

SPECIAL SERVICE VALVES

There are several types of valves commonly used in different piping applications that do not necessarily fall into the classification of general purpose valves. Expansion, relief, and solenoid valves are some of the more common special purpose valves.

A relief valve is held closed by a spring or some the line or container pressure in excess of its setting. In general a relief valve should be installed wherever there is any danger of the fluid prissure rising above the design working pressure of the pipe fittings or pressure vessels.

VALVE AND FITTING PRESSURE LOSSES

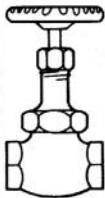
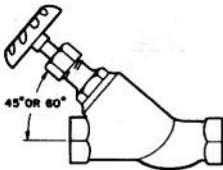
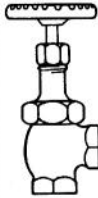

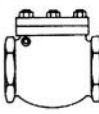
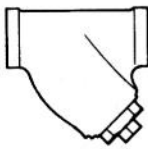

To properly design any type of piping system conveying a fluid, the losses thru the valves and fittings in system must be realistically evaluated. Tables have been prepared for determining these losses in terms of equivalent length of pipe. These values are then used with the correct friction chart for the particular fluid flowing thru the system.

Table 10 gives valve losses with screwed, flanged, flared, welded, soldered, or brazed connections.

Table 11 gives fitting losses with screwed, flanged, flared, welded, soldered, or brazed connections.

Table 12 lists the losses for special types of fittings sometimes encountered in piping applications.

TABLE 10—VALVE LOSSES IN EQUIVALENT FEET OF PIPE*
Screwed, Welded, Flanged, and Flared Connections

NOMINAL PIPE OR TUBE SIZE (in.)	GLOBE†	60°-Y	45°-Y	ANGLE†	GATE††	SWING CHECK‡	Y-TYPE STRAINER‡‡		LIFT CHECK
									
							Flanged End	Screwed End	
3/8	17	8	6	6	0.6	5	—	—	Globe & Vertical Lift Same as Globe Valve**
1/2	18	9	7	7	0.7	6	—	3	
3/4	22	11	9	9	0.9	8	—	4	
1	29	15	12	12	1.0	10	—	5	
1 1/4	38	20	15	15	1.5	14	—	9	
1 1/2	43	24	18	18	1.8	16	—	10	
2	55	30	24	24	2.3	20	27	14	
2 1/2	69	35	29	29	2.8	25	28	20	
3	84	43	35	35	3.2	30	42	40	
3 1/2	100	50	41	41	4.0	35	48	—	
4	120	58	47	47	4.5	40	60	—	
5	140	71	58	58	6	50	80	—	
6	170	88	70	70	7	60	110	—	
8	220	115	85	85	9	80	150	—	
10	280	145	105	105	12	100	190	—	
12	320	165	130	130	13	120	250	—	Angle Lift Same as Angle Valve
14	360	185	155	155	15	135	—	—	
16	410	210	180	180	17	150	—	—	
18	460	240	200	200	19	165	—	—	
20	520	275	235	235	22	200	—	—	
24	610	320	265	265	25	240	—	—	

*Losses are for all valves in fully open position and strainers clean.

†These losses do not apply to valves with needle point type seats.








‡Losses also apply to the in-line, ball type check valve.





**For "Y" pattern globe lift check valve with seat approximately equal to the nominal pipe diameter, use values of 60° "Y" valve for loss.

††Regular and short pattern plug cock valves, when fully open, have same loss as gate valve. For valve losses of short pattern plug cocks above 6 ins. check manufacturer.

‡‡For .045 thru 3/16 in. perforations with screens 50% clogged, loss is doubled.

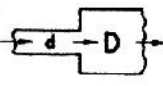
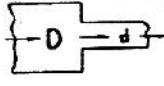




TABLE 11—FITTING LOSSES IN EQUIVALENT FEET OF PIPE
Screwed, Welded, Flanged, Flared, and Brazed Connections

