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Steel Pipes Formulas

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List of 14 Steel Pipes Formulas

Steel Pipes

1) Critical External Pressure

Open Calculator

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

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

2) Critical External Pressure given Thickness of Pipe

Open Calculator

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

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

Open Calculator

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

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

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

Open Calculator

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

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

5) Internal Pressure given Plate Thickness

Open Calculator

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

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

6) Joint Efficiency given Plate Thickness

Open Calculator

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

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

7) Modulus of Elasticity of Metal given Critical External Pressure

Open Calculator

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

$$1.639873\text{Pa} = \frac{57.45\text{Pa}}{\frac{20 \cdot 1.32\text{kg·m²}}{(0.91\text{m})^3}}$$

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

Open Calculator

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

$$1.635926\text{Pa} = \frac{2.82\text{Pa} \cdot 3 \cdot 0.91\text{m}}{5 \cdot \left((0.98\text{m})^3\right)}$$

9) Moment of Inertia given Thickness of Pipe

Open Calculator

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

$$0.078433\text{kg·m²} = \frac{(0.98\text{m})^3}{12}$$

10) Permissible Tensile Stress given Plate Thickness

Open Calculator

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

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

11) Plate Thickness Required to Resist Internal Pressure

Open Calculator

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

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

12) Radius of Pipe given Plate Thickness

Open Calculator

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

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

13) Thickness of Pipe given Critical External Pressure

Open Calculator

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

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

Open Calculator

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

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

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 (kg·m²)
  Moment of Inertia Unit Conversion
- Measurement: **Stress** in Megapascal (MPa)
  Stress Unit Conversion

Check other formula lists

- **Steel Pipes Formulas**

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