TABLE 12. PIPE SIZES FOR ONE-PIPE UP-FEED SYSTEM SHOWN IN FIG. 19

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	1¼	1¼
Riser	*a* to *b*	200	2	2
Riser	*b* to *c*	300	2½	2½
Riser	*c* to *d*	400	2½	2½
Riser	*d* to *e*	500	3	3
Riser	*e* to *f*	600	3	3
Runout to riser	*f* to *g*	600	3½	3½
Supply main	*g* to *h*	600	3	3
Branch to supply main	*h* to *j*	600	2½	3
Dry return main	*f* to *k*	600	1¼	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

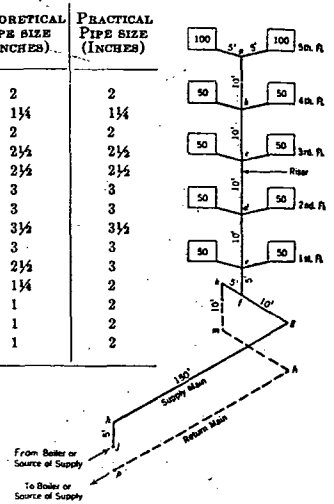

FIG. 19. RISER, SUPPLY MAIN AND RETURN MAIN OF ONE-PIPE SYSTEM

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 ½ 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 ¼ in. in 10 ft.

Pitch of horizontal runouts to risers and heating units should not be less than ½ 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 ½ 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 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*, although it so happens that the values in Columns *D* and *H* for small systems correspond. This will not hold true in larger systems.

For vapor systems over 200 ft of equivalent length, the drop should not exceed ⅛ psi to ¼ psi, if possible. Thus, for a 400 ft equivalent run the drop per 100 ft should be not over ⅛ psi divided by 4, or $\frac{1}{32}$ psi. In this case the steam mains would be sized from Column *B*, the radiator and undripped riser runouts from Column *I*; the risers from Column *B*, because Column *H* gives a drop in excess of $\frac{1}{32}$ psi. On a down-feed system, Column *B* would have to be used for both the main riser and the smaller risers feeding the radiators in order not to increase the drop over $\frac{1}{32}$ psi. The return risers would be sized from the lower portion of Column *O* and the dry return main from the upper portion of the same column, while any wet returns would be sized from Column *N*. The same pressure drop is applied on both the steam and the return sides of the system.

Notes on Vapor Systems

1. Pitch of mains should not be less than ¼ in. in 10 ft.
2. Pitch of horizontal runouts to risers and radiators should not be less than ½ in. per ft. 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 supply main smaller than 2 in.
4. When necessary, supply main, supply risers, or runouts to supply risers should be dripped separately into a wet-return, or may be connected into the dry-return through a thermostatic drip trap.

SIZING PIPING FOR TWO-PIPE VACUUM SYSTEMS

Vacuum, atmospheric, sub-atmospheric and orifice systems are usually employed in large installations and have total drops varying from ¼ to ½ psi. Systems in which the maximum equivalent length does not exceed 200 ft preferably employ the smaller pressure drop, while systems over 200 ft equivalent length of run, more frequently are designed for the higher drop, owing to the relatively greater saving in pipe sizes. For example, a system with 1200 ft longest equivalent length of run would employ a drop per 100 ft of ½ psi divided by 12, or $\frac{1}{24}$ psi. In this case, the steam main would be sized from Column *C*, Table 5, and the risers also from Column *C* (Column *H* could be used as far as critical velocity is concerned, but the drop would exceed the limit of $\frac{1}{24}$ psi). Riser runouts, if dripped, would use Column *C* but, if undripped, would use Column *I*; radiator runouts, Column *I*; return risers, lower part of Column *S*, Tables 6 and 7; return runouts to radiators, one pipe size larger than the radiator trap connections.