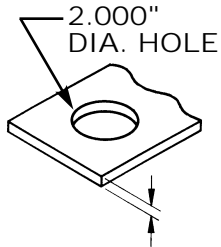


# Technical Data

## How to Obtain Tonnage Required for Punching Round Holes:



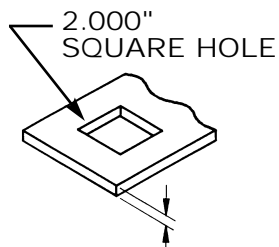
1/4 (.250") THICK M.S.

FORMULA:  
TONNAGE IN MILD STEEL =  
 $3.1416 \times \text{DIA. OF HOLE} \times$   
 $\text{MAT'L THICKNESS} \times 25$

EXAMPLE:  
 $3.1416 \times 2.000 \times .250 \times 25$

ANSWER:  
39.26 TONS

## How to Obtain Tonnage Required for Punching Shaped Holes:



1/4 (.250") THICK M.S.

FORMULA:  
TONNAGE IN MILD STEEL =  
 $\text{PERIPHERY} \times \text{MATERIAL THICKNESS} \times 25$

EXAMPLE:  
 $(2 + 2 + 2 + 2) \times .250 \times 25$

ANSWER:  
50 TONS

## Approximate Tonnage Required for Punching Round Holes in Mild Steel (50,000 psi shear strength)

Hole Dia. in Inches	20 GA. .036	18 GA. .048	16 GA. .060	14 GA. .075	12 GA. .105	11 GA. .120	10 GA. .135	3/16 .187	1/4 .250	5/16 .312	3/8 .375	1/2 .500
1/8	.35	.47	.59	.74	1.0	1.2	—	—	—	—	—	—
3/16	.53	.71	.89	1.1	1.6	1.8	2.0	2.8	—	—	—	—
1/4	.71	.94	1.2	1.5	2.1	2.4	2.7	3.7	4.9	—	—	—
5/16	.88	1.2	1.5	1.9	2.6	3.0	3.3	4.6	6.2	7.8	—	—
3/8	1.1	1.4	1.8	2.2	3.1	3.5	4.0	5.5	7.4	9.2	11.1	—
7/16	1.2	1.7	2.1	2.6	3.6	4.1	4.6	6.5	8.6	10.8	13.0	17.2
1/2	1.4	1.9	2.4	2.9	4.1	4.7	5.3	7.4	9.8	12.3	14.8	19.7
9/16	1.6	2.1	2.7	3.3	4.7	5.3	6.0	8.3	11.0	13.8	16.6	22.1
5/8	1.8	2.4	2.9	3.7	5.2	5.9	6.6	9.2	12.3	15.4	18.5	24.6
11/16	1.9	2.6	3.2	4.1	5.7	6.5	7.3	10.2	13.5	16.9	20.3	27.1
3/4	2.1	2.8	3.5	4.4	6.2	7.1	8.0	11.1	14.8	18.4	22.1	29.5
13/16	2.3	3.1	3.8	4.8	6.7	7.7	8.6	12.0	16.0	20.0	24.0	32.0
7/8	2.5	3.3	4.1	5.2	7.2	8.3	9.3	12.9	17.2	21.5	25.8	34.4
15/16	2.7	3.5	4.4	5.5	7.7	8.8	10.0	13.8	18.5	23.0	27.7	36.9
1	2.8	3.8	4.7	5.9	8.3	9.4	10.6	14.8	19.7	24.6	29.5	39.4
1-1/2	4.2	5.6	7.0	8.8	12.3	14.1	15.8	22.1	29.5	36.8	44.2	58.9
2	5.6	7.5	9.4	11.7	16.4	18.8	21.1	29.5	39.3	49.1	58.9	78.5
2-1/2	7.1	9.4	11.7	14.7	20.5	23.6	26.4	36.8	49.1	61.4	73.6	98.2
3	8.5	11.3	14.1	17.6	24.6	28.2	31.7	44.2	58.9	73.6	88.4	118
3-1/2	9.9	13.1	16.4	20.5	28.8	32.7	37.0	51.5	68.7	85.9	103	137
4	11.3	15.0	18.8	23.5	32.8	37.6	42.2	58.9	78.5	98.2	118	157
4-1/2	12.7	16.9	21.2	26.4	37.0	42.4	47.5	66.3	88.4	110	133	177
5	14.1	18.7	23.5	29.3	41.1	47.1	52.8	73.6	98.2	123	147	196

To obtain tonnage required for punching round holes in mild steel multiply as follows:  
 $3.1416 \times \text{Diameter of Hole} \times \text{Material Thickness} \times 25 = \text{Punching Tonnage Required for One Hole}$

## Approximate Tonnage Required for Notching

Metal Thickness	Gauge	20	18	16	14	12	10	3/16"	1/4"	3/8"	1/2"
	Decimal	.036	.048	.060	.075	.105	.135	.187	.250	.375	.500
Tons Required to Notch 1" Length		.99	1.30	1.65	2.05	2.85	3.65	5.01	6.60	9.55	12.5

To obtain tonnage required for notching mild steel multiply as follows:  
 $\text{Total shear length} \times \text{material thickness} \times 25 = \text{tonnage required for total length of shear}$

## Multiplier Chart for Various Materials

Above chart shows tonnage for punching holes in mild steel (50,000 psi).  
For punching materials of different shear strength, use multiplier in chart below.

Material Description	Tons Per Sq. In.	Yield or Shear Strength Per Sq. In.	Multiplier
Aluminum — Soft Sheet	7-1/2	15,000 psi	.30
Aluminum — Half Hard	9-1/2	19,000 psi	.38
Aluminum — Hard	12	25,000 psi	.50
Brass — Soft Sheet	15	30,000 psi	.60
Brass — Half Hard	17-1/2	35,000 psi	.70
Copper — Rolled	14	28,000 psi	.56
Steel — Mild	25	50,000 psi	1.00
Steel — ASTM - A36	30	60,000 psi	1.20
Steel — 50 Carbon	35	70,000 psi	1.40
Steel — Cold Drawn	30	60,000 psi	1.20
Steel — Stainless (18 - 8)	35	70,000 psi	1.40

## Effect of Punch Shear on Tonnage

The chart at top shows tonnage for flat ground punches (without shear).  
Chisel shear on punches can considerably reduce required press tonnage.  
The chart below shows tonnage reduction factors for the shear depths listed.

Multiply shear factor times actual tonnage to obtain reduced tonnage per hole.

Shear Depth	Up to 16 GA.	14 GA.	12 GA.	10 GA.	8 GA.	3/16 GA.	1/4 GA.
1/16	.50	.60	.75	.80	.85	.87	.90
3/32	.50	.50	.60	.70	.75	.80	.85
3/16	.50	.50	.50	.50	.50	.50	.65

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