Preceding table does not allow for entrained water in low-pressure steam, condensation in covered pipe and roughness in commercial pipe, therefore reduce calculated capacities approximately 20 per cent:

SELECTING THE PROPER PIPE SIZES

The steam pressure at the boiler and the allowable loss in pressure in a low-pressure gravity return heating system control the sizing of the piping. The allowable drop in pressure is determined by the available height between the water line of the boiler and where the piping is run, together with the type of boiler and kind of fuel used. In good practice a total pressure drop of not over 2 oz., between the boiler and the farthest radiator, is generally used.

Pipe sizing tables are usually given in capacities of square feet of direct radiation based on a rate of condensation of ¼ lb. per sq. ft. per hr.

Pipe should be graded at least as follows:

	Inches	Feet
Supply Mains	1	20
Wet Return Mains	1	20
Dry Return Mains	1	20
Horizontal Branches	1	5

Except in rare cases, supply mains should not be made less than 2 in. in size and a supply main starting over 2½ in. in size should not end less than 2½ in.

Pipes of less size than the following should not be used:

	Inches
Dry Return Mains	1
Wet Return Mains	1¼
Supply Risers	1
Return Risers	¾

The end of all supply mains where dripped into wet mains should be vented through proper size air valves.

The lowest point in a steam main should always be at least 18 in. above the water line of the boiler and more if possible. The lowest point in a dry return main should always be at least 24 in. above the water line of the boiler and more if possible.

In residences, small apartments and smaller buildings where the firing of the boiler is intermittent, frequently extending over a period of 6 to 10 hr., the pressure at the boiler will vary and a pressure drop of over 2 oz. should not be considered in designing the piping. In large apartments, public buildings and smaller buildings, where the boiler is fired as often as necessary and pressure is maintained constantly, greater pressure drops than 2 oz. can be used in designing the piping.

Capacities given in Table 27 are based on an initial pressure of at least twice the pressure drop, and for a straight run of pipe 100 ft. long and no allowance is made for friction due to valves, elbows and tees.

Table 28 gives the number of feet to be added, for various kinds of valves and fittings, to the measured length.

Example.—A 4-in. pipe measures 160 ft. and contains one gate valve, and 6 elbows. Then from Table 28 find:

1–4″ Gate Valve	=	5′–0″
6–4″ Elbows	= 6 × 14 =	84′–0″
Length to be Added	=	89′–0″
Measured Length	=	160′–0″
Equivalent Length	=	249′–0″

Table 27, under Column 4, gives factors for changing amounts of radiation as given in Table 29 for other lengths than 100 ft.

Example.—The above example gave an equivalent length of 249 ft. for 4-in. pipe. To find how many square feet of direct radiation this pipe will supply for any given pressure drop, take square feet of radiation given in Table 29 for 4-in. pipe 100 ft. run and multiply by factor given in Column 4 Table 27. Factor for 250 ft. run as taken from Column 4 Table 27 = 0.632.

Amount of radiation a 4-in. pipe will supply with 2-oz. pressure drop with an initial pressure of at least 4 oz. if 100 ft. long as taken from Table 29 = 2866 sq. ft., then, 2866 × 0.632 = 1811 sq. ft. a 4-in. pipe will supply if it has an equivalent length of 259 ft.

Valves and fittings of similar sizes of different manufacturers vary in the resistance they offer to the flow of steam or water. In estimating lengths of pipes it is necessary to include the resistance offered by the various fittings.

The following Table 28 gives this in units of length, in feet, to be added to the measured length of pipe for a given kind of fitting.

TABLE 28. LENGTH IN FEET OF PIPE TO BE ADDED TO ACTUAL LENGTH OF RUN

Size of Pipe	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.

