transferred per square foot of outer surface of the insulation is given by the equation:

$$q_0 = \frac{k(t_1 - t_2)}{r_2 \log_e \frac{r_2}{r_1}} \tag{1}$$

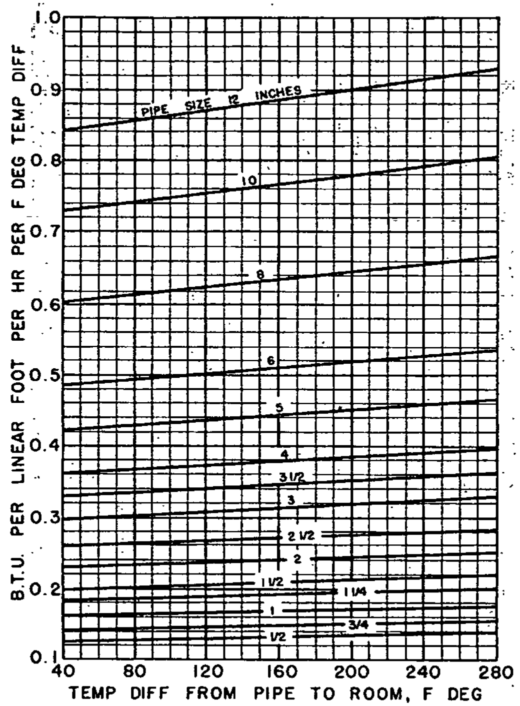


Fig. 2. Heat Loss Through $1\frac{1}{2}$ In. Thick 85 per cent Magnesia Type Covering

*where*

$q_0$ = 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 loss by means of surface loss curves such as given in Fig. 4.



After the true heat loss is obtained, the loss per square foot of pipe surface can be calculated from the relationship:

$$q_i = q_0(r_2/r_1)$$

*where*

$q_i$ = Btu per (hour) (square foot outer surface of pipe).

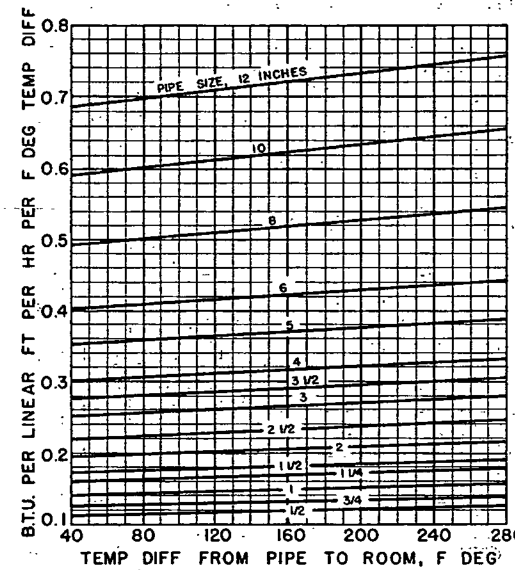


Fig. 3. Heat Loss Through 2 In. Thick 85 per cent Magnesia Type Covering

The heat loss through two or more thicknesses of insulation applied to a pipe can be calculated by means of the equation:

$$q_0 = \frac{t_1 - t_2}{\dfrac{r_s \log_e \frac{r_2}{r_1}}{k_1} + \dfrac{r_s \log_e \frac{r_3}{r_2}}{k_2} + \cdots} \tag{2}$$

*where*

$r_3$ = outer radius of second layer of insulation, inches.
$r_s$ = outer radius of last layer of insulation, inches.

The method of solving Equation 2, which is the most difficult of the two, is given in Example 3.

*Example 3.* Compute the heat loss per linear foot of pipe surface per hour from a 6-in. pipe, insulated with a 3-in. thickness of diatomaceous silica, and a 2-in. thickness of 85 per cent magnesia. The pipe is operating at a temperature of 1200 F and is exposed to a room temperature of 80 F.