

Pressure Ratings of Steel Pipe

Based on ASTM A53 Grade B or A106 Grade B Seamless
ANSI B31.1, 1977 with allowances for connections and fittings
reduces these working pressures approx. 25%

PIPE		PRESSURE-PSI		WATER HAMMER FACTOR	PIPE		PRESSURE-PSI		WATER HAMMER FACTOR
NOM. SIZE INCHES	SCH. NO.	WORKING	BURST		NOM. SIZE INCHES	SCH. NO.	WORKING	BURST	
1/8	40	3500	20,200		2½	160	4200	15,700	5.43
1/8	80	4800	28,000		2½	XXS	6900	23,000	7.82
1/4	40	2100	19,500		3	40	1600	7,400	2.60
1/4	80	4350	26,400		3	80	2600	10,300	2.92
3/8	40	1700	16,200		3	160	4100	15,000	3.56
3/8	80	3800	22,500		3	XXS	6100	20,500	4.64
1/2	40	2300	15,600	63.4	3½	40	1500	6,800	1.94
1/2	80	4100	21,000		3½	80	2400	9,500	2.17
1/2	160	7300	26,700		4	40	1400	6,300	1.51
1/2	XXS	12300	42,100		4	80	2300	9,000	1.67
3/4	40	2000	12,900	36.1	4	160	4000	14,200	2.08
3/4	80	3500	17,600	44.5	4	XXS	5300	18,000	2.47
3/4	169	8500	25,000		5	40	1300	5,500	.960
3/4	XXS	10000	35,000		5	80	2090	8,100	1.06
1	40	2100	12,100	22.3	5	160	3850	13,500	1.32
1	80	3500	15,900	26.8	5	XXS	4780	16,200	1.49
1	160	5700	22,300	36.9	6	40	1210	5,100	.666
1	XXS	9500	32,700	68.3	6	80	2070	7,800	.738
1¼	40	1800	10,100	12.9	6	160	3760	13,000	.912
1¼	80	3000	13,900	15.0	6	XXS	4660	15,000	1.02
1¼	160	4400	18,100	18.2	8	40	1100	4,500	.385
1¼	XXS	7900	27,700	30.5	8	80	1870	6,900	.422
1½	40	1700	9,100	9.46	8	160	3700	12,600	.529
1½	80	2800	12,600	10.9	8	XXS	3560	12,200	.519
1½	160	4500	17,700	13.7	10	40	1030	4,100	.244
1½	XXS	7200	25,300	20.3	10	*80	1800	6,600	
2	40	1500	7,800	5.74	10	160	3740	12,500	.340
2	80	2500	11,000	6.52	10	XXS	3300	11,200	
2	160	4600	17,500	8.60	12	@40	1000	3,800	
2	XXS	6300	22,100	10.9	12	**80	1800	6,500	
2½	40	1900	8,500	4.02	12	160	3700	12,300	.239
2½	80	2800	11,500	4.54	12	XXS	2700	9,400	

The allowable pressures were calculated by the formula in the Code for Pressure Piping, ASA B31.1-1955, Section 3, par. 324(a),

$$P = \frac{25(t-C)}{D-2y(t-C)}$$

where P = allowable pressure in lb per sq in. (gauge)
 S = allowable working stress in lb per sq in.
 D = outside diameter in inches
 t = design thickness in inches, or 12 1/2% less than the nominal thickness shown in the table
 C = allowance in inches for corrosion and/or mechanical strength (C=0.05" has been used above for all pipe sizes)
 y = a coefficient having values for ferritic steels, as follows:

- 0.4 up to and including 900°F
- 0.5 for 950°F
- 0.7 for 1000°F and above

The allowable working stresses were obtained from the Code for Pressure Piping, ASA B31.1.1-1955, Table 12.

Hydraulic machinery piping is not covered by the Code for Pressure Piping, but it is current practice to use stresses comparable with those given for Refinery and Oil Transportation Piping, Div. A. The allowable working

pressures at 100°F tabulated above accordingly may be used, provided that water hammer or shock conditions are considered by reducing these values by the product of the flow rate in gallons per minute and the Water Hammer Factor tabulated above.

Thus if the flow rate is 100 gpm in a 2" extra strong line, the shock pressure created by water hammer is 100 x 6.52 = 652 lbs. per sq. in.; by deducting this from the value of 2500 lb per sq in. shown in the table the allowable static working pressure is found to be 1848 lb per sq in.

Burst pressures for pipe were calculated using formula

$$P = \frac{25t}{OD}$$

Where P = internal burst pressure, psig
 S = allowable stress (60,000 psi)
 OD = outside diameter of tube in inches
 t = nominal wall thickness

NOTES: *Not extra strong. Schedule 60 is extra strong in this size.

** Not extra strong. Extra strong does not have a schedule number in this size! (ID of 12" XS is 11.75 Inches)

@ Not standard weight. Standard weight does not have a schedule number in this size! (ID of 12" Standard is 12.00 Inches).