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Riveted Joints Formulas

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List of 36 Riveted Joints Formulas

Riveted Joints

Rivet Dimensions

1) Diagonal pitch

$$\text{fx } p_d = \frac{2 \cdot p_1 + d}{3}$$

[Open Calculator !\[\]\(de95854c7ee024cfadc48187bbb781b2_img.jpg\)](#)

$$\text{ex } 27.46667\text{mm} = \frac{2 \cdot 32.2\text{mm} + 18\text{mm}}{3}$$

2) Diameter of Rivet given Margin of Rivet

$$\text{fx } d = \frac{m}{1.5}$$

[Open Calculator !\[\]\(6a9b39b98eb945faa14c645ec99e4eaa_img.jpg\)](#)

$$\text{ex } 18\text{mm} = \frac{27\text{mm}}{1.5}$$



3) Diameter of Rivet given Pitch along Caulking Edge

$$\text{fx } d = p_c - 14 \cdot \left(\frac{(h_c)^3}{P_f} \right)^{\frac{1}{4}}$$

[Open Calculator !\[\]\(cbe80b694ebd74fcfe136a095b608235_img.jpg\)](#)

$$\text{ex } 17.93051\text{mm} = 31.2\text{mm} - 14 \cdot \left(\frac{(14\text{mm})^3}{3.4\text{N/mm}^2} \right)^{\frac{1}{4}}$$

4) Diameter of rivets for lap joint

$$\text{fx } d = \left(4 \cdot \frac{P}{\pi \cdot n \cdot \tau} \right)^{0.5}$$

[Open Calculator !\[\]\(3e2231b1ad3ca8da8658228c00dd08e0_img.jpg\)](#)

$$\text{ex } 18.03839\text{mm} = \left(4 \cdot \frac{46000\text{N}}{\pi \cdot 3 \cdot 60\text{N/mm}^2} \right)^{0.5}$$

5) Longitudinal pitch

$$\text{fx } p_l = \frac{3 \cdot p_d - d}{2}$$

[Open Calculator !\[\]\(0d5ec72f61334709c3fc9450209b754f_img.jpg\)](#)

$$\text{ex } 32.25\text{mm} = \frac{3 \cdot 27.5\text{mm} - 18\text{mm}}{2}$$


6) Margin of Rivet

$$\text{fx } m = 1.5 \cdot d$$

[Open Calculator !\[\]\(b64b40baaee5acddc1eab8538ba84754_img.jpg\)](#)

$$\text{ex } 27\text{mm} = 1.5 \cdot 18\text{mm}$$




7) Minimum transverse pitch as per ASME boiler code if ratio of p is to d is less than 4 

$$fx \quad p_t = 1.75 \cdot d$$

Open Calculator 

$$ex \quad 31.5\text{mm} = 1.75 \cdot 18\text{mm}$$

8) Minimum transverse pitch as per ASME boiler code if ratio of p to d is greater than 4 (SI) 

$$fx \quad p_t = 1.75 \cdot d + .001 \cdot (p_1 - d)$$

Open Calculator 


$$ex \quad 31.5142\text{mm} = 1.75 \cdot 18\text{mm} + .001 \cdot (32.2\text{mm} - 18\text{mm})$$

9) Number of Rivets Per Pitch given Crushing Resistance of Plates 

$$fx \quad n = \frac{P_c}{d \cdot t \cdot \sigma_c}$$

Open Calculator 

$$ex \quad 2.999688 = \frac{53800\text{N}}{18\text{mm} \cdot 10.6\text{mm} \cdot 94\text{N}/\text{mm}^2}$$

10) Pitch along caulking edge 

$$fx \quad p_c = 14 \cdot \left(\left(\frac{(h_c)^3}{P_f} \right)^{\frac{1}{4}} \right) + d$$

Open Calculator 

$$ex \quad 31.26949\text{mm} = 14 \cdot \left(\left(\frac{(14\text{mm})^3}{3.4\text{N}/\text{mm}^2} \right)^{\frac{1}{4}} \right) + 18\text{mm}$$



