

open systems are not so popular because they have the disadvantage of not holding heat when the rate of steam generation is diminishing.

Closed systems should preferably be equipped with an automatic return trap to prevent water from backing out of the boiler. In installing the return trap a check valve is inserted in the return main at a point near the boiler and a vertical pipe is run up into the bottom of the return trap, which is usually located with the bottom about 18 in. above the boiler water line. Some traps are constructed so that they will operate when they are installed with their bottom as close as 8 in. above the boiler water line. On the other side of this connection a second check valve is installed in the main return just before it enters the boiler. Fig. 9 shows a typical connection for an automatic return trap.

Down-Feed Two-Pipe Vapor System

In the down-feed two-pipe vapor system the steam is carried to the top of the building, the top of the vertical riser constituting the high point of

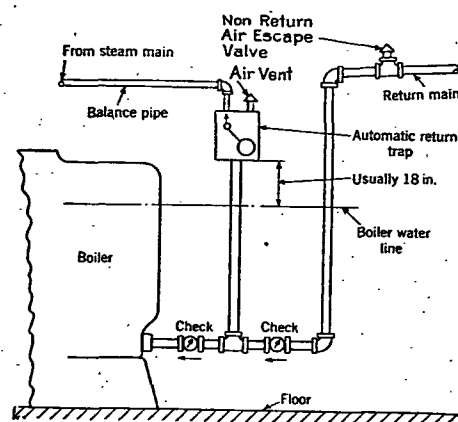


FIG. 9. TYPICAL CONNECTIONS FOR AUTOMATIC RETURN TRAP

the system, and the horizontal supply main is sloped down from this location to the far ends of each branch. The branches are taken off the main from the bottom or at a 45-deg angle downward, with the runouts sloped toward the drops. Thus each branch from the main forms a drip and no accumulation of water is carried down any one drop.

The steam drops are carried down through the building with suitable reductions as the various radiator connections are taken off until the lowest radiator runout is reached. If the drop is only two or three stories high, the portion feeding the bottom radiator should be increased one pipe size to provide for draining the riser, and if the drop is over three stories high it is well to increase the portion feeding the two lowest radiators one or two pipe sizes, especially if the two lowest radiators are small and the normal size of drop required is 1 in. or less. The bottom of each steam drop should terminate with a dirt pocket and be dripped as shown in Fig. 10. The returns on a down-feed vapor system are the same as on an up-feed system. The runouts to the radiators and the radiator connections of the down-feed system are the same as those for the up-feed system already described.

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 condensation 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) because with large variation in pressure the value of graduated valves on radiators is destroyed.

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 4, 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 Table 5, Column U, (lower portion) and the mains from Column U (upper portion). It should again be noted that

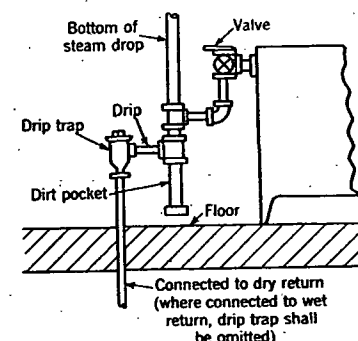


FIG. 10. DETAIL OF DRIP CONNECTIONS AT BOTTOM OF DOWN-FEED STEAM DROP

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 correspond. This will not hold true in larger systems.

For vapor systems over 200 ft of equivalent length, the drop should not exceed $\frac{1}{8}$ lb to $\frac{1}{4}$ lb, if possible. Thus, for a 400 ft equivalent run the drop per 100 ft should be not over $\frac{1}{8}$ lb divided by 4, or $\frac{1}{32}$ lb. 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 $\frac{1}{32}$ lb. 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 $\frac{1}{32}$ lb. 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 $\frac{1}{4}$ in. in 10 ft.
2. Pitch of horizontal runouts to risers and radiators should not be less than $\frac{1}{2}$ in.