg\)](#)

$$\text{ex } 2.827024\text{Pa} = \frac{5 \cdot 1.64\text{Pa} \cdot (0.98\text{m})^3}{3 \cdot 0.91\text{m}}$$

3) Diameter of Pipe given Critical External Pressure

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

[Open Calculator !\[\]\(f60b7a900783ac3fd531bfd9c111be6d_img.jpg\)](#)

$$\text{ex } 0.910023\text{m} = \left(\frac{20 \cdot 1.64\text{Pa} \cdot 1.32\text{kg}\cdot\text{m}^2}{57.45\text{Pa}} \right)^{\frac{1}{3}}$$



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



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

[Open Calculator](#)

$$ex \quad 0.912266\text{m} = \frac{5 \cdot 1.64\text{Pa} \cdot (0.98\text{m})^3}{3 \cdot 2.82\text{Pa}}$$

5) Internal Pressure given Plate Thickness

$$fx \quad P_i = \frac{P_t}{\frac{r}{\sigma_{\text{tp}} \cdot \eta}}$$

[Open Calculator](#)

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

6) Joint Efficiency given Plate Thickness

$$fx \quad \eta = \frac{P_i \cdot r}{\sigma_{\text{tp}} \cdot P_t}$$

[Open Calculator](#)

$$ex \quad 1.999733 = \frac{74.99\text{MPa} \cdot 200\text{mm}}{75\text{MPa} \cdot 100.00\text{mm}}$$



7) Modulus of Elasticity of Metal given Critical External Pressure

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

[Open Calculator !\[\]\(e78f798d4ea5c530c9db49e7d26e6b95_img.jpg\)](#)

$$ex \quad 1.639873Pa = \frac{57.45Pa}{\frac{20 \cdot 1.32kg \cdot m^2}{(0.91m)^3}}$$

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

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

[Open Calculator !\[\]\(05be7c7a8995decd503647c99211f7c2_img.jpg\)](#)

$$ex \quad 1.635926Pa = \frac{2.82Pa \cdot 3 \cdot 0.91m}{5 \cdot ((0.98m)^3)}$$

9) Moment of Inertia given Thickness of Pipe

$$fx \quad I_{\text{pipe}} = \frac{(t_{\text{pipe}})^3}{12}$$

[Open Calculator !\[\]\(fe3aebe81acea8d45108cd2768939da7_img.jpg\)](#)

$$ex \quad 0.078433kg \cdot m^2 = \frac{(0.98m)^3}{12}$$



10) Permissible Tensile Stress given Plate Thickness

$$fx \quad \sigma_{tp} = \frac{P_i \cdot r}{P_t \cdot \eta}$$

[Open Calculator !\[\]\(e2376d476d06eb31946dc01a69a4403a_img.jpg\)](#)

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

11) Plate Thickness Required to Resist Internal Pressure

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

[Open Calculator !\[\]\(0b5e7e25e8775f7e7e80906ada4f0021_img.jpg\)](#)

$$ex \quad 99.98667mm = \frac{74.99MPa \cdot 200mm}{75MPa \cdot 2}$$

12) Radius of Pipe given Plate Thickness

$$fx \quad r = \frac{P_t}{\frac{P_i}{\sigma_{tp} \cdot \eta}}$$

[Open Calculator !\[\]\(bd3b31712ad9bab5a241210fa6925cdd_img.jpg\)](#)

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



13) Thickness of Pipe given Critical External Pressure

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

[Open Calculator !\[\]\(d3fb9f94af8b26d1c844efa9a98805b0_img.jpg\)](#)

$$\text{ex } 1.954484\text{m} = \frac{2.82\text{Pa}}{\left(\frac{5 \cdot 1.64\text{Pa}}{3 \cdot 0.91\text{m}}\right)^{\frac{1}{3}}}$$

14) Thickness of Pipe given Moment of Inertia

$$\text{fx } t_{\text{pipe}} = (12 \cdot I_{\text{pipe}})^{\frac{1}{3}}$$

[Open Calculator !\[\]\(e1d6102fe77919492c04879c8450f1f5_img.jpg\)](#)

$$\text{ex } 0.979864\text{m} = (12 \cdot 0.0784\text{kg} \cdot \text{m}^2)^{\frac{1}{3}}$$







Variables Used

- 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

- **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 



Check other formula lists

- **Steel Pipes Formulas** 

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