STA-RITE

Pipe Friction Loss Charts

LOSS OF HEAD IN FEET DUE TO FRICTION PER 100 FEET OF PIPE

1/2"					3/4"					1"					1-1/4"				
Flow U.S. Gal. Min.	Velocity Plastic ft / sec	Plastic C = 140 ID .622"	Steel C = 100 ID .622"	Copper C = 130 ID .625"	Flow U.S. Gal. Min.	Velocity Plastic ft / sec	Plastic C = 140 ID .824"	Steel C = 100 ID .824"	Copper C = 130 ID .822"	Flow U.S. Gal. Min.	Velocity Plastic ft / sec	Plastic C = 140 ID 1.049"	Steel C = 100 ID 1.049"	Copper C = 130 ID 1.062"	Flow U.S. Gal. Min.	Velocity Plastic ft / sec	Plastic C = 140 ID 1.380"	Steel C = 100 ID 1.380"	Copper C = 130 ID 1.368"
0.5	0.5	0.314	0.582	0.35	1.5	0.9	0.61	1.13	0.7	2	0.74	0.322	0.595	0.345	4	0.9	0 .304	0.564	0.364
1	1.1	1.14	2.1	1.26	2	1.20	1.04	1.93	1.21	3	1.1	0.68	1.26	0.732	5	1.1	0.46	0.853	0.545
1.5	1.6	2.38	4.44	2.67	2.5	1.5	1.57	2.91	1.82	4	1.5	1.15	2.14	1.24	6	1.3	0.649	1.2	0.765
2	2.1	4.1	7.57	4.56	3	1.8	2.21	4.08	2.56	5	1.9	1.75	3.42	1.88	7	1.5	0.86	1.59	1.02
2.5	2.6	6.15	11.4	6.88	3.5	2.1	2.93	5.42	3.4	6	2.2	2.45	4.54	2.63	8	1.7	1.1	2.04	1.31
3	3.2	8.65	16	9.66	4	2.4	3.74	6.94	4.36	8	3.0	4.16	7.73	4.5	10	2.1	1.67	3.08	1.98
3.5	3.7	11.5	21.3	12.9	4.5	2.7	4.66	8.63	5.4	10	3.7	6.31	11.7	6.77	12	2.6	2.33	4.31	2.75
4	4.2	14.8	27.3	16.4	5	3.0	5.66	10.5	6.57	12	4.5	8.85	16.4	9.47	14	3.0	3.1	5.73	3.64
4.5	4.8	18.3	33.9	20.4	6	3.6	7.95	14.7	9.22	14	5.2	11.8	21.8	12.6	16	3.4	3.96	7.34	4.68
5	5.3	22.2	41.2	24.8	7	4.2	10.6	19.6	12.2	16	5.9	15.1	27.9	16.2	18	3.9	4.93	9.13	5.81
5.5	5.8	26.6	49.2	29.5	8	4.8	13.5	25	15.7	18	6.7	18.7	34.7	20.1	20	4.3	6	11.1	7.1
6	6.3	31.2	57.8	34.8	9	5.4	16.8	31.1	19.5	20	7.4	22.8	42.1	24.4	25	5.4	9.06	16.8	10.7
6.5	6.9	36.2	67	40.2	10	6.0	20.4	37.8	23.7	22	8.2	27.1	50.2	28.8	30	6.4	12.7	23.5	15
7	7.4	41.5	76.8	46.1	11	6.6	24.4	45.1	28.2	24	8.9	31.9	59	34	35	7.5	16.9	31.2	20
7.5	7.9	47.2	87.3	52.5	12	7.2	28.6	53	33.2	26	9.7	36.9	68.4	39.7	40	8.6	21.6	40	25.6
8	8.4	53	98.3	59.4	13	7.8	33.2	61.5	38.5	28	10.4	42.5	78.5	45.5	50	10.7	32.6	60.4	38.7
8.5	9.0	59.5	110	66	14	8.4	38	70.5	44.2	30	11.1	48.1	89.2	51.6	60	12.9	45.6	84.7	54.1
9	9.5	66	122	73.5	16	9.6	48.6	90.2	56.6	35	13.0	64.3	119	68.7	70	15.0	61.5	114	72.2
9.5	10.0	73	135	81	18	10.8	60.5	112	70.4	40	14.8	82	152	88	80	17.2	77.9	144	92.4
10	10.6	80.5	149	89.4	20	12.0	73.5	136	83.5	45	16.7	102	189	109	90	19.3	96.6	179	115

