Table 43. Flow of Steam in Pounds per Minute through Standard Pipes and Pressure Drop In Pounds per 100 Ft.—Velocity, 4000 ft. per Minute*

Pipe Size Inches	Gage Pressure in Pounds per Square Inch—Standard Pipe													
	1	3	5	10	15	25	35	50	75	100	125	150	175	
½	0.340	0.381	0.420	0.518	0.614	0.805	0.993	1.270	1.727	2.175	2.620	3.072	3.515	Flow
	2.733	3.100	3.384	4.180	4.955	6.500	8.030	10.25	13.93	17.54	21.22	24.82	28.42	Drop
¾	0.597	0.668	0.737	0.908	1.077	1.411	1.740	2.225	3.029	3.814	4.593	5.382	6.160	Flow
	1.610	1.803	1.990	2.452	2.900	3.805	4.700	6.000	8.190	10.29	12.37	14.53	16.66	Drop
1	0.968	1.083	1.195	1.473	1.746	2.287	2.821	3.608	4.908	6.182	7.448	8.730	9.990	Flow
	1.061	1.190	1.310	1.516	1.913	2.492	3.090	3.956	5.385	6.775	8.165	9.585	10.99	Drop
1¼	1.675	1.873	2.068	2.548	3.023	3.958	4.882	6.241	4.490	10.70	12.88	15.11	17.28	Flow
	0.657	0.734	0.811	1.000	1.185	1.555	1.915	2.448	3.330	4.190	5.045	5.938	6.796	Drop
1½	2.281	2.551	2.816	3.471	4.113	5.388	6.650	8.500	11.57	14.457	17.56	20.56	23.53	Flow
	0.505	0.566	0.624	0.770	0.910	1.194	1.472	1.883	2.564	3.222	3.889	4.555	5.222	Drop
2	3.760	4.208	4.641	5.721	6.782	8.880	10.96	14.02	19.06	24.02	28.92	33.90	38.80	Flow
	0.334	0.376	0.412	0.509	0.602	0.788	0.976	1.243	1.690	2.160	2.562	3.110	3.448	Drop
2½	5.365	6.000	6.621	8.165	9.680	12.68	15.64	20.00	27.20	34.26	41.28	48.36	55.35	Flow
	0.250	0.280	0.309	0.382	0.452	0.592	0.713	0.933	1.270	1.598	1.926	2.260	2.585	Drop
3	8.280	9.260	10.22	12.60	14.93	19.57	24.13	30.85	42.00	52.88	63.70	74.62	85.45	Flow
	1.77	0.199	0.220	0.272	0.322	0.421	0.520	0.664	0.905	1.138	1.370	1.610	1.840	Drop
4	14.26	15.96	17.61	21.70	25.73	33.70	41.58	53.15	72.33	91.10	109.8	128.6	147.2	Flow
	0.118	0.133	0.146	0.181	0.214	0.279	0.345	0.441	0.600	0.755	0.911	1.068	1.235	Drop
5	22.43	25.08	27.68	34.12	40.45	52.96	65.32	83.60	113.7	143.2	172.4	202.2	231.3	Flow
	0.085	0.096	0.106	0.130	0.154	0.202	0.249	0.318	0.433	0.546	0.656	0.768	0.883	Drop
6	32.36	36.22	39.95	49.25	58.38	76.48	94.30	120.7	164.2	206.7	249.0	291.8	334.0	Flow
	0.066	0.074	0.082	0.101	0.119	0.156	0.193	0.247	0.336	0.422	0.508	0.597	0.683	Drop
8	57.30	64.10	70.72	87.15	103.4	135.4	166.9	213.6	291.0	365.9	440.8	516.6	591.0	Flow
	0.045	0.051	0.056	0.069	0.082	0.107	0.131	1.67	0.229	0.287	0.346	0.406	0.465	Drop
10	90.40	101.1	111.6	137.6	163.1	213.6	263.4	336.8	458.5	577.2	695.0	815.0	932.8	Flow
	0.034	0.038	0.042	0.052	0.061	0.080	0.098	0.126	0.171	0.214	0.258	0.304	0.348	Drop
12	128.6	143.8	158.8	195.7	232.0	303.9	374.6	479.3	652.0	821.5	989.0	1159.0	1327.0	Flow
	0.027	0.031	0.034	0.042	0.049	0.064	0.079	0.101	0.137	0.172	0.208	0.280	0.313	Drop

*Courtesy Crane Company.

Solution.—From Table 35 find, 1926, the capacity of this pipe with a 1 lb. initial pressure. Multiplying this by 1.03 for a 2 lb. initial pressure as given in Table 37 gives 1984 the capacity for the given condition. By using the capacities given in Table 34 rather than Table 35 in examples 1 and 2, the capacities for the given conditions without allowing for a factor of safety of 20 per cent may be obtained.

Table 38 gives the capacities of various sized pipes for parts of systems based upon stated conditions. Column B gives the capacities of various sizes, of supply mains, branches to risers which are dripped, down-feed risers, or any other part of any system where steam and the condensation either from radiation or from the pipe itself flow in the same direction, based upon 1 lb. initial pressure and a drop of 1 oz. per 100 ft. and allowing a 20 per cent factor of safety. These capacities apply particularly to two-pipe steam and two-pipe vapor systems.

Column C gives the capacity of supply mains, branches to risers not dripped, up-feed risers, or any other part of any system where steam and condensate flow in opposite directions, based upon a steam velocity of 16 ft. per second. These capacities apply particularly to a one-pipe system and those parts of any two-pipe system where the condensate from radiators or from the pipe itself are expected to flow in the opposite direction to the steam.

Column D gives the capacity of branches to radiators based upon steam velocities of 12 and 16 ft. per second respectively for such branches with ¼ in. and 1 in. pitch per 10 ft. length.

Table 39 gives the capacity in square feet and pressure drop in ounces for various sized pipe and various steam velocities ranging from 12 to 40 ft. per second.

Tables 40, 41 and 42 give the capacities of return mains, return risers and radiator connections, for vacuum systems. The capacity of supply mains and risers for vacuum systems may be taken directly from Table 35 if the allowable pressure drop is greater than 1 oz. per 100 ft. or from Table 38, Column B, if a pressure drop of only 1 oz. per 100 ft. is to be allowed.

Table 43 gives the pounds of steam which will flow per minute through standard pipe at 4000 ft. velocity, and the resulting pressure drop in pounds per 100 ft. equivalent length. This table is particularly applicable to transmission mains and should not be used without particular consideration in designing distribution systems.

Either capacity of a pipe in any part of a system is limited either by the allowable pressure drop along the pipe, or by the steam velocity through the pipe or both. If condensate, either from radiation supplied or from the pipe itself, is to return counter to the flow of steam the velocity of the steam must not exceed certain critical values. If the velocity exceeds the critical value the system may continue to operate, but will be noisy. If the velocity exceeds a higher maximum value the condensate will cease to return counter to the steam and will be carried along with it clogging the radiator if it has a one-pipe connection, or passing through the radiator if it has a two-pipe connection.