NOMINAL PIPE OR TUBE SIZE (in.)	SMOOTH BEND ELBOWS						SMOOTH BEND TEES			
	90° Std*	90° Long Rad.†	90° Street*	45° Std*	45° Street*	180° Std*	Flow-Thru Branch	Straight-Thru Flow		
									No Reduction	Reduced ¼
¾	1.4	0.9	2.3	0.7	1.1	2.3	2.7	0.9	1.2	1.4
½	1.6	1.0	2.5	0.8	1.3	2.5	3.0	1.0	1.4	1.6
¾	2.0	1.4	3.2	0.9	1.6	3.2	4.0	1.4	1.9	2.0
1	2.6	1.7	4.1	1.3	2.1	4.1	5.0	1.7	2.3	2.6
1¼	3.3	2.3	5.6	1.7	3.0	5.6	7.0	2.3	3.1	3.3
1½	4.0	2.6	6.3	2.1	3.4	6.3	8.0	2.6	3.7	4.0
2	5.0	3.3	8.2	2.6	4.5	8.2	10	3.3	4.7	5.0
2½	6.0	4.1	10	3.2	5.2	10	12	4.1	5.6	6.0
3	7.5	5.0	12	4.0	6.4	12	15	5.0	7.0	7.5
3½	9.0	5.9	15	4.7	7.3	15	18	5.9	8.0	9.0
4	10	6.7	17	5.2	8.5	17	21	6.7	9.0	10
5	13	8.2	21	6.5	11	21	25	8.2	12	13
6	16	10	25	7.9	13	25	30	10	14	16
8	20	13	—	10	—	33	40	13	18	20
10	25	16	—	13	—	42	50	16	23	25
12	30	19	—	16	—	50	60	19	26	30
14	34	23	—	18	—	55	68	23	30	34
16	38	26	—	20	—	62	78	26	35	38
18	42	29	—	23	—	70	85	29	40	42
20	50	33	—	26	—	81	100	33	44	50
24	60	40	—	30	—	94	115	40	50	60

NOMINAL PIPE OR TUBE SIZE (in.)	MITRE ELBOWS			
	90° EH	60° EH	45° EH	30° EH
				
¾	2.7	1.1	0.6	0.3
½	3.0	1.3	0.7	0.4
¾	4.0	1.6	0.9	0.5
1	5.0	2.1	1.0	0.7
1¼	7.0	3.0	1.5	0.9
1½	8.0	3.4	1.8	1.1
2	10	4.5	2.3	1.3
2½	12	5.2	2.8	1.7
3	15	6.4	3.2	2.0
3½	18	7.3	4.0	2.4
4	21	8.5	4.5	2.7
5	25	11	6.0	3.2
6	30	13	7.0	4.0
8	40	17	9.0	5.1
10	50	21	12	7.2
12	60	25	13	8.0
14	68	29	15	9.0
16	78	31	17	10
18	85	37	19	11
20	100	41	22	13
24	115	49	25	16

*R/D approximately equal to 1. †R/D approximately equal to 1.5.

TABLE 12—SPECIAL FITTING LOSSES IN EQUIVALENT FEET OF PIPE

NOM. PIPE OR TUBE SIZE (in.)	SUDDEN ENLARGEMENT* d/D			SUDDEN CONTRACTION* d/D			SHARP EDGE*		PIPE PROJECTION*	
	¼	½	¾	¼	½	¾	Entrance	Exit	Entrance	Exit
										
¾	1.4	0.8	0.3	0.7	0.5	0.3	1.5	.8	1.5	1.1
1	1.8	1.1	0.4	0.9	0.7	0.4	1.8	1.0	1.8	1.5
1¼	2.5	1.5	0.5	1.2	1.0	0.5	2.8	1.4	2.8	2.2
2	3.2	2.0	0.7	1.6	1.2	0.7	3.7	1.8	3.7	2.7
2½	4.7	3.0	1.0	2.3	1.8	1.0	5.3	2.6	5.3	4.2
3	5.8	3.6	1.2	2.9	2.2	1.2	6.6	3.3	6.6	5.0
4	8.0	4.8	1.6	4.0	3.0	1.6	9.0	4.4	9.0	6.8
5	10	6.1	2.0	5.0	3.8	2.0	12	5.6	12	8.7
6	13	8.0	2.6	6.5	4.9	2.6	14	7.2	14	11
8	15	9.2	3.0	7.7	6.0	3.0	17	8.5	17	13
10	17	11	3.8	9.0	6.8	3.8	20	10	20	16
12	24	15	5.0	12	9.0	5.0	27	14	27	20
14	29	22	6.0	15	11	6.0	33	19	33	25
16	—	25	8.5	—	15	8.5	47	24	47	35
18	—	32	11	—	20	11	60	29	60	46
20	—	41	13	—	25	13	73	37	73	57
24	—	—	16	—	—	16	86	45	86	66
28	—	—	18	—	—	18	96	50	96	77
36	—	—	20	—	—	20	115	58	115	90
48	—	—	—	—	—	—	142	70	142	108
60	—	—	—	—	—	—	163	83	163	130

*Enter table for losses at smallest diameter "d."