11) Pitch of Rivet

$$fx \quad p = 3 \cdot d$$

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

$$ex \quad 54\text{mm} = 3 \cdot 18\text{mm}$$

12) Pitch of Rivets given Tensile Resistance of Plate between two Rivets

$$fx \quad p = \left(\frac{P_t}{t \cdot \sigma_t} \right) + d$$

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

$$ex \quad 54.03774\text{mm} = \left(\frac{28650\text{N}}{10.6\text{mm} \cdot 75\text{N/mm}^2} \right) + 18\text{mm}$$

13) Rivet Diameter given Thickness of Plate

$$fx \quad d = 0.2 \cdot \sqrt{t}$$

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

$$ex \quad 20.59126\text{mm} = 0.2 \cdot \sqrt{10.6\text{mm}}$$

14) Transverse pitch

$$fx \quad p_t = \sqrt{\left(\frac{2 \cdot p_1 + d}{3} \right)^2 - \left(\frac{p_1}{2} \right)^2}$$

[Open Calculator !\[\]\(7bc43b319a082987e20f7bf78f4bab80_img.jpg\)](#)

$$ex \quad 22.25326\text{mm} = \sqrt{\left(\frac{2 \cdot 32.2\text{mm} + 18\text{mm}}{3} \right)^2 - \left(\frac{32.2\text{mm}}{2} \right)^2}$$



15) Transverse Pitch for Zig-Zag riveting

$$fx \quad p_t = 0.6 \cdot p$$

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

$$ex \quad 32.4\text{mm} = 0.6 \cdot 54\text{mm}$$

16) Transverse Pitch of Rivet Chain Riveting

$$fx \quad p_t = 0.8 \cdot p$$

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

$$ex \quad 43.2\text{mm} = 0.8 \cdot 54\text{mm}$$

Rivet Shank Dimensions

17) Length of Rivet Shank

$$fx \quad l = (t_1 + t_2) + a$$

[Open Calculator !\[\]\(104fbf564e2e5a8fbd84f31656d114c7_img.jpg\)](#)

$$ex \quad 38\text{mm} = (10.5\text{mm} + 12.5\text{mm}) + 15\text{mm}$$

18) Length of Shank Portion necessary to form Closing Head

$$fx \quad a = l - (t_1 + t_2)$$

[Open Calculator !\[\]\(21226b58c700e5231ab98d27101bac58_img.jpg\)](#)

$$ex \quad 15\text{mm} = 38\text{mm} - (10.5\text{mm} + 12.5\text{mm})$$



19) Shank Diameter of Rivet given Crushing Resistance of Plates

$$fx \quad d = \frac{P_c}{n \cdot t \cdot \sigma_c}$$

[Open Calculator !\[\]\(9dfdaff1d86ba3c1f8353b4d1b61b8c5_img.jpg\)](#)

$$ex \quad 17.99813\text{mm} = \frac{53800\text{N}}{3 \cdot 10.6\text{mm} \cdot 94\text{N}/\text{mm}^2}$$

20) Shank Diameter of Rivet given Pitch of Rivet

$$fx \quad d = \frac{p}{3}$$

[Open Calculator !\[\]\(2b376d1a92330ab09dad2665d2f89bf5_img.jpg\)](#)

$$ex \quad 18\text{mm} = \frac{54\text{mm}}{3}$$

21) Shank diameter of Rivet subjected to double shear given Shear resistance of Rivet per Pitch

$$fx \quad d = \sqrt{2 \cdot \frac{P_s}{\pi \cdot \tau}}$$

[Open Calculator !\[\]\(c444627dab9fee9a1550c053ffaaaae2_img.jpg\)](#)

$$ex \quad 17.9893\text{mm} = \sqrt{2 \cdot \frac{30500\text{N}}{\pi \cdot 60\text{N}/\text{mm}^2}}$$



