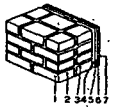
Table 6. . . . Coefficients of Transmission (U) of Solid Masonry Walls[a]

Coefficients are expressed in Btu per (hour) (square foot) (Fahrenheit degree difference in temperature between the air on the two sides), and are based on an outside wind velocity of 15 mph



Example—Wall G 2

Resistances used are given below in this table or in Table 5 or 4

Construction	Resistance (R)
1. Outside surface (15 mph wind)	0.17
2. Face brick (4 in.)	0.44
3. Common brick (4 in.)	0.80
4. Air space[b]	0.97
5. Gypsum lath (⅜ in.)	0.32
6. Plas. (sand agg.) (½ in.)	0.09
7. Inside surface (still air)	0.68
Total resistance	3.47
$U = 1/R = 1/3.47 =$	0.29

See value 0.29 in boldface type in table below.

Example of Substitution

Resistances used are given below in this table or in Table 5 or 4

Assume plain wall—no furring or plaster.	
Total resistance	3.47
Deduct 4. Air space	0.97
5. Gypsum lath (⅜ in.)	0.32
6. Plas. (sand agg.) (½ in.)	0.09 1.38
Total resistance	2.09
$U = 1/R = 1/2.09 =$	0.48

To Adjust U Values for Construction with Added Insulation between Furring Strips, See Table 16

Exterior Construction[c]	R	Interior Finish: None	Plas. ⅝ in. on Wall: (Sand agg.) 0.11	Plas. ⅝ in. on Wall: (Lt. wt. agg.) 0.39	Metal Lath and ¾ in. Plas. on Furring: (Sand agg.) 0.13	Metal Lath and ¾ in. Plas. on Furring: (Lt. wt. agg.) 0.47	Gypsum Lath (⅜ in.) and ½ in. Plas. on Furring: No plas. 0.32	Gypsum Lath (⅜ in.) and ½ in. Plas. on Furring: (Sand agg.) 0.41	Gypsum Lath (⅜ in.) and ½ in. Plas. on Furring: (Lt. wt. agg.) 0.64	Insul. Bd. Lath (½ in.) and ½ in. Plas. on Furring: No plas. 1.43	Insul. Bd. Lath (½ in.) and ½ in. Plas. on Furring: (Sand agg.) 1.52	Wood Lath and ½ in. Plas.: (Sand agg.) 0.40	Number
Resistance →		U	U	U	U	U	U	U	U	U	U	U	
Material		A	B	C	D	E	F	G	H	I	J	K	
Brick (face and common)[d]													
(6 in.)	0.81	0.68	0.64	0.54	0.39	0.34	0.36	0.35	0.33	0.26	0.25	0.35	1
(8 in.)	1.84	0.48	0.45	0.41	0.31	0.28	0.30	0.29	0.27	0.22	0.22	0.29	2
(12 in.)	2.04	0.35	0.33	0.30	0.25	0.23	0.24	0.23	0.22	0.19	0.19	0.23	3
(16 in.)	2.84	0.27	0.26	0.25	0.21	0.19	0.20	0.20	0.19	0.16	0.16	0.20	4
Brick (common only)													
(8 in.)	1.60	0.41	0.39	0.35	0.28	0.26	0.27	0.26	0.25	0.21	0.20	0.26	5
(12 in.)	2.40	0.31	0.30	0.27	0.23	0.21	0.22	0.22	0.21	0.18	0.17	0.22	6
(16 in.)	3.20	0.25	0.24	0.23	0.19	0.18	0.19	0.18	0.18	0.16	0.15	0.18	7
Stone (lime and sand)													
(8 in.)	0.64	0.67	0.63	0.53	0.39	0.34	0.36	0.35	0.32	0.26	0.25	0.35	8
(12 in.)	0.96	0.55	0.52	0.45	0.34	0.31	0.32	0.31	0.29	0.24	0.23	0.31	9
(16 in.)	1.28	0.47	0.45	0.40	0.31	0.28	0.29	0.28	0.27	0.22	0.22	0.29	10
(24) in.	1.92	0.36	0.35	0.32	0.26	0.24	0.25	0.24	0.23	0.19	0.19	0.24	11
Hollow clay tile													
(8 in.)	1.85	0.36	0.36	0.32	0.26	0.24	0.25	0.25	0.23	0.20	0.19	0.25	12
(10 in.)	2.22	0.33	0.31	0.29	0.24	0.22	0.23	0.22	0.21	0.18	0.18	0.23	13
(12 in.)	2.50	0.30	0.29	0.27	0.22	0.21	0.22	0.21	0.20	0.17	0.17	0.21	14
Poured concrete													
30 lb per cu ft													
(4 in.)	4.44	0.19	0.19	0.18	0.16	0.15	0.15	0.15	0.14	0.13	0.13	0.15	15
(6 in.)	6.66	0.13	0.13	0.13	0.12	0.11	0.11	0.11	0.11	0.10	0.10	0.11	16
(8 in.)	8.88	0.10	0.10	0.10	0.09	0.09	0.09	0.09	0.09	0.08	0.08	0.09	17
(10 in.)	11.10	0.08	0.08	0.08	0.08	0.07	0.08	0.08	0.07	0.07	0.07	0.08	18
80 lb per cu ft													
(6 in.)	2.40	0.31	0.30	0.27	0.23	0.21	0.22	0.22	0.21	0.18	0.17	0.22	19
(8 in.)	3.20	0.25	0.24	0.23	0.19	0.18	0.19	0.18	0.18	0.16	0.15	0.18	20
(10 in.)	4.00	0.21	0.20	0.19	0.17	0.16	0.16	0.16	0.15	0.14	0.14	0.16	21
(12 in.)	4.80	0.18	0.17	0.17	0.15	0.14	0.14	0.14	0.14	0.12	0.12	0.14	22
140 lb per cu ft													
(6 in.)	0.48	0.75	0.69	0.58	0.41	0.36	0.38	0.37	0.34	0.27	0.26	0.37	23
(8 in.)	0.64	0.67	0.63	0.53	0.39	0.34	0.36	0.35	0.32	0.26	0.25	0.35	24
(10 in.)	0.80	0.61	0.57	0.49	0.36	0.32	0.34	0.33	0.31	0.25	0.24	0.33	25
(12 in.)	0.96	0.55	0.52	0.45	0.34	0.31	0.32	0.31	0.29	0.24	0.23	0.31	26

