PROBLEMS IN PRACTICE

1 ● The heating capacity of an indirect water heater is 100 gal per hour, using steam at 215 F and raising the water from a temperature of 50 to 150 F. Determine the heating capacity of the same water heater using water at a temperature of 180 F for the heating medium.

Using Equation 1, and because the surface area of the water heater is the same for each condition, the two conditions may be equated as follows:

$$\frac{100 \times 8.33\ (150 - 50)}{240\left[215 - \frac{(150 + 50)}{2}\right]} = \frac{Q \times 8.33\ (150 - 50)}{100\left[180 - \frac{(150 + 50)}{2}\right]}$$

Q = 28.98 gal per hour, capacity of heater using water at a temperature of 180 F.

2 ● Why is it impractical to size water supply piping so pipe friction will produce an equal pressure on each fixture?

Because the friction would be built up only in periods of maximum flow and at all other times it would be only a fraction of that required.

3 ● What is the purpose of zoning water supply systems in tall buildings?

To avoid excessive pressures in the lower stories.

4 ● Define the maximum possible flow, the maximum probable flow, and the average probable flow.

The maximum possible flow is the flow which would occur if all of the outlets on the system were opened at one and the same time. The maximum probable flow is the flow which will occur with probable peak conditions. The average probable flow is the flow likely to occur under a normal condition of use.

5 ● What is the factor of usage?

This is the percentage of the maximum possible flow which is likely to occur at peak load.

6 ● How many feet higher than the uppermost fixtures must the water line in a house tank be to provide about 15 lb per square inch pressure at the fixture outlet?

Allowing for pipe losses, about 45 ft.

7 ● What methods of hot water circulation commonly are employed with hot water supply systems?

a. Up-feed risers with returns having no connections paralleling the risers.
b. Up-feed risers with returns in other locations, and with connections taken off both supply and return.
c. One main up-feed riser, without connections, supplying all down-feed risers for all fixtures.

8 ● Which method of hot water supply generally is the most satisfactory?

The single main up-feed riser supplying drop risers for all fixtures.

9 ● How much of the water stored in a hot water storage tank really is available for use?

About 75 per cent, because when only 25 per cent of the original water remains in the tank it has been so cooled down by the entering water that it is too cold for satisfactory use.

10 ● In cases of intermittent demand, does a large hot water storage tank increase or decrease the steam load for water heating?

It decreases the steam load in cases of intermittent demand but causes no change in the steam load if the demand is constant.

Chapter 36

INSULATION OF PIPING

Heat Losses from Bare Pipes, Steam and Hot Water Lines, Low Temperature Pipe Insulation, Pipe Sweating, Heat Losses from Pipe Surfaces, Economical Pipe Thicknesses, Underground Insulation

PIPE insulation performs an important function in preventing loss of heat where steam or hot water are conveyed from one part of a building to another, and in reducing the absorption of heat by cold pipes as well as preventing condensation on the outer surfaces.

HEAT LOSSES FROM BARE PIPE

Heat losses from horizontal bare iron pipes, based on data obtained from tests conducted at the Mellon Institute, are given in Table 1. These losses are expressed in Btu per hour per linear foot of pipe per degree Fahrenheit difference in temperature between the steam or hot water in the pipe and the air surrounding the pipe. The monetary value of the loss of heat given in Table 1 may be obtained by means of Fig. 1 for various heating system efficiencies, temperature differences, and calorific values and costs of coal. To solve a problem, select the proper heat loss coefficient from Table 1 and locate this value on the upper left hand margin of the chart. Then draw lines in the order indicated by the dotted lines, the dollar value of the heat loss per 100 linear feet of pipe per 1000 hours being given on the upper right hand scale. In using this chart, the cost of coal should also include the labor for handling it, boiler room expense, etc.

Heat losses from horizontal copper pipes based on tests at the A.S.H.V.E. Laboratory, are given in Table 2[1].

In order to determine heat losses per linear foot of pipe from known losses per square foot, it is necessary to know the area in square feet per linear foot of pipe. Table 3 gives these areas for various standard pipe sizes while Table 4 gives the area in square feet for flanges and fittings for various standard pipe sizes.

Very often, even where pipes are thoroughly insulated, flanges and fittings are left bare due to the belief that the losses from these parts are not large. However, the fact that a pair of 8-in. standard flanges having an area of 2.41 sq ft would lose, at 100 lb steam pressure, an amount of

[1]Heat Emission from Iron and Copper Pipe, by F. C. Houghten and Carl Gutberlet (A.S.H.V.E. TRANSACTIONS, Vol. 38, 1932).