

Important Butt Welds Formulas PDF



Formulas Examples with Units

List of 16 Important Butt Welds Formulas

1) Average Tensile Stress in Butt Weld Formula ↻

Formula

$$\sigma_t = \frac{P}{L \cdot h_t}$$

Example with Units

$$56.4027 \text{ N/mm}^2 = \frac{16.5 \text{ kN}}{19.5 \text{ mm} \cdot 15.002 \text{ mm}}$$

Evaluate Formula ↻

2) Efficiency of Butt Welded Joint Formula ↻

Formula

$$\eta = \frac{P}{\sigma_t \cdot t_p \cdot L}$$

Example with Units

$$0.8335 = \frac{16.5 \text{ kN}}{56.4 \text{ N/mm}^2 \cdot 18 \text{ mm} \cdot 19.5 \text{ mm}}$$

Evaluate Formula ↻

3) Inner Diameter of Boiler given Thickness of Welded Boiler Shell Formula ↻

Formula

$$D_i = t \cdot 2 \cdot \frac{\sigma_b}{P_i}$$

Example with Units

$$1400 \text{ mm} = 30 \text{ mm} \cdot 2 \cdot \frac{105 \text{ N/mm}^2}{4.5 \text{ MPa}}$$

Evaluate Formula ↻

4) Internal Pressure in Boiler given Thickness of Welded Boiler Shell Formula ↻

Formula

$$P_i = t \cdot 2 \cdot \frac{\sigma_b}{D_i}$$

Example with Units

$$4.5 \text{ MPa} = 30 \text{ mm} \cdot 2 \cdot \frac{105 \text{ N/mm}^2}{1400 \text{ mm}}$$

Evaluate Formula ↻

5) Length of Butt Weld given Average Tensile Stress in Weld Formula ↻

Formula

$$L = \frac{P}{\sigma_t \cdot h_t}$$

Example with Units

$$19.5009 \text{ mm} = \frac{16.5 \text{ kN}}{56.4 \text{ N/mm}^2 \cdot 15.002 \text{ mm}}$$

Evaluate Formula ↻

6) Length of Butt Weld given Efficiency of Welded Joint Formula ↻

Formula

$$L = \frac{P}{\sigma_t \cdot t_p \cdot \eta}$$

Example with Units

$$19.5114 \text{ mm} = \frac{16.5 \text{ kN}}{56.4 \text{ N/mm}^2 \cdot 18 \text{ mm} \cdot 0.833}$$

Evaluate Formula ↻



7) Permissible Tensile Stress in Butt Weld Formula

Formula

$$\sigma_t = \frac{P}{L \cdot t_p}$$

Example with Units

$$47.0085 \text{ N/mm}^2 = \frac{16.5 \text{ kN}}{19.5 \text{ mm} \cdot 18 \text{ mm}}$$

Evaluate Formula 

8) Permissible Tensile Stress in Butt Weld given Efficiency of Welded joint Formula

Formula

$$\sigma_t = \frac{P}{t_p \cdot L \cdot \eta}$$

Example with Units

$$56.4328 \text{ N/mm}^2 = \frac{16.5 \text{ kN}}{18 \text{ mm} \cdot 19.5 \text{ mm} \cdot 0.833}$$

Evaluate Formula 

9) Strength of Butt Welded Joint Formula

Formula

$$\sigma_t = \frac{P}{b_{ns} \cdot L}$$

Example with Units

$$56.4103 \text{ N/mm}^2 = \frac{16.5 \text{ kN}}{15 \text{ mm} \cdot 19.5 \text{ mm}}$$

Evaluate Formula 

10) Tensile Force on Butt Welded Plates given Thickness of Plate Formula

Formula

$$P = \sigma_t \cdot L \cdot h_t$$

Example with Units

$$16.4992 \text{ kN} = 56.4 \text{ N/mm}^2 \cdot 19.5 \text{ mm} \cdot 15.002 \text{ mm}$$

Evaluate Formula 

11) Tensile Force on Plates given Average Tensile Stress in Butt Weld Formula

Formula

$$P = \sigma_t \cdot h_t \cdot L$$

Example with Units

$$16.4992 \text{ kN} = 56.4 \text{ N/mm}^2 \cdot 15.002 \text{ mm} \cdot 19.5 \text{ mm}$$

Evaluate Formula 

12) Tensile Force on Plates given Efficiency of Butt Welded Joint Formula

Formula

$$P = \sigma_t \cdot t_p \cdot L \cdot \eta$$

Example with Units

$$16.4904 \text{ kN} = 56.4 \text{ N/mm}^2 \cdot 18 \text{ mm} \cdot 19.5 \text{ mm} \cdot 0.833$$

Evaluate Formula 

13) Tensile Stress in Boiler Butt Weld given Thickness of Boiler Shell Formula

Formula

$$\sigma_b = P_i \cdot \frac{D_i}{2 \cdot t}$$

Example with Units

$$105 \text{ N/mm}^2 = 4.5 \text{ MPa} \cdot \frac{1400 \text{ mm}}{2 \cdot 30 \text{ mm}}$$

Evaluate Formula 

14) Thickness of Plate given Efficiency of Butt Welded Joint Formula

Formula

$$t_p = \frac{P}{\sigma_t \cdot L \cdot \eta}$$

Example with Units

$$18.0105 \text{ mm} = \frac{16.5 \text{ kN}}{56.4 \text{ N/mm}^2 \cdot 19.5 \text{ mm} \cdot 0.833}$$

Evaluate Formula 



15) Thickness of Welded Boiler Shell given Stress in Weld Formula

Formula

$$t = P_i \cdot \frac{D_i}{2 \cdot \sigma_b}$$

Example with Units

$$30 \text{ mm} = 4.5 \text{ MPa} \cdot \frac{1400 \text{ mm}}{2 \cdot 105 \text{ N/mm}^2}$$

Evaluate Formula 

16) Throat of Butt Weld given Average Tensile Stress Formula

Formula

$$h_t = \frac{P}{L \cdot \sigma_t}$$

Example with Units

$$15.0027 \text{ mm} = \frac{16.5 \text{ kN}}{19.5 \text{ mm} \cdot 56.4 \text{ N/mm}^2}$$

Evaluate Formula 



Variables used in list of Butt Welds Formulas above

- b_{ns} Beam Width for Nominal Shear (Millimeter)
- D_i Inner Diameter of Boiler (Millimeter)
- h_t Throat Thickness of Weld (Millimeter)
- L Length of Weld (Millimeter)
- P Tensile Force on Welded Plates (Kilonewton)
- P_i Internal Pressure in Boiler (Megapascal)
- t Thickness of Boiler Wall (Millimeter)
- t_p Welded Base Plate Thickness (Millimeter)
- η Efficiency of Welded Joints
- σ_b Tensile Stress in Boiler Butt Weld (Newton per Square Millimeter)
- σ_t Tensile Stress in Weld (Newton per Square Millimeter)

Constants, Functions, Measurements used in list of Butt Welds Formulas above

- **Measurement: Length** in Millimeter (mm)
[Length Unit Conversion](#) 
- **Measurement: Pressure** in Megapascal (MPa)
[Pressure Unit Conversion](#) 
- **Measurement: Force** in Kilonewton (kN)
[Force Unit Conversion](#) 
- **Measurement: Stress** in Newton per Square Millimeter (N/mm²)
[Stress Unit Conversion](#) 



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