which usually is much higher than the relative humidity occurring at the maximum temperature. Any statement of weather condition which gives a wet-bulb temperature higher than 80 deg. in the United States is questionable.

WIND MOVEMENT

The effect of wind on the heating requirements of any building should be given consideration under two heads:

1. Wind movement increases the heat transmission of walls, glass, and roof, affecting poor walls to a much greater extent than good walls.

2. Wind movement materially increases the infiltration (inleakage) of cold air through the cracks around doors and windows, and even through the building materials themselves, if such materials are at all porous.

It is entirely possible that a building may require more heat on a windy day with a moderately low outside temperature than on a quiet day with a much lower outside temperature. It will, therefore, be evident that the wind movement in any locality must be given careful consideration in computing the probable heating requirements of a building, and for the purposes of calculation, not less than the average wind movement in any locality during December, January and February should always be provided for in computing (1) the heat transmission of a building, and (2) the heat required to take care of the infiltration of outside air.

The first condition is readily taken care of, as explained in Chapter 3, by using a surface coefficient f_o for the outside wall surface, which is based on the proper wind velocity. In case specific data are lacking for any given locality, it is sufficiently accurate to use an average wind velocity of approximately 15 mph which is the velocity upon which the heat transmission coefficient tables in Chapter 3, are based.

In a similar manner, the heat allowance for infiltration through cracks and walls (Tables 1 and 2, Chapter 4) must be based on the proper wind velocity for a given locality, although not necessarily the average wind velocity, as explained on p. 75, Chapter 4.

Wind movement involves both *direction* and *velocity*, and hence after transmission and infiltration losses have been computed, using coefficients which allow for the proper velocity, a further allowance must be made for the direction of the prevailing wind in any given locality. This shall be done by adding 15 per cent to the wall and glass transmission losses and the infiltration losses on the sides of the building exposed to the prevailing winds. Those walls which lie in the two adjacent sides of the building most nearly facing the prevailing wind are to be considered in making this correction. (See Fig. 8, Chapter 4). This is not necessarily the same as adding 15 per cent to the total heat loss of a room on the exposed sides of the building.

HEAT SOURCES

Heat Available from Sources other than Heating Plant

The heat supplied by persons, lights, motors and machinery should always be ascertained in the case of theaters, assembly halls, and industrial plants, but allowances for such heat sources must be made only

TABLE 4. HEAT GIVEN UP BY PERSONS AND LIGHTS

PERSONS:

Man at rest .... 400 B.t.u. per hr.
Man at work .... 500 B.t.u. per hr.

LIGHTS:

Electric lamps, B.t.u. per hr. equals watts per lamp × number of lamps × 3.415

Gas lighting:

1 cu. ft. producer gas .... 150 B.t.u.
1 cu. ft. illuminating gas .... 700 B.t.u.
1 cu. ft. natural gas .... 1,000 B.t.u.

A WELSBACH BURNER AVERAGES 3 CU. FT. OF GAS PER HOUR AND A FISH TAIL BURNER 5 CU. FT. PER HOUR.

TABLE 5. HEAT EMITTED BY PERSONS PER HOUR AT DIFFERENT ROOM TEMPERATURES[a]

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.

HE = Heat Energy = $\left(\frac{\text{Foot-Pounds per hour}}{778}\right)$ = 84 B.t.u., 168 B.t.u. and 252 B.t.u. respectively for light, average and hard labor.

t = Room Temperature.

$H = 13.2\ (98.6 - t)$ Heat due labor $= \frac{t \times HE}{100}$

$$Hl, Ha, \text{ or } Hh = 13.2\ (98.6 - t) + \frac{t \times HE}{100}$$

Room Temp. Deg. Fahr.	Rest	Heat Emitted by Man[a] B.t.u. per Hour at			Condition Required to Balance Excess and Shortage in Heat Emission
		84 B.t.u. Light Labor	168 B.t.u. Average Labor	252 B.t.u. Hard Labor	
30	905	931	954	981	Increasing Humidity.
40	773	807	838	874	Heavy Clothing for Reduction or Prevention of Radiation.
50	642	684	723	768	
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 Evaporation of Perspiration.
85	180	251	322	394	
90	114	189	259	342	

[a]For children use one-half of table values.

after careful consideration of all local conditions. In many cases, these heat sources should not be allowed to affect the size of the installation at all, although they may have a marked effect on the operation and control of the system later. In general, it is safe to say that where audiences are involved, the heating installation must have sufficient capacity to bring the building up to the stipulated inside temperature before the audience arrives. In industrial plants, quite a different condition exists, and heat sources, if they are always available during the period of human