TABLE 1. FLOW OF STEAM IN PIPES

P = loss in pressure in pounds.
d = inside diameter of pipe in inches.
L = length of pipe in feet.
D = weight of 1 cu. ft. of steam.
W = pounds of steam per hour.

$$W = 5220\sqrt{\frac{PDd^5}{\left(1+\frac{3.6}{d}\right)L}}$$

$$P = 0.0000000367\left(1+\frac{3.6}{d}\right)\frac{W^2L}{Dd^5}$$

Pressure Loss in Ounces	Col. 1 $5220\sqrt{\frac{P}{100}}$	Pipe Size Nominal	Pipe Size Actual Internal Diameter	Internal Area of Pipe Sq. Inches	Col. 2 $\sqrt{\frac{d^5}{1+\frac{3.6}{d}}}$	Steam Press. by Gage	Col. 3 $\sqrt{D}$	Length of Pipe in Feet	Col. 4 $\sqrt{\frac{100}{L}}$
0.25	65.28	1	1.049	0.864	0.536	−1.0[a]	0.187	20	2.240
0.50	92.28	1¼	1.380	1.496	1.178	−0.5[a]	0.190	40	1.580
1.00	130.5	1½	1.610	2.036	1.828	0.0	0.193	60	1.290
2	184.6	2	2.067	3.356	3.710	0.3	0.195	80	1.120
3	226.0	2½	2.469	4.788	6.109	1.3	0.201	100	1.000
4	261.0	3	3.068	7.393	11.183	2.3	0.207	120	0.912
5	291.8	3½	3.548	9.887	16.705	5.3	0.223	140	0.841
6	319.7	4	4.026	12.730	23.631	10.3	0.248	160	0.793
7	345.3	4½	4.506	15.947	32.134	15.3	0.270	180	0.741
8	369.1	5	5.047	20.006	43.719	20.3	0.290	200	0.710
10	412.7	6	6.065	28.886	71.762	30.3	0.326	250	0.632
12	452.0	7	7.023	38.743	106.278	40.3	0.358	300	0.578
14	488.3	8	7.981	50.027	149.382	50.3	0.388	350	0.538
16	522.0	9	8.941	62.786	201.833	60.3	0.415	400	0.500
20	583.6	10	10.020	78.854	272.592	75.3	0.452	450	0.477
24	639.3	12	12.000	113.098	437.503	100.3	0.507	500	0.447
28	690.5	14	13.250	137.880	566.693	125.3	0.557	600	0.407
32	738.2	16	15.250	182.655	816.872	150.3	0.603	700	0.378
40	825.4					175.3	0.645	800	0.354
48	904.1					200.3	0.685	900	0.333
80	1167.2							1000	0.316
160	1650.7							1200	0.289
320	2334.5							1500	0.258
480	2859.1							2000	0.224

Column 1 × 2 × 3 × 4 = lb. of steam per hour that will flow through a straight pipe for a given condition.

Example: 1 oz. drop — 2 in. pipe — 1.3 lb. press. — 100 ft. equivalent length:

130.5 × 3.710 × 0.201 × 1 = 97.2 lb. per hour.
97.2 × 4[b] = 388.8 sq. ft. equivalent radiation.

Table 1 does not allow for entrained water in low-pressure steam, condensation in covered pipe and roughness in commercial pipe as found in practice.

[a]Pounds per square inch gage = 2.04 in. Vacuum, Mercury Column.
[b]The factor 4 is the approximate equivalent in square feet of steam radiation of 1 lb. of steam per hour.

so that the steam flowing in any pipe may be calculated by multiplying together the proper factors in each column as shown in the example at the bottom of the table.

Table 2 is a basic table giving the theoretical capacities of pipe in square feet of direct cast-iron radiation (Based on ¼ lb steam per hour per square foot) and the resulting velocity in feet per second for various pressure drops in ounces per 100 ft length of pipe with an initial steam pressure of 1 lb gage. This table was compiled from the values given in Table 1. In using Tables 1 or 2 the total pressure drop figured should never equal or exceed the initial pressure.

Example 1. In a 3-in. pipe, what pressure drop is required in ounces per 100 ft of length of pipe to supply steam to 2014 sq ft of equivalent heating surface? The initial steam pressure is 1 lb gage.

Solution. In Table 2, column for 3-in. pipe, find that steam for 2014 sq ft of equivalent heating surface will be supplied at 1 lb initial pressure and a pressure drop of 3 oz per 100 ft length of run.

Table 3 is to be used with Table 2 for calculating the capacity of a steam pipe, for other initial pressures and lengths when the capacity is known for 1-lb pressure and 100-ft length. To determine the capacity of any pipe for an initial pressure other than 1 lb, multiply the capacity given in Table 2 by the pressure factor in Column 2, Table 3, opposite the required pressure indicated in Column 1.

Example 2. What is the capacity of a 100-ft, 4-in. pipe with 2-lb initial pressure and pressure drop of 1 oz?

Solution. From Table 2, find 2457, the capacity of the 4-in. pipe with 1-lb initial pressure and 1-oz pressure drop. Multiplying 2457 by 1.03, the constant for 2-lb initial pressure (Column 2 of Table 3), gives 2531 as the capacity of the 4-in. pipe with 2-lb initial pressure and a pressure drop of 1 oz per 100-ft length.

To determine the capacity for any length other than 100 ft, multiply the capacity given in Table 2 by the length factor in Column B, Table 3, opposite the required length in Column A.

Example 3. What is the capacity of a 140-ft, 4-in. pipe with an initial pressure of 1 lb and a pressure drop of 2 oz in the 140 ft?

Solution. From Table 2 it is found that the capacity of a 100-ft, 4-in. pipe with 1-lb initial pressure and 2-oz pressure drop, is 3475 sq ft. Multiplying this value by 0.841 the constant for a 140-ft length as given in Table 3 gives 2922 which is the capacity for the given conditions.

Example 4. What is the capacity of a 140-ft, 4-in. pipe with 2-lb initial pressure and a pressure drop of 2 oz?

Solution. From Table 2 find 3475, the capacity of the 4-in. pipe with 1-lb initial pressure and 2-oz pressure drop. Multiplying 3475 by 1.03, the constant for 2-lb initial pressure (see Column 2, Table 3), and this by 0.841, the constant for 140-ft length (see Column B, Table 3), gives 3010 as the capacity of the 4-in. pipe with 2-lb initial pressure and a pressure drop of 2 oz in the 140-ft length.

Should lengths other than those given in Column A, Table 3, and under length of pipes in feet in Table 1 be desired the constant may be obtained from the formula in Column 4, Table 1, and used the same as the constants from Table 3.

Example 5. What would be the constant for 2500 ft of pipe to be used either in Tables 1 or 3?

Solution. The constant to be used $= \sqrt{\frac{100}{2500}} = 0.2.$