

sized from Column C; radiator runouts and undrilled riser runouts from Column L; up-feed risers from Column J; the main riser on a down-feed system from Column C (it will be noted that if Column H is used the drop would exceed the limit of $\frac{1}{2}$ psi); the dry return from Column R; and the wet-return from Column Q.

With a $\frac{1}{32}$ -psi drop the sizing would be the same as for $\frac{1}{2}$ psi, except that the steam main and dripped runouts would be sized from Column B, the main riser on a down-feed system from Column B, the dry-return from Column O, and the wet-return from Column N.

Notes on Gravity One-Pipe Air-Vent Systems

1. Pitch of mains should not be less than $\frac{1}{4}$ in. in 10 ft.
2. Pitch of horizontal runouts to risers and radiators should not be less than $\frac{1}{2}$ in. per foot. Where this pitch cannot be obtained, runouts over 8 ft in length should be one size larger than called for in the table.
3. In general, it is not desirable to have a main less than 2 in. The diameter of the far end of the supply main should not be less than half its diameter at its largest part.
4. Supply mains, runouts to risers, or risers, should be dripped where necessary.
5. Where supply mains are decreased in size they should be dripped, or be provided with eccentric couplings, flush on bottom.

Example 3: Size the one-pipe gravity steam system shown in Fig. 22 assuming that this is all there is to the system, or that the riser and main shown involve the longest run on the system.

Solution: The total length of run actually shown is 215 ft. If the equivalent length of run is taken at double this, it will amount to 430 ft, and with a total drop of $\frac{1}{2}$ psi the drop per 100 ft will be slightly less than $\frac{1}{4}$ psi. It would be well in this case to use $\frac{1}{4}$ psi, and this would result in the theoretical sizes indicated in Table 12. These theoretical sizes, however, should be modified by not using a wet-return less than 2 in., while the main supply, g-h, if from the uptake of a boiler, should be made the full size of the main, or 3 in. Also the portion of the main k-m should be made 2 in. if the wet-return is made 2 in.

SIZING PIPING FOR ONE-PIPE VAPOR SYSTEMS

Piping for one-pipe vapor systems is sized so as to permit only a few ounces pressure drop in the system. Otherwise, the method follows that outlined for sizing one-pipe gravity systems.

SIZING PIPING FOR TWO-PIPE HIGH PRESSURE SYSTEMS

Steam supply piping for two-pipe high pressure can be sized for greater pressure drops than that of the return piping. For a system using steam at 30 psig, the total pressure drop can be 5 to 10 psi, and for 150 psig systems, 25 to 30 psi.

It has been observed that the maximum total pressure in the returns of a 30-psig system is about 5 psig, and that of a 150-psig system is about 20 psig. The pressure in the return mains is, of course, caused by the discharge of traps and flashing of condensate into steam because the return line pressure is below that corresponding to the saturation temperature of the condensate. The usual practice in the sizing of high pressure returns has been to size on the basis of $\frac{1}{2}$ psi per 100 ft of pipe for 30-psig systems, and 1 psi per 100 ft for 150-psig systems. This is an average figure which corresponds generally to several of the previously published tables for the design of high pressure return piping.

Notes on Two-Pipe High Pressure Systems

Pitch of mains should not be less than $\frac{1}{4}$ in. in 10 ft.

Pitch of horizontal runouts to risers and heating units should not be less than $\frac{1}{2}$ in. per ft.

SIZING PIPING FOR TWO-PIPE LOW PRESSURE SYSTEMS

Piping for two-pipe low pressure systems is sized in the same manner as for two-pipe vapor systems, except that the pressure drop throughout the system can be based on $\frac{1}{2}$ psi to 1 psi drop.

SIZING PIPING FOR TWO-PIPE VAPOR SYSTEMS

While many manufacturers of patented vapor heating accessories have their own schedules for pipe sizing, an inspection of these sizing tables

TABLE 12. PIPE SIZES FOR ONE-PIPE UP-FEED SYSTEM SHOWN IN FIG. 22

PART OF SYSTEM	SECTION OF PIPE	RADIATION SUPPLIED EDR Sq Ft	THEORETICAL PIPE SIZE (INCHES)	PRACTICAL PIPE SIZE (INCHES)
Branches to radiators.....		100	2	2
Branches to radiators.....		50	1 $\frac{1}{4}$	1 $\frac{1}{4}$
Riser.....	a to b	200	2	2
Riser.....	b to c	300	2 $\frac{1}{2}$	2 $\frac{1}{2}$
Riser.....	c to d	400	2 $\frac{1}{2}$	2 $\frac{1}{2}$
Riser.....	d to e	500	3	3
Riser.....	e to f	600	3	3
Runout to riser.....	f to g	600	3 $\frac{1}{2}$	3 $\frac{1}{2}$
Supply main.....	g to h	600	3	3
Branch to supply main.....	h to j	600	2 $\frac{1}{2}$	3
Dry return main.....	f to k	600	1 $\frac{1}{4}$	2
Wet return main.....	k to m	600	1	2
Wet return main.....	m to n	600	1	2
Wet return main.....	n to p	600	1	2

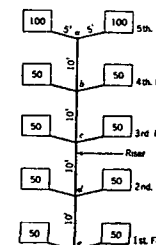


FIG. 22. RISER, SUPPLY MAIN AND RETURN MAIN OF ONE-PIPE SYSTEM

From Boiler or Source of Supply
To Boiler or Source of Supply

indicates that in general as small a drop as possible is recommended. The reasons for this are: (1) to have the condensate return to the boiler by gravity; (2) to obtain a more uniform distribution of steam throughout the system, especially when it is desirable to carry a moderate or low fire; and (3) to prevent large variations in pressure which would nullify the value of graduated valves on radiators.

For small vapor systems where the equivalent length of run does not exceed 200 ft, it is recommended that the main and any runouts to risers that may be dripped, should be sized from Column D, Table 5, while riser runouts not dripped and radiator runouts should employ Column I. The up-feed steam risers should be taken from Column H. On the returns, the risers should be sized from Tables 6 and 7, Column U (lower portion), and the mains from Column U (upper portion). It should again be noted that the pressure drop in the steam side of the system is kept the same as on the return side, except where the flow in the riser is concerned.

On a down-feed system, the main vertical riser should be sized from Column H, but the down-feed risers can be taken from Column D, al-