TABLE 17. HEAT EMITTED BY PERSONS PER HOUR AT DIFFERENT ROOM TEMPERATURES

H = Heat emitted by man at rest per hour.
Hl = Heat emitted by man at light labor per hour.
Ha = Heat emitted by man at average labor per hour.
Hh = Heat emitted by man at hard labor per hour.

$$H\,E = \text{Heat Energy} = \left(\frac{\text{Foot-Pounds per hour}}{778}\right) = 84 \text{ B.t.u., } 168 \text{ B.t.u. and}$$

252 B.t.u. respectively for light, average and hard labor.

T = Room Temperature.

$$H = 13.2\,(98.6 - T) \qquad \text{Heat due labor} = \frac{T \times H\,E}{100}$$

$$Hl,\ Ha, \text{ or } Hh = 13.2\,(98.6 - T) \text{ plus } \frac{T \times H\,E}{100}$$

Room Temp. Deg. Fahr.	Rest	Heat Emitted by Man* B.t.u. per Hour at 84 B.t.u. Light Labor	168 B.t.u. Average Labor	252 B.t.u. Hard Labor	Condition Required to Balance Excess and Shortage in Heat Emission
30	905	931	954	981	Increasing Humidity
40	773	807	838	874	Heavy Clothing for Reduction or Pre-
50	642	684	723	768	vention of Radiation
60	509	559	606	660	
68	404	461	518	575	Normal Condition
70	378	436	491	554	
75	312	375	438	501	Decreasing Humidity
80	246	313	375	447	Air Currents for Producing Evapora-
85	180	251	322	394	tion of Perspiration
90	114	189	259	342	

*For children use one-half of table values, February, 1911.

If power is transmitted to the machinery from the outside, then only the heat equivalent of the brake horsepower supplied is used. In the first case the B.t.u. supplied per hour $= \dfrac{\text{Motor horsepower}}{\text{Efficiency of motor}} \times 2546$, and in the second case B.t.u. per hr. = b.hp. $\times$ 2546, in which 2546 is the B.t.u. equivalent of 1 hp. hour. In high-powered mills this is the chief source of heating and is frequently sufficient to overheat the building even in zero weather, thus requiring cooling by ventilation the year round.

For intermittent heating allow 10 per cent additional for rooms heated in the day time only, and for longer intervals of several days or more, add 25 per cent in determining minimum heating requirements, and size of plant.

Application to Factory Heating[3] (See Fig. 6)

Lowest outside temperature for Philadelphia, Pa. = −6 deg. fahr. (Table 2), hence use (−6 + 10) = +4 for heat loss computations. Average wind movement (Table 2) for December, January, February = 11.0 miles per hour from the Northwest. Long axis of building is north and south.

Inside breathing line temperature = 60 deg. fahr.

Walls: 9 in. concrete (stone), furred with 2 in. tile, plastered ½ in.

K_1 = 0.93 plaster in still air, Table 4.
K_2 = 3 × 1.3 concrete moving air, Tables 4 and 6.
c_1 = 8.3 for stone concrete, Table 5.
c_2 = for tile as shown use 0.99 (not per 1 in.), Table 5.

[3]In this example a design temperature only 10 deg. fahr. above lowest on record instead of 15 deg. fahr. above was used. Infiltration values were taken from Table 14 for a plain window.

$$U = \frac{1}{\frac{1}{K_1} + \frac{1}{K_2} + \frac{x_1}{c_1} + \frac{x_2}{c_2}} = \frac{1}{\frac{1}{0.93} + \frac{1}{3.9} + \frac{9}{8.3} + \frac{1}{0.99}} =$$

0.292 *from equations* (6) and (7).

The air temperature at the mean height of inside walls is greater than at breathing line. Mean height of walls is 16 ÷ 2 = 8 ft., which 8 − 5 = 3 ft. above breathing line. Allowing 2 per cent per foot above 5 ft., or 2 × 3 = 6 per cent, makes the mean air temperature 1.06 × 60 = 63.4 deg. fahr. The triangular areas in the end wall are practically at the mean height of the roof at which level the air temperature is 78 deg. fahr.

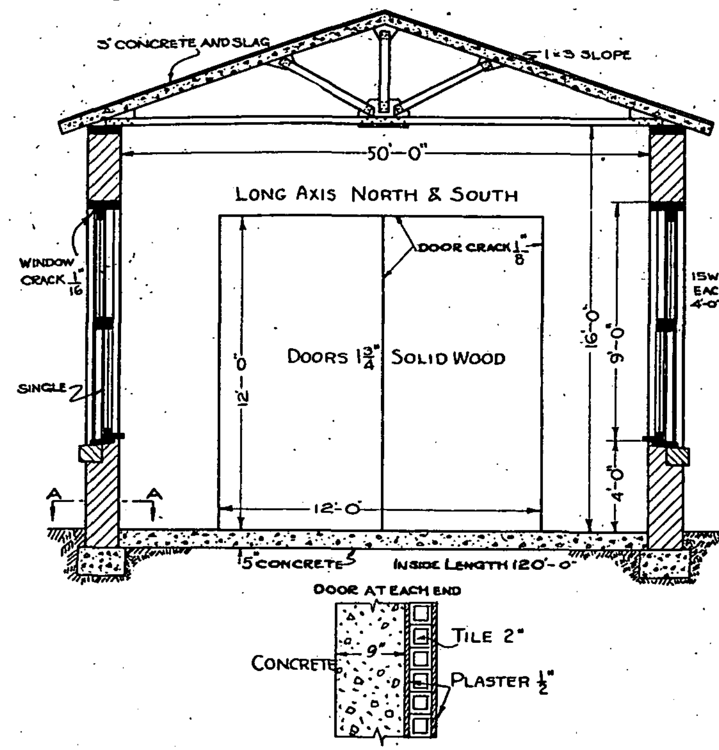

FIG. 7. ELEVATION OF FACTORY BUILDING

Roof: 3 in. concrete (stone), with ⅛ in. tar paper and slag.

$$U = \frac{1}{\frac{1}{K_1} + \frac{1}{K_2} + \frac{x_1}{c_1} + \frac{x_2}{c_2}} = \frac{1}{\frac{1}{1.3} + \frac{1}{4.2} + \frac{3}{8.3} + \frac{0.125}{0.40}} = 0.60$$

The air temperature just below roof is higher than that at the breathing line. Mean height of roof is 16 + 4 = 20 ft., or it is 20 − 5 = 15 ft.