of the air leaking in through one degree) through cracks, must be based on the average wind velocity for a given locality, and is explained in the next subdivision of this chapter.

Wind movement involves both *direction* and *velocity*, and hence after transmission and infiltration losses have been computed, using coefficients which allow for average 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. 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.

INFILTRATION RESULTING FROM WIND MOVEMENT

Reference has already been made to the fact that in addition to the heat transmission of the walls, glass and roof, consideration must always be given to the inleakage of cold outside air which must be heated to room temperature. This inleakage or infiltration is exclusive and independent of air that may be supplied for ventilation through ducts or flues of any sort. Calculation of the heat required for this purpose is a very simple matter if the volume of air leaking into the building per hour is known.

$$H_i = 0.24\, Q\, d\, (t - t_0) \qquad (10)$$

where

H_i = B. t.u. per hour required for heating air leaking into building from outside temperature t_0 to breathing line temperature t;
Q = cubic feet of air entering per hour at breathing line temperature, t.
d = density (lb. per cu. ft.) of air at breathing line temperature, t.
t = breathing line temperature;
t_0 = outside air temperature for which heating system is designed;
0.24 = specific heat of air.

The determination of Q, the amount of air leaking in per hour, may be arrived at in either of two ways: (1) by assuming a certain number of air changes per hour for each room, the number of changes assumed (Table 13) being dependent upon the type, use, and location of room, or (2) by computing the infiltration taking place through the cracks around windows and doors in that side of the room which has the greatest number of feet of such crack. In no case should the amount of crack used for computation be less than half of the total crack in the outside walls of the room. Thus, in a room with one exposed wall, take all the crack; with two exposed walls take the wall having the most crack; and with three or four exposed walls take the wall having the most crack, but in no case take less than half the total crack.

The linear feet of crack for a double hung sash is equal to the sash perimeter plus the meeting rail. For a standard type steel sash constructed of solid rolled sections (Fenestra, Lupton and others) the linear feet of crack consists of the perimeter of the ventilating section plus the linear feet of sash section in contact with steel work as, for example, vertical and horizontal mullion steel. The perimeter of sash properly grouted with cement mortar into brick work or concrete is not to be counted as crack.

Neither of these methods for estimating the infiltration is entirely satisfactory in view of the limited amount of data available, but for the purposes of calculation the second (infiltration) method is to be preferred and then checked against the first (air changes per hour) method. In no case use less than one-half an air change where outside doors and windows exist. The infiltration method based on recent tests by F. C. Houghten and C. C. Schrader, reported in TRANSACTIONS, A. S. H. AND V. E., Vol. 30, 1924 and Vol. 31, 1925 and others may be conveniently adapted to calculation purposes.

Tables 14 and 15 as well as Figs. 4, 5, and 6 present values from the recent tests by Houghten and Schrader at the Research Laboratory of the AMERICAN SOCIETY OF HEATING AND VENTILATING ENGINEERS at

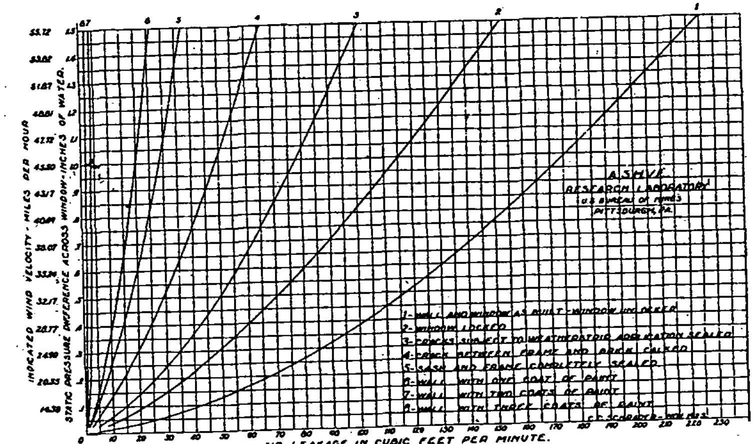

FIG. 4. RESULTS OF TESTS OF LEAKAGE THROUGH VARIOUS PARTS OF WINDOW AND FRAME

Pittsburgh. Table 14 and Fig. 4 based on the report TRANSACTIONS, Vol. 30, 1924, No. 686 while Table 15 and Figs. 5 and 6 are based on data presented in the TRANSACTIONS, Vol. 30, 1924, p. 313.

TABLE 13. AIR CHANGES TAKING PLACE UNDER AVERAGE CONDITIONS EXCLUSIVE OF AIR PROVIDED FOR VENTILATION

Kind of Room or Building	Number of Air Changes Taking Place per Hour
Rooms, 1 side exposed	1
Rooms, 2 sides exposed	1½
Rooms, 3 sides exposed	2
Rooms, 4 sides exposed	2
Rooms with no windows or outside doors	½ to ¾
Entrance Halls	2 to 3
Reception Halls	2
Living Rooms	1 to 2
Dining Rooms	1 to 2
Bath Rooms	2
Drug Stores	2 to 3
Clothing Stores	1
Churches, Factories, Lofts, etc.	½ to 3

Table 14 gives the leakage through a 13 in. brick wall, between the frame and the brick, the leakage for a plain window not weather-stripped