

TABLE 6—QUADRUPLE RIVETED BUTT JOINTS*

Thickness of Plate	Thickness of Strap	Diameter of Rivet Hole	Efficiency %	Long Pitch	Middle Pitch	Short Pitch	A	B	C	D	E	F
1/4"	1/4"	1 1/16"	93.8	11"	5 1/2"	2 3/4"	16 1/2"	7 3/4"	1 1/16"	1 3/4"	2 1/8"	2 1/4"
9/32"	1/4"	1 1/16"	93.8	11"	5 1/2"	2 3/4"	16 1/2"	7 3/4"	1 1/16"	1 3/4"	2 1/8"	2 1/4"
5/16"	9/32"	1 3/16"	93.8	13"	6 1/2"	3 1/4"	18 7/8"	8 3/4"	1 1/4"	1 7/8"	2 7/16"	2 5/8"
11/32"	9/32"	1 3/16"	93.8	13"	6 1/2"	3 1/4"	18 7/8"	8 3/4"	1 1/4"	1 7/8"	2 7/16"	2 5/8"
3/8"	5/16"	1 3/16"	94.2	14"	7"	3 1/2"	19 1/8"	8 3/4"	1 1/4"	1 7/8"	2 7/16"	2 3/4"
13/32"	5/16"	1 3/16"	94.2	14"	7"	3 1/2"	19 1/8"	8 3/4"	1 1/4"	1 7/8"	2 7/16"	2 3/4"
7/16"	3/8"	1 5/16"	94.0	15 1/2"	7 3/4"	3 7/8"	21 3/8"	9 3/4"	1 7/16"	2"	2 3/4"	3 1/16"
15/32"	3/8"	1 5/16"	94.0	15 1/2"	7 3/4"	3 7/8"	21 3/8"	9 3/4"	1 7/16"	2"	2 3/4"	3 1/16"
1/2"	7/16"	1 5/16"	94.1	16"	8"	4"	21 1/2"	9 3/4"	1 7/16"	2"	2 3/4"	3 1/8"
17/32"	7/16"	1 5/16"	94.1	16"	8"	4"	21 1/2"	9 3/4"	1 7/16"	2"	2 3/4"	3 1/8"
9/16"	7/16"	1 5/16"	94.1	16"	8"	4"	21 1/2"	9 3/4"	1 7/16"	2"	2 3/4"	3 1/8"
9/16"	7/16"	1 1/16"	93.4	16"	8"	4"	23 5/8"	11"	1 5/8"	2 1/4"	3"	3 5/16"
19/32"	1/2"	1 1/16"	93.4	16"	8"	4"	23 5/8"	11"	1 5/8"	2 1/4"	3"	3 5/16"
5/8"	1/2"	1 1/16"	93.4	16"	8"	4"	23 5/8"	11"	1 5/8"	2 1/4"	3"	3 5/16"
21/32"	1/2"	1 1/16"	93.4	16"	8"	4"	23 5/8"	11"	1 5/8"	2 1/4"	3"	3 5/16"
11/16"	1/2"	1 3/16"	92.8	16 1/2"	8 1/4"	4 1/8"	25 5/8"	12"	1 13/16"	2 3/8"	3 1/4"	3 9/16"
23/32"	1/2"	1 3/16"	92.8	16 1/2"	8 1/4"	4 1/8"	25 5/8"	12"	1 13/16"	2 3/8"	3 1/4"	3 9/16"
3/4"	1/2"	1 3/16"	92.7	16 1/2"	8 1/4"	4 1/8"	25 5/8"	12"	1 13/16"	2 3/8"	3 1/4"	3 9/16"
25/32"	9/16"	1 5/16"	92.3	17"	8 1/2"	4 1/4"	27 7/8"	13 1/4"	2"	2 5/8"	3 1/2"	3 13/16"
13/16"	9/16"	1 5/16"	92.3	17"	8 1/2"	4 1/4"	27 7/8"	13 1/4"	2"	2 5/8"	3 1/2"	3 13/16"
27/32"	9/16"	1 5/16"	91.8	17"	8 1/2"	4 1/4"	27 7/8"	13 1/4"	2"	2 5/8"	3 1/2"	3 13/16"
7/8"	5/8"	1 5/16"	91.2	17 1/2"	8 3/4"	4 3/8"	28"	13 1/4"	2"	2 5/8"	3 1/2"	3 7/8"
29/32"	5/8"	1 5/16"	90.5	17 1/2"	8 3/4"	4 3/8"	28"	13 1/4"	2"	2 5/8"	3 1/2"	3 7/8"
15/16"	1 1/16"	1 5/16"	90.1	18"	9"	4 1/2"	28 1/8"	13 1/4"	2"	2 5/8"	3 1/2"	3 15/16"
31/32"	1 1/16"	1 5/16"	89.5	18"	9"	4 1/2"	28 1/8"	13 1/4"	2"	2 5/8"	3 1/2"	3 15/16"
1"	3/4"	1 7/16"	90.2	19"	9 1/2"	4 3/4"	30 1/2"	14 1/2"	2 3/16"	2 7/8"	3 3/4"	4 1/4"
1 1/32"	3/4"	1 7/16"	89.6	19"	9 1/2"	4 3/4"	30 1/2"	14 1/2"	2 3/16"	2 7/8"	3 3/4"	4 1/4"
1 1/16"	3/4"	1 7/16"	89.0	19"	9 1/2"	4 3/4"	30 1/2"	14 1/2"	2 3/16"	2 7/8"	3 3/4"	4 1/4"
1 3/32"	3/4"	1 7/16"	88.5	19"	9 1/2"	4 3/4"	30 1/2"	14 1/2"	2 3/16"	2 7/8"	3 3/4"	4 1/4"
1 1/8"	3/4"	1 7/16"	88.0	19"	9 1/2"	4 3/4"	30 1/2"	14 1/2"	2 3/16"	2 7/8"	3 3/4"	4 1/4"
1 1/32"	3/4"	1 7/16"	87.5	19"	9 1/2"	4 3/4"	30 1/2"	14 1/2"	2 3/16"	2 7/8"	3 3/4"	4 1/4"
1 3/16"	13/16"	1 7/16"	87.7	20"	10"	5"	30 5/8"	14 1/2"	2 3/16"	2 7/8"	3 3/4"	4 5/16"
1 7/16"	13/16"	1 7/16"	87.2	20"	10"	5"	30 5/8"	14 1/2"	2 3/16"	2 7/8"	3 3/4"	4 5/16"
1 1/4"	7/8"	1 7/16"	86.8	20"	10"	5"	30 5/8"	14 1/2"	2 3/16"	2 7/8"	3 3/4"	4 5/16"

