

200 ft preferably employ the smaller pressure drop while systems over 200 ft equivalent length of run more frequently go to 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 $\frac{1}{2}$ lb divided by 12, or $\frac{1}{24}$ lb. In this case the steam main would be sized from Column C, 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 $\frac{1}{24}$ lb). 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; return runouts to radiators, one pipe size larger than the radiator trap connections.

Notes on Vacuum Systems

1. It is not generally considered good practice to exceed $\frac{1}{8}$ -lb drop per 100 ft of equivalent run nor to exceed 1 lb total pressure drop in any system.
2. Pitch of mains should not be less than $\frac{1}{4}$ in. in 10 ft.
3. Pitch of horizontal runouts to risers and radiators should not be less than $\frac{1}{2}$ in. in 10 ft. Where this pitch cannot be obtained runouts over 8 ft in length should be one size larger than called for in the table.
4. In general it is not considered desirable to have a supply main smaller than 2 in. When the supply main is 3 in. or over, at the boiler or pressure reducing valve, it should not be less than $2\frac{1}{2}$ in. at the far end.
5. When necessary, the supply main, supply riser, or branch to a supply riser should be dripped separately through a trap into the vacuum return. A connection should not be made between the steam and return sides of a vacuum system without interposing a trap to prevent the steam from entering the return line.
6. Lifts should be avoided if possible, but when they cannot be eliminated they should be made in the manner described in Chapter 15.
7. No lifts can be used in orifice and atmospheric systems. In sub-atmospheric systems the lift must be at the vacuum pump.

STEAM SUPPLY SOURCES

Steam heating systems may be supplied from boilers used exclusively for heating or which provide steam both for heating and other purposes. Low pressure boilers are widely used because in modern practice steam heating systems usually operate at low pressures, usually not exceeding 15 lb gage. Frequently the heating boiler serves the heating system and the domestic hot water supply (See Chapter 43). If the boiler plant supplies steam for other purposes requiring pressures exceeding 15 lb gage, a pressure reducing valve is the means used to lower the steam to the pressure required for use in heating. In some installations there may be separate zones used to supply steam for (a) direct steam heating, (b) process work, (c) air conditioning or ventilation, and (d) domestic water heating. Each of these may require different steam pressures and consequently individual pressure reducing valves are needed.

PIPING CONNECTIONS AND DETAILS

Piping connections may be classified into two groups: *first*, those suitable for any system of steam heating; *second*, those devised for certain systems which cannot be satisfactorily applied to any other type. There are also various details that apply to piping on the steam side which cannot be used on the returns. An installation that is designed and sized

correctly and installed with care may be rendered defective by the use of improper connections, such as runouts that do not allow for expansion, thermostatic traps unprotected from scale, pressure-reducing valves without strainers, and lack of drips at required points.

BOILER CONNECTIONS

Supply

Boiler headers and connections have the largest sizes of pipe used in a system. Cast-iron, horizontal-type, low pressure heating boilers usually have several tapped outlets in the top, the manufacturers recommending their use in order to reduce the velocity of the steam in the vertical uptakes from the boiler and to permit entrained water to return to the boiler instead of being carried over into the steam main where it must be cared for by dripping. Steel heating boilers usually are equipped with

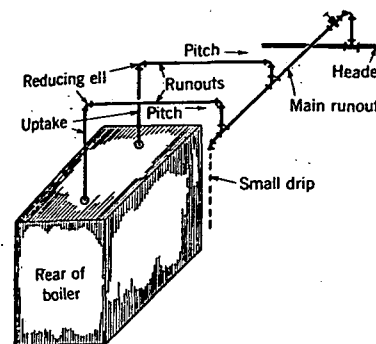


FIG. 3. OLD STYLE STANDARD BOILER CONNECTIONS

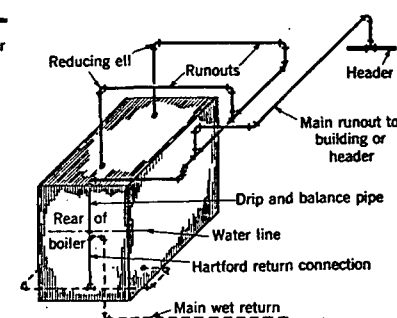


FIG. 4. APPROVED METHOD OF BOILER CONNECTIONS

only one steam outlet but many engineers believe that better results are obtained by specifying that such boilers have two. The second outlet, usually located 3 or 4 ft back of the regular one, reduces the velocity 50 per cent in the steam uptake.

Fig. 3 shows a type of boiler connection that was used for many years and one with which some boilers are now piped. The uptakes are carried as high as possible, turned horizontally and run out to the side of the boiler and then are connected together into the main boiler runout which drops into the top of the boiler header through a boiler stop valve. No drips are provided on this type of runout except a very small one which is sometimes installed on the boiler side of the stop valve. Fig. 4 shows a type of boiler connection which is regarded as superior to that shown in Fig. 3 and which is the type illustrated in the system diagrams in Chapter 15. This type is similar to that shown in Fig. 3 except that the horizontal branches from the uptakes are connected into the main boiler runout, and the steam is carried toward the rear of the boiler. The branch to the building or boiler header is taken off *behind* the last horizontal boiler connection. At the rear end of this main runout, a large size drip, or balance