Table 6. . . . Coefficients of Transmission (U) of Solid Masonry Walls (Concluded)

Exterior Construction[c]	R	Interior Finish: None	Plas. ⅝ in. on Wall: (Sand agg.)	Plas. ⅝ in. on Wall: (Lt. wt. agg.)	Metal Lath and ¾ in. Plas. on Furring: (Sand agg.)	Metal Lath and ¾ in. Plas. on Furring: (Lt. wt. agg.)	Gypsum Lath (⅜ in.) and ½ in. Plas. on Furring: No plas.	Gypsum Lath (⅜ in.) and ½ in. Plas. on Furring: (Sand agg.)	Gypsum Lath (⅜ in.) and ½ in. Plas. on Furring: (Lt. wt. agg.)	Insul. Bd. Lath (½ in.) and ½ in. Plas. on Furring: No plas.	Insul. Bd. Lath (½ in.) and ½ in. Plas. on Furring: (Sand agg.)	Wood Lath and ½ in. Plas.: (Sand agg.)	Number
Resistance →			0.11	0.39	0.13	0.47	0.32	0.41	0.64	1.43	1.52	0.40	
Material		U A	U B	U C	U D	U E	U F	U G	U H	U I	U J	U K	
Concrete block													
(Gravel agg.) (8 in.)	1.11	0.52	0.48	0.43	0.33	0.29	0.31	0.30	0.28	0.23	0.22	0.30	27
(12 in.)	1.28	0.47	0.45	0.40	0.31	0.28	0.29	0.28	0.27	0.22	0.22	0.29	28
(Cinder agg.) (8 in.)	1.72	0.39	0.37	0.34	0.27	0.25	0.26	0.25	0.24	0.20	0.20	0.25	29
(12 in.)	1.89	0.36	0.35	0.32	0.26	0.24	0.25	0.24	0.23	0.19	0.19	0.24	30
(Lt. wt. agg.) (8 in.)	2.00	0.35	0.34	0.31	0.26	0.23	0.24	0.24	0.22	0.19	0.19	0.24	31
(12 in.)	2.27	0.32	0.31	0.28	0.24	0.22	0.23	0.22	0.21	0.18	0.18	0.22	32