1-1/2"					2"					2-1/2"				
Flow U.S. Gal. Min.	Velocity Plastic ft / sec	Plastic C = 140 ID 1.61"	Steel C = 100 ID 1.61"	Copper C = 130 ID 1.60"	Flow U.S. Gal. Min.	Velocity Plastic ft / sec	Plastic C = 140 ID 2.067"	Steel C = 100 ID 2.067"	Copper C = 130 ID 2.062"	Flow U.S. Gal. Min.	Velocity Plastic ft / sec	Plastic C = 140 ID 2.469"	Steel C = 100 ID 2.469"	Copper C = 130 ID 2.500"
4	0.6	0.144	0.267	0.165	10	1.0	0.233	0.431	0.268	20	1.3	0.353	0.654	0.375
6	0.9	0.305	0.565	0.358	15	1.4	0.495	0.916	0.569	30	2.0	0.75	1.39	0.792
8	1.3	0.52	0.962	0.611	20	1.9	0.839	1.55	0.962	40	2.7	1.27	2.36	1.35
10	1.6	0.785	1.45	0.923	25	2.4	1.27	2.35	1.45	50	3.4	1.92	3.56	2.04
12	1.9	1.1	2.04	1.29	30	2.9	1.78	3.29	2.03	60	4.0	2.69	4.99	2.86
14	2.2	1.46	2.71	1.71	35	3.3	2.36	4.37	2.71	70	4.7	3.58	6.64	3.82
16	2.5	1.87	3.47	2.2	40	3.8	3.03	5.6	3.47	80	5.4	4.59	8.5	4.88
18	2.8	2.33	4.31	2.75	45	4.3	3.76	6.96	4.31	90	6.0	5.72	10.6	6.06
20	3.2	2.83	5.24	3.31	50	4.8	4.57	8.46	5.24	100	6.7	6.9	12.8	7.37
25	3.9	4.26	7.9	5	55	5.3	5.46	10.1	6.22	110	7.4	8.25	15.3	8.8
30	4.7	6	11.1	7	60	5.7	6.44	11.9	7.34	120	8.0	9.71	18	10.3
35	5.5	7.94	14.7	9.35	70	6.7	8.53	15.8	9.78	130	8.7	11.3	20.9	12
40	6.3	10.2	18.9	12	80	7.6	10.9	20.2	12.5	140	9.4	12.9	23.9	13.7
45	7.1	12.63	23.4	14.9	90	8.6	13.6	25.1	15.6	150	10.1	14.7	27.3	15.6
50	7.9	15.4	28.5	18.1	100	9.6	16.5	30.5	18.9	160	10.7	16.6	30.7	17.6
55	8.7	18.35	34	21.5	110	10.5	19.7	36.4	22.5	170	11.4	18.5	34.3	19.7
60	9.5	21.6	40	25.3	120	11.5	23.1	42.7	26.6	180	12.1	20.6	38.1	21.9
65	10.2	25.1	46.4	29	130	12.4	26.8	49.6	30.7	190	12.7	22.7	42.1	24.2
70	11.0	28.7	53.2	33.8	140	13.4	30.6	56.9	35.2	200	13.4	25	46.3	26.6
75	11.8	32.6	60.4	38	150	14.3	35	64.7	40.1	220	14.7	29.8	55.3	31.8
80	12.6	36.8	68.1	43.1	160	15.3	39.3	72.8	45.1	240	16.1	35.8	66.4	37.4
85	13.4	41.2	76.2	47.6	170	16.3	44	81.4	50.5	260	17.4	41.6	75.3	43.3
90	14.2	45.7	84.7	53.6	180	17.2	48.9	90.5	56.1	280	18.8	46.6	86.3	49.4
95	15.0	50.5	93.6	58.8	190	18.2	54	100	62	300	20.1	52.9	98.1	56.8
100	15.8	56.6	103	65.1	200	19.1	59.4	110	68					

NOTE: Recommended velocity is 5 FPS (feet per second) with a maximum of 7 FPS.

FRICTION LOSSES THROUGH FITTINGS IN TERMS OF EQUIVALENT LENGTHS OF PIPE

Type Fitting and Application	Pipe and Fitting Material (Note 1)	Equivalent Length of Pipe Nominal Size Fitting and Pipe						
		1/2	3/4	1	1-1/4	1-1/2	2	2-1/2
Threaded Adapter Plastic or Copper to Thread	Copper	1	1	1	1	1	1	1
	Plastic	3	3	3	3	3	3	3
90° Standard Elbow	Steel	2	3	3	4	4	5	6
	Copper	2	3	3	4	4	5	6
	Plastic	4	5	6	7	8	9	10
Insert Coupling	Plastic	3	3	3	3	3	3	3
Standard Tee	Steel	4	5	6	8	9	11	14
	Copper	4	5	6	8	9	11	14
	Plastic	7	8	9	12	13	17	20
Gate Valve	Note (2)	2	3	4	5	6	7	8

Note (1) Loss Figures are based on equivalent lengths of indicated pipe material. **Note (2)** Loss Figures for screwed valves and based on equivalent lengths of steel pipe.