

# ENGINEERING TABLES

## PIPE FRICTION - WATER 68° F / PRESSURE LOSS IN PSI PER 100 FEET OF PIPE AND TUBE

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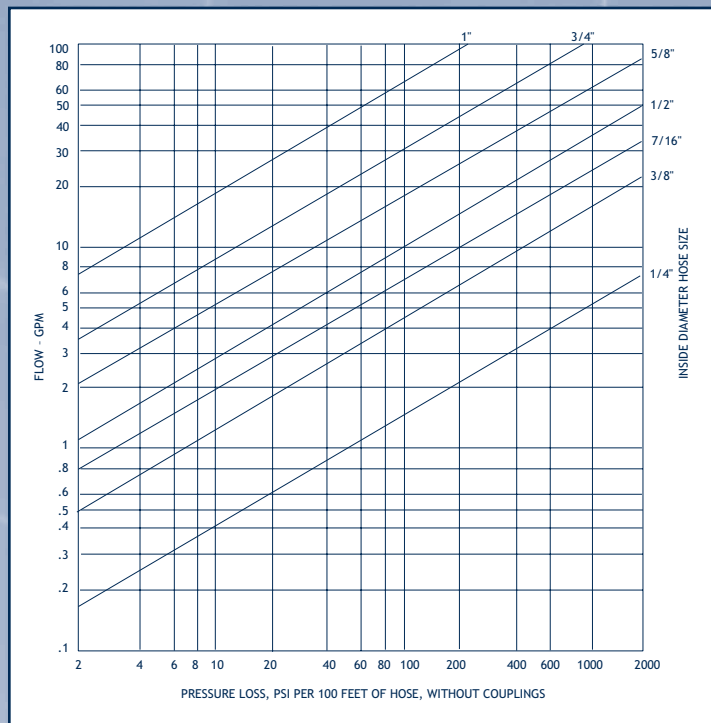
NOMINAL SIZES - INSIDE DIAMETERS											
Gallons Per Minute	1/4" O.D. TUBE .206	1/8" PIPE .269	3/8" O.D. TUBE .305	1/4" PIPE .364	1/2" O.D. TUBE .430	3/8" PIPE .493	1/2" PIPE .622	3/4" PIPE .824	1" PIPE 1.049	1 1/4" PIPE 1.380	1 1/2" PIPE 1.610
.2	4.28	1.86	.591	.359	.134	.042	-	.033	-	-	-
.5	26.7	10.5	3.92	2.39	.853	.539	.167	.033	-	-	-
1	107	37.2	14.8	8.28	3.38	1.85	.602	.155	.050	-	-
2	-	134	50.1	30.1	11.5	6.58	2.10	.526	.164	.044	-
3	-	-	102	64.1	23.2	13.9	4.33	1.09	.336	.090	.043
4	2" PIPE	-	169	111	38.5	23.9	7.42	1.83	.565	.150	.071
5	2.067	-	-	-	56.9	36.7	11.2	2.75	.835	.223	.104
6	-	2 1/2" PIPE	-	-	78.4	51.9	15.8	3.84	1.17	.309	.145
8	.073	2.469	-	-	130	91.1	27.7	6.60	1.99	.518	.241
10	.108	-	3" PIPE	-	-	-	42.4	9.99	2.99	.774	.361
15	.224	.094	3.068	-	-	-	93.2	21.6	6.36	1.63	.755
20	.375	.158	-	4" PIPE	-	-	-	37.8	10.9	2.78	1.28
25	.561	.234	.083	4.026	-	-	-	58.1	16.7	4.22	1.93
30	.786	.327	.114	-	5" PIPE	-	-	86.3	23.8	5.92	2.72
40	1.35	.556	.192	.052	5.047	-	-	-	41.5	10.2	4.65
50	2.03	.839	.288	.076	-	-	-	-	66.4	15.6	7.15
60	2.87	1.18	.406	.107	.035	-	-	-	92.8	22.2	10.2
70	3.84	1.59	.540	.143	.047	-	-	-	-	30.5	13.7
80	4.97	2.03	.687	.180	.060	-	-	-	-	39.0	17.6
90	6.20	2.53	.861	.224	.074	-	-	-	-	49.8	22.0
100	7.59	3.09	1.05	.272	.090	-	-	-	-	60.0	26.9

NOTE: Pipe sizes shown apply to standard weight schedule 40 pipe. Tube is standard copper tubing.

## VALVE AND FITTING FRICTION (EQUIVALENT FEET OF PIPE)

Size of Fittings, Inches	1/2"	3/4"	1"	1 1/4"	1 1/2"	2"	2 1/2"	3"	4"	5"	6"	8"	10"
90° Ell	1.5	2.0	2.7	3.5	4.3	5.5	6.5	8.0	10.0	14.0	15	20	25
45° Ell	0.8	1.0	1.3	1.7	2.0	2.5	3.0	3.8	5.0	6.3	7.1	9.4	12
Long Sweep Ell	1.0	1.4	1.7	2.3	2.7	3.5	4.2	5.2	7.0	9.0	11.0	14.0	-
Close Return Bend	3.6	5.0	6.0	8.3	10.0	13.0	15.0	18.0	24.0	31.0	37.0	39.0	-
Tee-Straight Run	1	2	2	3	3	4	5	-	-	-	-	-	-
Tee-Side Inlet or Outlet or Pitless Adapter	3.3	4.5	5.7	7.6	9.0	12.0	14.0	17.0	22.0	27.0	31.0	40.0	-
Ball or Globe Valve Open	17.0	22.0	27.0	36.0	43.0	55.0	67.0	82.0	110.0	140.0	160.0	220.0	-
Angle Valve Open	8.4	12.0	15.0	18.0	22.0	28.0	33.0	42.0	58.0	70.0	83.0	110.0	-
Gate Valve Fully Open	0.4	0.5	0.6	0.8	1.0	1.2	1.4	1.7	2.3	2.9	3.5	4.5	-
Check Valve (Swing)	4	5	7	9	11	13	16	20	26	33	39	52	65
In Line Check Valve (Spring) or Foot Valve	4	6	8	12	14	19	23	32	43	58	-	-	-

## HOSE FRICTION - WATER 68° F



## OIL VISCOSITY vs. TEMPERATURE

