flow leads to surface conductances averaging about 1.50 for block and vertical glass, and about 1.80 for horizontal glass, as compared to the value of 1.65 used in computing U values given in other tables in this chapter. These values should therefore be used in estimating the temperature at which condensation on glass surfaces will occur.

The application factors given in Section D of Table 20 are based upon hot box tests summarized in a research bulletin[15], and are approximate only. In practice, some variation in heat flow through windows having

TABLE 21. CONVERSION TABLE FOR WALL COEFFICIENT U FOR VARIOUS WIND VELOCITIES

U FOR 15 MPH[a]	U FOR 0 TO 30 MPH WIND VELOCITIES					
	0	5	10	20	25	30
0.050	0.049	0.050	0.050	0.050	0.050	0.050
0.060	0.059	0.059	0.060	0.060	0.060	0.060
0.070	0.068	0.069	0.070	0.070	0.070	0.070
0.080	0.078	0.079	0.080	0.080	0.080	0.080
0.090	0.087	0.089	0.090	0.090	0.091	0.091
0.100	0.096	0.099	0.100	0.100	0.101	0.101
0.110	0.105	0.108	0.109	0.110	0.111	0.111
0.130	0.123	0.127	0.129	0.131	0.131	0.131
0.150	0.141	0.147	0.149	0.151	0.151	0.152
0.170	0.158	0.166	0.169	0.171	0.172	0.172
0.190	0.175	0.184	0.188	0.191	0.192	0.193
0.210	0.192	0.203	0.208	0.212	0.213	0.213
0.230	0.209	0.222	0.227	0.232	0.233	0.234
0.250	0.226	0.241	0.247	0.252	0.253	0.254
0.270	0.241	0.259	0.266	0.273	0.274	0.275
0.290	0.257	0.278	0.286	0.293	0.295	0.296
0.310	0.273	0.296	0.305	0.313	0.315	0.317
0.330	0.288	0.314	0.324	0.333	0.336	0.338
0.350	0.303	0.332	0.344	0.354	0.357	0.359
0.370	0.318	0.350	0.363	0.375	0.378	0.380
0.390	0.333	0.368	0.382	0.395	0.399	0.401
0.410	0.347	0.385	0.402	0.416	0.420	0.422
0.430	0.362	0.403	0.421	0.436	0.441	0.444
0.450	0.376	0.420	0.439	0.457	0.462	0.465
0.500	0.410	0.464	0.487	0.509	0.514	0.518
0.600	0.474	0.548	0.581	0.612	0.620	0.626
0.700	0.535	0.631	0.675	0.716	0.728	0.736
0.800	0.592	0.711	0.766	0.821	0.836	0.847
0.900	0.645	0.789	0.858	0.927	0.946	0.960
1.000	0.695	0.865	0.949	1.034	1.058	1.075
1.100	0.742	0.939	1.039	1.142	1.170	1.192
1.200	0.786	1.010	1.129	1.250	1.285	1.318
1.300	0.828	1.080	1.217	1.359	1.400	1.430

[a] U in first column is from previous tables or as calculated for 15 mph wind velocity.

the same ratio of glass to sash area, may be expected because of difference in construction details and in air space edge effects.

Wind Velocity Correction for U-Values

Tables 7 to 9, and 15 to 19, present values of U for walls and other surfaces based on an outside wind velocity of 15 mph. Table 21 shows comparative values of U for other wind velocities.

Example 3: Find the coefficient of transmission U of a frame wall consisting of wood siding, $\frac{25}{32}$-in. insulation board sheathing, 2 x 4-in. studs, gypsum lath and plaster, and with 2-in. blanket insulation between studs, for 25 mph wind velocity.

Solution: From Table 7, Wall No. 40, with no insulation between studs has a value of $U = 0.19$. From Table 6, Col. B, this wall with 2-in. insulation added has a value

of $U = 0.084$. Entering Table 21 in the 15 mph column, interpolate between 0.080 and 0.090 in 15 mph column and proceed horizontally to the 25 mph column where the U-value is found by interpolation to be 0.085.

CALCULATING SURFACE TEMPERATURES

In many heating and cooling load calculations it is necessary to determine the inside surface temperature or the temperature of the surfaces within the structure. As the resistance of any path of heat flow is expressed in Fahrenheit degrees per (Btu) (hour) (square foot), the resistances through any two paths of heat flow would be proportional to the temperature drop through these paths, and can be expressed as follows:

$$\frac{R_1}{R_2} = \frac{(t_i - t_x)}{(t_i - t_o)} \qquad (6)$$

where

R_1 = the resistance from the inside air to any point in the structure at which the temperature is to be determined.
R_2 = the overall resistance of the wall from inside air to outside air.
t_i = inside air temperature.
t_x = temperature to be determined.
t_o = outside air temperature.

Example 4: Determine the inside surface temperature for a wall having an overall coefficient of heat transmission U = 0.25, inside air temperature 70 F, outside air temperature −20 F.

Solution:

$$R_1 = 1/f_i = 1/1.65 = 0.606$$
$$R_2 = 1/U = 1/0.25 = 4.00$$

Then, by Equation 6

$$\frac{0.606}{4.00} = \frac{70 - t_x}{70 - (-20)}$$

$$t_x = 56.4 \text{ F}$$

The same procedure can be used for determining the temperature at any point within the structure.

A chart for determining inside wall surface temperature is given in Fig. 12 of Chapter 24, Panel Heating.

REFERENCES

[1] Standard Method of Test for Thermal Conductivity by Means of the Guarded Hot Plate, sponsored by A.S.H.V.E., *A.S.T.M.*, *A.S.R.E.*, and *N.R.C.*, and approved as a Tentative Code by A.S.H.V.E. and *A.S.T.M.* in 1942 (*A.S.T.M.* designation C-177-45, Approved 1945).

[2] Heat Transmission Through Building Materials, by F. B. Rowley and A. B. Algren (*University of Minnesota, Engineering Experiment Station Bulletin*, No. 8, p. 11).

[3] Thermal Properties of Soils, by Miles S. Kersten (*University of Minnesota, Engineering Experiment Station Bulletin* No. 28, June 1949).

[4] Radiation and Convection from Surfaces in Various Positions, by G. B. Wilkes and C. M. F. Peterson (A.S.H.V.E. TRANSACTIONS, Vol. 44, 1938, p. 513).

[5] Radiation Corrections for Basic Constants Used in the Design of All Types of Heating Systems, by B. F. Raber and F. W. Hutchinson (A.S.H.V.E. TRANSACTIONS, Vol. 51, 1945, p. 213).