*Joints for plate thickness from 27/32" to 1 1/4" (both inclusive) fail by tearing the plate between rivet holes in the third row and shearing the rivets in the outer two rows. This also applies to the joint for 3/4" plate. All other joints in the above table fail by tearing the plate between rivet holes in the outer row. For convenience in driving rivets, any of the dimensions for back-pitch (dimensions D, E and F) may be increased, if desired, without affecting the joint efficiency, but they should not be decreased.

$$A = Ptf = 3.75 \times 0.4375 \times 55,000 = 90,234.$$

$$B = (P-d)tf = (3.75 - 0.9375) \times 0.4375 \times 55,000 = 67,677.$$

$$C = nsa = 3 \times 44,000 \times 0.6903 = 99,120.$$

$$D = ndtc = 3 \times 0.9375 \times 0.4375 \times 95,000 = 116,689.$$

$$e = B/A = 0.75 = 75\%.$$

Second trial: Assume the same diameter of rivet and a pitch of 3 3/8 ins. Then $P = 3.625$ ins., and

$$A = Ptf = 3.625 \times 0.4375 \times 55,000 = 87,338.$$

$$B = (P-d)tf = (3.625 - 0.9375) \times 0.4375 \times 55,000 = 64,669.$$

$$C = nsa = 3 \times 44,000 \times 0.6903 = 99,120.$$

$$D = ndtc = 3 \times 0.875 \times 0.4375 \times 95,000 = 109,102.$$

$$e = B/A = 0.74 = 74\%.$$

Third trial: Assume the same diameter of rivet and a pitch of 3 7/8 ins. Then $P = 3.875$ ins., and

$$A = Ptf = 3.875 \times 0.4375 \times 55,000 = 93,242.$$

$$B = (P-d)tf = (3.875 - 0.9375) \times 0.4375 \times 55,000 = 70,684.$$

$$C = nsa = 3 \times 44,000 \times 0.6903 = 91,120.$$

$$D = ndtc = 3 \times 0.875 \times 0.4375 \times 95,000 = 109,112.$$

$$e = B/A = 0.758 = 75.8\%.$$

From the above, it is seen that by increasing the pitch of the rivets, an increase in the efficiency of the joint is

TABLE 8—RANGE OF PLATE THICKNESSES FOR VARIOUS DIAMETERS OF RIVETS

Diameter of rivet, inches	5/8"	3/4"	7/8"	1"	1 1/8"	1 1/4"	1 1/2"
Minimum thickness of plate, inches	1/4"	5/16"	3/8"	3/8"	7/16"	7/16"	1/2"
Maximum thickness of plate, inches	1/2"	5/8"	3/4"	7/8"	1"	1 1/8"	1 1/4"

obtained. However, the pitch of the rivets is limited to that which will permit water-tight caulking. In this case the pitch should not exceed 3 3/4 ins. (see Table 7), and hence the maximum efficiency attainable with a 7/8-in. rivet is 75%.

The process should be repeated, using different sizes of rivets and various pitches. That combination of rivet diameter and pitch that gives the greatest efficiency, and does not exceed the maximum rivet spacing prescribed in Table 7, is the most desirable.

Rule riveted butt and double strap joint for 3/4-in. plate:—

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TABLE 7—MAXIMUM LIMITING PITCHES FOR LAP JOINTS

Diameter of Rivet	5/8"	3/4"	7/8"	1"	1 1/8"	1 1/4"	1 1/2"
" " Hole	1 1/16"	1 3/16"	1 5/16"	1 7/16"	1 9/16"	1 11/16"	1 13/16"
Plate Thickness							
1/4"	2 7/16"						
5/16"	2 7/16"	3"					
3/8"	2 1/2"	3 1/16"	3 1/2"	3 3/4"			
7/16"	2 7/16"	3 1/4"	3 3/4"	4 1/16"	4 5/16"	4 9/16"	4 13/16"
1/2"	2 3/8"	3 5/16"	4"	4 3/8"	4 9/16"	4 13/16"	5 1/8"