Stresses and Resistances

22) Crushing Resistance of Plates per Pitch Length

$$fx \quad P_c = d \cdot n \cdot t \cdot \sigma_c$$

[Open Calculator !\[\]\(96cc62f861fdd6e50510c0224a756dff_img.jpg\)](#)

$$ex \quad 53805.6N = 18mm \cdot 3 \cdot 10.6mm \cdot 94N/mm^2$$

23) Permissible Compressive Stress of Plate Material given Crushing Resistance of Plates

$$fx \quad \sigma_c = \frac{P_c}{d \cdot n \cdot t}$$

[Open Calculator !\[\]\(f95dab70c751fda7d824b8b03650f7aa_img.jpg\)](#)

$$ex \quad 93.99022N/mm^2 = \frac{53800N}{18mm \cdot 3 \cdot 10.6mm}$$

24) Permissible Shear Stress for Rivet for Single Shear

$$fx \quad \tau = \frac{P_s}{\left(\frac{\pi}{4}\right) \cdot n \cdot d^2}$$

[Open Calculator !\[\]\(e9474ce1d70442456f8fe9c393ea149c_img.jpg\)](#)

$$ex \quad 39.95248N/mm^2 = \frac{30500N}{\left(\frac{\pi}{4}\right) \cdot 3 \cdot (18mm)^2}$$



25) Permissible Shear Stress for Rivet given Shear Resistance of Rivet Per Pitch Length

$$fx \quad \tau = \frac{P_s}{\left(\frac{\pi}{4}\right) \cdot d^2}$$

[Open Calculator !\[\]\(c3d993ca47bfe2a953c700506ce31fa0_img.jpg\)](#)

$$ex \quad 119.8574N/mm^2 = \frac{30500N}{\left(\frac{\pi}{4}\right) \cdot (18mm)^2}$$

26) Permissible Tensile Stress of Plate given Tensile Resistance of Plate between two Rivets

$$fx \quad \sigma_t = \frac{P_t}{(p - d) \cdot t_1}$$

[Open Calculator !\[\]\(17413706fd4997a1a4bdf85c6864eee1_img.jpg\)](#)

$$ex \quad 75.79365N/mm^2 = \frac{28650N}{(54mm - 18mm) \cdot 10.5mm}$$

27) Shear Resistance of Rivet per Pitch Length

$$fx \quad p_s = \left(\frac{\pi}{4}\right) \cdot d^2 \cdot \tau$$

[Open Calculator !\[\]\(4b7a79268f6ba26c1471d4232fffa85a_img.jpg\)](#)

$$ex \quad 15268.14N = \left(\frac{\pi}{4}\right) \cdot (18mm)^2 \cdot 60N/mm^2$$

28) Shear Resistance of Rivet Per Pitch Length for Double Shear

$$fx \quad p_s = 2 \cdot \left(\frac{\pi}{4}\right) \cdot d^2 \cdot \tau \cdot n$$

[Open Calculator !\[\]\(3342c215b2a8b663596a81468d5dc314_img.jpg\)](#)

$$ex \quad 91608.84N = 2 \cdot \left(\frac{\pi}{4}\right) \cdot (18mm)^2 \cdot 60N/mm^2 \cdot 3$$



29) Shear Resistance of Rivet Per Pitch Length for Single Shear

$$fx \quad p_s = \left(\frac{\pi}{4}\right) \cdot d^2 \cdot \tau \cdot n$$

[Open Calculator !\[\]\(0f848bbd71cef6b345273b16f905912a_img.jpg\)](#)

$$ex \quad 45804.42N = \left(\frac{\pi}{4}\right) \cdot (18mm)^2 \cdot 60N/mm^2 \cdot 3$$

30) Tensile Resistance of Plate between two Rivets

$$fx \quad P_t = (p - d) \cdot t \cdot \sigma_t$$

[Open Calculator !\[\]\(3211b5d1d968fc1665909b34f9f16010_img.jpg\)](#)

$$ex \quad 28620N = (54mm - 18mm) \cdot 10.6mm \cdot 75N/mm^2$$

Thickness of Plates

31) Thickness of plate 1 given Length of Rivet Shank

$$fx \quad t_1 = l - (a + t_2)$$

[Open Calculator !\[\]\(e3275251d0893157c3584e20c81dc3ba_img.jpg\)](#)

$$ex \quad 10.5mm = 38mm - (15mm + 12.5mm)$$

32) Thickness of Plate 2 given Length of Rivet Shank

$$fx \quad t_2 = l - (t_1 + a)$$

[Open Calculator !\[\]\(eabd9f9ababee93effadc3b380fe65fd_img.jpg\)](#)

$$ex \quad 12.5mm = 38mm - (10.5mm + 15mm)$$



33) Thickness of Plate given Tensile Resistance of Plate between two Rivets

$$fx \quad t = \frac{P_t}{(p - d) \cdot \sigma_t}$$

[Open Calculator !\[\]\(cbe80b694ebd74fcfe136a095b608235_img.jpg\)](#)

$$ex \quad 10.61111\text{mm} = \frac{28650\text{N}}{(54\text{mm} - 18\text{mm}) \cdot 75\text{N/mm}^2}$$

