by a properly distributed reserve of heating capacity, which reserve, however, is not in use at all places at the same time, nor in any one place at all times.

Example. Consider a room with four 7 ft x 4 ft double-hung weatherstripped wood windows with ¼ in. crack, and calked frame, on the side of a building exposed to prevailing winds (see Fig. 8). Assume a wind velocity of 20 mph and a temperature difference of 70 F. Neglecting chimney effect, what is the maximum heat loss of this room due to infiltration?

Solution. From Table 2, the leakage per foot of crack is 35 cu ft per hour. Length of crack for room = 4 (windows) × (7 + 7 + 4 + 4 + 4) = 104 ft. The infiltration (Q) is equal to 35 × 104 or 3,640 cu ft per hour and the additional heat loss (maximum) due to infiltration is equal to 0.018 × 3,640 × 70 or 4,590 Btu per hour. For a room on a side exposed to non-prevailing wind direction (see Fig. 8), the wind velocity chosen may be 15 mph, in which case the leakage per foot of crack per hour is 23 cu ft (Table 2), the leakage into the room (Q) is 2,390 cu ft per hour, and the increase in the maximum heat loss of the room for which provision must be made is 3,020 Btu per hour.

Example. What is the probable inleakage of air for a room with four windows on the first floor, on the side exposed to prevailing winds, if the wind velocity is 20 mph? The building is 100 ft high and is equipped with heavy casement section projected steel windows, with three ventilators each of a total perimeter of 36.5 ft, 1/32-in. crack.

Solution. For a temperature difference of 70 F the equivalent wind velocity (M_e) is equal to $\sqrt{20^2 + 1.75 \times 50}$ or 22 mph. Leakage per foot of crack for this type of window (Table 2, interpolating) is equal to 61 cu ft per hour. The total leakage rate (Q) is equal to 4 (windows) × 36.5 (ft of crack per window) × 61 or 8,910 cu ft per hour. For a similar room in the top story, on the same side of the building, the equivalent wind velocity (M_e) is equal to $\sqrt{20^2 - 1.75 \times 50}$ or 18 mph for which the leakage per foot of crack is 48 cu ft per hour (Table 2). The total inleakage of air into the room (Q) is equal to 4 × 36.5 × 48 or 7,010 cu ft per hour. For a similar room 20 ft above the ground (30 ft below mid-height), $M_e = \sqrt{20^2 + 1.75 \times 30} = 21$ mph for which the unit crack leakage will be 58 cu ft per hour, and the total leakage for the room will be 8,470 cu ft per hour. On sides exposed to non-prevailing wind directions, the calculations are the same, except for the lower value of the wind velocity.

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Chapter 5

HEAT LOSS CALCULATIONS

Outline of Procedure; Inside Temperatures; Outside Temperatures; Wind Movement; Heat Sources; Examples of Heat Loss Computations.

THE normal heat losses of a building consist of the transmission losses described in Chapter 3, and the infiltration losses described in Chapter 4. An additional quantity of heat must be supplied to warm any air that may be brought into the building for ventilation purposes. This chapter contains information for estimating the normal heat losses of a building due to transmission through walls, roof and glass, and infiltration through cracks and materials, to which must be added the heat required for ventilation.

OUTLINE OF PROCEDURE

The procedure to be followed in determining the heat loss from any building can be divided into seven consecutive steps, as follows:

1. Determine on the inside air temperature, at the breathing line, which is to be maintained in the building during the coldest weather. (See Table 1, p. 82).

2. Determine on an outside air temperature for design purposes, based on the minimum temperatures recorded in the locality in question, which will provide for all but the most severe conditions. Such conditions as may exist for only a few consecutive hours are readily taken care of by the heat capacity of the building itself. (See Table 3, p. 86).

3. Select or compute the heat transmission coefficients for outside walls and glass, also for inside walls, floors, or top-floor ceilings, if these are next to unheated space; include roof if next to heated space. (See Chapter 3).

4. Measure up net outside wall, glass and roof next to heated spaces, as well as any cold walls, floors or ceilings next to unheated space. Such measurements are made from building plans, or from the actual building.

5. Compute the heat transmission losses for each kind of wall, glass, floor, ceiling and roof in the building by multiplying the heat transmission coefficient in each case by the area of the surface in square feet and the temperature difference between the inside and outside air. (See pars. 1 and 2).

6. Select unit values and compute the heat equivalent of the infiltration of cold air taking place around outside doors and windows. These unit values depend on the kind or width of crack and wind velocity and when multiplied by the length of crack and the temperature difference between the inside and outside air, the result expresses the heat required to warm up the cold air leaking into the building per hour. (See Chapter 4).

7. The sum of the heat losses by transmission (par. 5) through the outside wall and glass, as well as through any cold floors, ceilings or roof, and the heat equivalent (par. 6) of the cold air entering by infiltration represents the total heat loss equivalent for any building.

Item 7 represents the heat losses after the building is heated and under stable operating conditions in coldest weather. Additional heat