

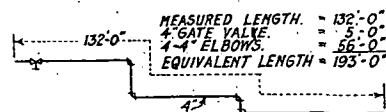
TABLE 3. CONSTANTS FOR VARIOUS LENGTHS AND INITIAL PRESSURES

STEAM PRESSURE GAGE LB.	CONSTANT BY WHICH TO MULTIPLY CAPACITY OF ANY PIPE FOR 1 LB. GAGE STEAM PRESSURE TO OBTAIN CAPACITY OF SAME PIPE FOR PRES- SURE IN COL. 1	LENGTH OF PIPE FT.	CONSTANT BY WHICH TO MULTIPLY CAPACITY OF 100 FT. PIPE TO OBTAIN CAPACITY OF SAME SIZED PIPE WITH SAME PRESSURE AND LENGTH AS GIVEN IN COL. A
Col. 1	Col. 2	Col. A	Col. B
0	0.92	20	2.240
1	1.00	40	1.580
2	1.03	60	1.290
5	1.11	80	1.120
10	1.24	100	1.000
15	1.35	120	0.912
20	1.45	140	0.841
30	1.63	160	0.793
40	1.79	180	0.741
50	1.94	200	0.710
60	2.08	250	0.632
75	2.26	300	0.578
100	2.54	350	0.538
125	2.79	400	0.500
150	3.02	450	0.477
175	3.23	500	0.447
200	3.44	600	0.407
...		700	0.378
...		800	0.354
...		900	0.333
...		1000	0.316
...		1400	0.267

TABLE 4. LENGTH IN FEET OF PIPE TO BE ADDED TO ACTUAL LENGTH OF RUN—
DUE TO FITTINGS—TO OBTAIN EQUIVALENT LENGTH

SIZE OF PIPE INCHES	ST'D. ELBOW	SIDE OUTLET TEE	GATE VALVE	GLOBE VALVE	ANGLE VALVE
Length in Feet to be Added in Run					
2	5	16	2	18	9
2½	7	20	3	25	12
3	10	26	3	33	16
3½	12	31	4	39	19
4	14	35	5	45	22
5	18	44	7	57	28
6	22	50	9	70	32
7	26	55	10	82	37
8	31	63	12	94	42
9	35	69	13	105	47
10	39	76	15	118	52
12	47	90	18	140	63
14	53	105	20	160	72

Example of length in
feet of pipe to be added
to actual length of run.



PIPE SIZES

The principal factors upon which the determination of pipe sizes for steam heating depends, are:

1. The equivalent length of the run from the boiler, or source of steam supply, to the farthest heating unit. (See Table 4).
2. The initial pressure and the total pressure drop, which may be allowed, between the source of supply and the end of the return system.
3. The maximum velocity of steam allowable for quiet and dependable operation of the system.
4. Unusual conditions in the building to be heated.

Equivalent Length of Run

The length of run must not only include the actual linear feet of straight pipe, but also the proper allowance for fittings, valves and other items which cause drop in pressure. Table 4 gives the allowance for fittings in feet of pipe to be added to the actual length of run to obtain the equivalent length.

Gate valves are recommended in all cases where service calls for the valve to be either entirely closed or open. They should never be used for throttling. Angle and globe valves should be used for throttling, such as the by-pass valve in a pressure-reducing outfit.

Initial Pressure; Pressure Drop

Theoretically there are several factors to be considered such as initial pressure and the pressure required at the end of the line, but it is most important that (1) the total pressure drop does not exceed the initial pressure of the system; (2) that the pressure drop is not so great as to cause high velocities and in the case of counter-flowing condensate, to cause water hammer; (3) that there is a constant initial pressure; (4) that there is sufficient difference in level between the water line of the boiler and the lowest point of the steam main, dry return and heating units.

It is recommended that all systems be designed for low initial pressure and a reasonably small pressure drop. Such systems will operate under higher pressures without difficulty. When a system is designed for high pressure with a relatively large pressure drop and then operated at a low pressure, it is apt to be noisy and to have poor circulation.

It is recommended that the total pressure drop never exceed one-half of the initial pressure. This applies to cases where the condensate is flowing in the same direction as the steam, but in the case of counter-flowing condensate the capacities should not exceed those shown in Tables 5 and 6.

Maximum Velocity

The capacity of pipe of a given size in any part of a steam or vapor heating system depends upon the quantity of condensation present, as well as upon the available pressure drop in the pipe. Where no water is present or where a limited quantity flows by gravity in the same direction as the steam the available pressure drop only need be considered.

Where water and steam flow counter to each other the velocity of the steam must not exceed certain values above which disturbance between