TABLE 12. COEFFICIENTS OF TRANSMISSION (U) OF DOORS, WINDOWS AND SKYLIGHTS

NOTE.—These coefficients are based on a wind exposure of 15 miles per hour, and are expressed in B.t.u. per hour per square foot per deg. fahr. difference in temperature between the air inside and outside of the door, window or skylight.

A. Windows and Skylights

	U
Single	1.13*†
Double	0.45*
Triple	0.281*

*B. Solid Wood Doors***†

Nominal Thickness Inches	Actual Thickness Inches	U
1	$\frac{13}{16}$	0.563
1¼	$1\frac{1}{16}$	0.485
1½	$1\frac{5}{16}$	0.432
2	$1\frac{5}{8}$	0.382
2½	$2\frac{1}{8}$	0.321
3	$2\frac{5}{8}$	0.277

*See page 59, Volume I, "Mechanical Equipment of Buildings," by Harding and Willard.
**Computed using $C = 1.0$ for wood, $K_1 = 1.34$ and $K_2 = 4.02$.
†It is sufficiently accurate to use the same coefficient of transmission for doors containing thin wood panels, as that of single panes of glass, namely, 1.13 B.t.u. per hr. per square foot per 1 deg. fahr. difference between inside and outside air temperature.

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 already explained, by using a surface coefficient K_2 for the outside wall surface which is based on the proper wind velocity (Table 5). In case specific data are lacking for any locality, use an average wind velocity of approximately 15 miles per hour. In a similar manner, the heat allowance (Table 14) for infiltration (B.t.u. per hour per foot of crack required to raise the temperature 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