34) Thickness of plate of pressure vessel with circumferential joint

$$fx \quad t = \frac{P_f \cdot D}{4 \cdot \eta \cdot \sigma_h}$$

[Open Calculator !\[\]\(3e2231b1ad3ca8da8658228c00dd08e0_img.jpg\)](#)

$$ex \quad 10.64348\text{mm} = \frac{3.4\text{N/mm}^2 \cdot 1080\text{mm}}{4 \cdot 0.75 \cdot 115\text{N/mm}^2}$$

35) Thickness of plate of pressure vessel with longitudinal joint

$$fx \quad t = \frac{P_f \cdot D}{2 \cdot \eta \cdot \sigma_h}$$

[Open Calculator !\[\]\(0d5ec72f61334709c3fc9450209b754f_img.jpg\)](#)

$$ex \quad 21.28696\text{mm} = \frac{3.4\text{N/mm}^2 \cdot 1080\text{mm}}{2 \cdot 0.75 \cdot 115\text{N/mm}^2}$$



36) Thickness of Plates given Crushing Resistance 

$$\text{fx } t = \frac{P_c}{d \cdot n \cdot \sigma_c}$$

[Open Calculator](#) 

$$\text{ex } 10.5989\text{mm} = \frac{53800\text{N}}{18\text{mm} \cdot 3 \cdot 94\text{N}/\text{mm}^2}$$



Variables Used





- **a** Length of Shank Portion for Closing Head (*Millimeter*)
- **d** Diameter of Rivet (*Millimeter*)
- **D** Inner diameter of riveted pressure vessel (*Millimeter*)
- **h_c** Riveted Joint Cover Plate Thickness (*Millimeter*)
- **l** Length of Rivet Shank (*Millimeter*)
- **m** Margin of Rivet (*Millimeter*)
- **n** Rivets Per Pitch
- **p** Pitch of Rivet (*Millimeter*)
- **P** Tensile force on riveted plates (*Newton*)
- **p_c** Pitch along Caulking Edge (*Millimeter*)
- **P_c** Crushing Resistance of Riveted Plate per Pitch (*Newton*)
- **p_d** Diagonal Pitch of Rivet Joint (*Millimeter*)
- **P_f** Intensity of Fluid Pressure (*Newton per Square Millimeter*)
- **p_l** Longitudinal Pitch of Rivet Joint (*Millimeter*)
- **p_s** Shear Resistance of Rivet per Pitch Length (*Newton*)
- **p_t** Transverse Pitch of Rivet (*Millimeter*)
- **P_t** Tensile Resistance of Plate Per Rivet Pitch (*Newton*)
- **t** Thickness of Plate of Riveted joint (*Millimeter*)
- **t_1** Thickness of Plate 1 of Riveted Joint (*Millimeter*)
- **t_2** Thickness of Plate 2 of Riveted Joint (*Millimeter*)
- **η** Riveted joint efficiency



- σ_c Permissible Compressive Stress of Riveted Plate (*Newton per Square Millimeter*)
- σ_h Circumferential Hoop Stress in Riveted Vessel (*Newton per Square Millimeter*)
- σ_t Tensile Stress in Riveted Plate (*Newton per Square Millimeter*)
- τ Permissible Shear Stress for Rivet (*Newton per Square Millimeter*)









Constants, Functions, Measurements used

- **Constant:** **pi**, 3.14159265358979323846264338327950288
Archimedes' constant
- **Function:** **sqrt**, sqrt(Number)
Square root function
- **Measurement:** **Length** in Millimeter (mm)
Length Unit Conversion 
- **Measurement:** **Pressure** in Newton per Square Millimeter (N/mm²)
Pressure Unit Conversion 
- **Measurement:** **Force** in Newton (N)
Force Unit Conversion 
- **Measurement:** **Stress** in Newton per Square Millimeter (N/mm²)
Stress Unit Conversion 



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