Example 3: Find the coefficient of transmission U of a frame wall consisting of stucco, $^{25}/_{32}$-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. 20, with no insulation between studs has a value of $U = 0.19$. From Table 6, Col. 4, 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.

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.

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:

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

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.

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