TABLE 18. COEFFICIENTS OF TRANSMISSION (U) OF DOORS, WINDOWS, SKYLIGHTS AND GLASS BLOCK WALLS

Coefficients are expressed in Btu per (hour) (square foot) (Fahrenheit degree difference in the temperature between the air inside and outside of the door, window, skylight or wall) and are based on an outside wind velocity of 15 mph.

Section A. Windows and Skylights		Single	Double	Triple
	U	1.13[ac]	0.45[ae]	0.281[ae]

Section B. Solid Wood Doors[bc]	Nominal Thickness Inches	Actual Thickness Inches	U Exposed Door	U[d] With Glass Storm Door
	1	25/32	0.69	0.42
	1¼	1 1/16	0.59	0.38
	1½	1 5/16	0.52	0.35
	1¾	1⅜	0.51	0.35
	2	1⅝	0.46	0.32
	2½	2⅛	0.38	0.28
	3	2⅝	0.33	0.25

Section C. Hollow Glass Block Walls	Description	U Still Air Both Sides	U Still Air Inside 15 mph Outside
	Smooth surface glass blocks 7¾ x 7¾ x 3⅞ in. thick	0.40	0.49
	Ribbed surface glass blocks 7¾ x 7¾ x 3⅞ in. thick	0.38	0.46

[a]See Heating, Ventilating and Air Conditioning, by Harding and Willard, revised edition, 1932.

[b]Computed using C = 1.15 for wood; f_i = 1.65 and f_o = 6.0.

[c]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 Btu per (hour) (square foot) (degree difference between inside and outside air temperatures).

[d]These values may also be used with sufficient accuracy for wood storm doors. Neglect storm doors if loose and use values for exposed doors.

[e]Air spaces assumed to be ¾ in. or more in width.

Combined Ceiling and Roof Coefficients

If the attic space between ceiling and roof is unheated, the combined coefficient from room air below the ceiling to exterior air can be calculated from the following formula.

$$U = \frac{U_r \times U_{ce}}{U_r + \frac{U_{ce}}{n}} \tag{5}$$

where

U = combined coefficient to be used with ceiling area.

U_r = coefficient of transmission of roof.

U_{ce} = coefficient of transmission of ceiling.

n = ratio of roof area to ceiling area.

It should be noted that the over-all coefficient U should be multiplied by the ceiling area to determine heat loss and not by the roof area. Values of U_r and U_{ce} should be calculated using a value of 2.2 (the reciprocal of one-half the air space resistance) rather than 1.65 for the conductances of surfaces facing the attic, since the attic is equivalent to an air space.

If the attic contains windows, dormers and vertical wall spaces and if their area is small compared to that of the roof, they may be considered part of the roof area. For accuracy, the sum of the coefficients of each individual section multiplied by its percentage of the total area should be used as U_r. Where large vertical wall areas in the attic are involved, it is preferable to estimate the attic temperature as illustrated in Chapter 14 and calculate the heat loss through the ceiling by multiplying the value of U_{ce} for the ceiling by the difference in temperature above and below the ceiling.

Basement Floor, Basement Wall and Concrete Slab Floor Coefficients

The heat transfer through basement walls and floors to the ground is dependent on the temperature difference between the air within and that of the ground, on the material constituting the wall or floor, and on the conductivity of the surrounding earth. The conductivity of the earth will vary with local conditions and is usually unknown. Tests [8] at the A.S.H.V.E. Research Laboratory indicate a heat flow of approximately 2.0 Btu per (hour) (square foot) through an uninsulated concrete basement floor with a temperature difference of 20 F between ground temperature and the air temperature 6 in. above the floor. Based on this result, a coefficient of 0.10 Btu per (hour) (square foot) (Fahrenheit degree temperature difference) is recommended for calculation where it is desirable to allow for the small basement floor heat loss, *e.g.* for heated basements.

For basement walls the same coefficient may be used, but due to closer proximity to the surface of the ground, the temperature difference for winter design conditions will be greater than for the floor. The test results indicate a unit area heat loss, at mid-height of the basement wall, approximately twice that of the same floor area.

For concrete slab floors laid in contact with the ground at grade level, recent tests [9] indicate that for small floor areas (equal to that of a house 25 ft square) the heat loss may be calculated as proportional to the length of exposed edge rather than total area. This amounts to 0.81 Btu per (hour) (lineal foot of exposed edge) (Fahrenheit degree difference between the inside air temperature and the average outside air temperature). It should be noted that this may be appreciably reduced by insulating the edges of the floor from the abutting wall.

CONDENSATION IN BUILDINGS

Water vapor in the air within a building condenses if it comes in contact with surfaces at or below its dew-point temperature. It also will be transmitted into or through a wall, floor or ceiling, if a vapor pressure difference exists between the opposite sides, at a rate determined by the permeability of the materials encountered.[10] (see Table 14 Chapter 15). Building practice must take account of these facts in avoiding (1) surface condensation on interior building surfaces (walls, ceilings, roofs or glass) and (2) interstitial condensation or accumulation of condensation in the voids within the structure. The conditions under which surface condensation will take place are directly dependent on surface temperature and upon the relative humidity of the air in contact. Limiting maximum relative humidities for walls, roofs or glass having transmission coefficients up to 1.2 Btu for outside temperatures from −30 F to 40 F and for 70 F inside temperature may be obtained from Fig. 4 [11].

Surface condensation may be controlled by air conditioning, ventilation for the purpose of removing water vapor, particularly from laundries