

The heat losses through 1, 1½, and 2-in. thick block, blanket, or cement insulation when applied to a flat vertical surface is given in Fig. 4.

The losses through any of the insulations given in Table 1 can be obtained by multiplying the losses obtained from Figs. 1, 2, 3, or 4 by the factors given in Table 6.

Pipes operating at high temperatures are frequently insulated to the best advantage by combining a high-temperature insulation near the pipe with a

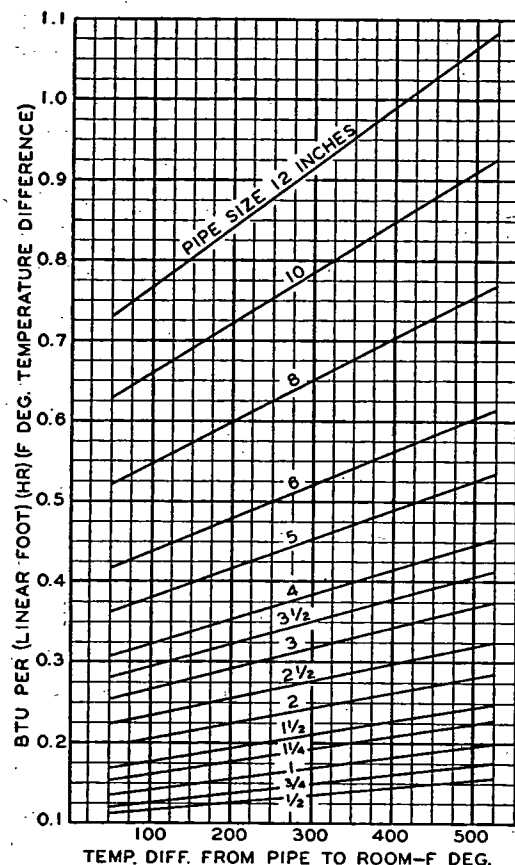


FIG. 2. HEAT LOSS THROUGH 1½ IN. THICK PIPE INSULATION
(Use with Table 6 for Various Insulations)

moderate or low-temperature insulation around it as an outer layer. By this method an efficient material may be used for each of the two temperature ranges encountered. In calculating the heat loss through such a combination the mean temperature of each layer must be determined along with the thickness of each. This is readily done in two or three calculations performed as a series of approximations, in which assumptions of thickness

and mean temperature are adjusted as indicated in the discussion which follows.

In the case of a single thickness of pipe covering, the quantity of heat transferred per square foot of outer surface of the insulation is given by the equation:

$$q_o = \frac{k(t_1 - t_2)}{r_2 \log_e \frac{r_2}{r_1}} \quad (1)$$

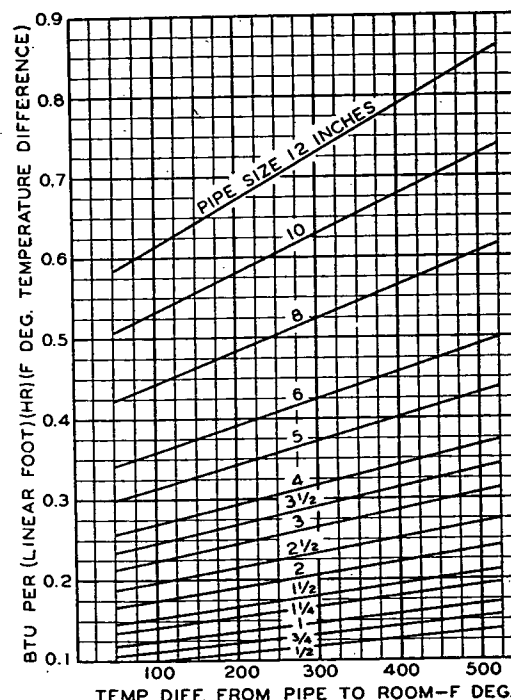


FIG. 3. HEAT LOSS THROUGH 2 IN. THICK PIPE INSULATION
(Use with Table 6 for Various Insulations)

where

q_o = Btu per (hour) (square foot of outer surface of insulation).

r_1 = outer radius of pipe or inner radius of insulation, inches.

r_2 = outer radius of insulation, inches.

k = thermal conductivity of insulation, Btu per (hour) (square foot) (Fahrenheit degree per inch).

t_1 = temperature of inner surface of insulation, Fahrenheit degrees.

t_2 = temperature of outer surface of insulation, Fahrenheit degrees.

It is convenient to work from the outer surface of the insulation, since the loss through the covering must be determined from the outer surface