[a] See text section Calculating Overall Coefficients for basis of calculations.
[b] To adjust U values for the effect of added insulation between framing members, see Table 16.
[c] To adjust U values for the effect of added insulation between framing members, see Table 16.
[c] If stucco or structural glass is applied to the exterior, the additional resistance value of 0.10 would have a negligible effect on the U value.
[c] If stucco or structural glass is applied to the exterior, the additional resistance value of 0.10 would have a negligible effect on the U value.
[d] Brick, 6 in. (5½ in. actual) is assumed to have no backing. Walls 8, 12 and 16 in. have 4 in. of face brick and balance of common brick.

(*Continued from p. 428*)

studs and in contact with the gypsum lath, and when (b) aluminum-foil-backed gypsum lath is added.

Solution: According to Table 5, the U value for this construction with no insulation in the air space is 0.24. Referring to Table 16, Part A, for walls, it is found that, corresponding to the value 0.24 in Column 1, the coefficient for conditions (*a*) and (*b*) are:

(*a*) In Column 4, find $U_i = 0.087$. Use 0.09.
(*b*) From Table 2, Section B, the effective emissivity E of aluminum foil is 0.05.
In Column 8, find $U_i = 0.173$. Use 0.17.

Example 4: Consider the floor-ceiling construction shown in the example at the top of Table 11, insulated with a sheet of aluminum foil, or paper faced on both sides with foil (effective emissivity E of air space = 0.05), placed between the joists and dividing the air space into two equal spaces. From Table 11, the U value for the uninsulated construction is 0.18 for heat flow down for summer, and 0.22 for heat flow up for winter. Determine the coefficient U_i for:

(*a*) Heat flowing downward from uncooled room above to cooled space below (a summer condition) and,
(*b*) Heat flowing upward from heated room below to unheated space above (a winter condition).

Solution:

(*a*) Use Table 16, Part D, and, corresponding to $U = 0.18$ in Column 1, find, in Column 11, $U_i = 0.049$. Use 0.05.
(*b*) Use Table 16, Part C, and corresponding to $U = 0.22$ in Column 1, find, in Column 11, $U_i = 0.12$.

Special Uses of Table 16

Values of U_i for insulating applications or combinations other than those indicated by the headings of Columns 2 to 14 of Table 16 can be ascertained if the table is used correctly. For instance, reading horizontally in the table from Column 2 to Column 3 is equivalent to adding ½ in. of fibrous insulation to the construction. Similarly, reading from Column 2 to Column 4 adds 1½ in. of fibrous insulation to the construction. In the same way, reading horizontally from Column 8 to Column 11 is equivalent to adding the insulating value of one additional highly reflective ($E = 0.05$) air space to a construction, and reading from Column 6 to Column 12 in effect adds two non-reflective ($E = 0.82$) air spaces to the construction, etc.

Example 5: Determine the coefficient U_i for the wall of *Example 3*, with 1½ in. of fibrous insulation added on one side of the air space.

Solution: U_i can be determined in several ways, by using Table 16, Part A, for example;

(*a*) By going from Column 1 to Column 2 three times, for a total of 1½ inches of insulation, as follows: enter Column 1 at 0.24 and find $U_i = 0.166$ in Column 2; enter Column 1 at 0.166 and find $U_i = 0.126$ in Column 2; enter Column 1 at 0.126 and find $U_i = 0.102$ in Column 2. Therefore, for a total of 1½ in. of insulation, use 0.10.
(*b*) More simply, by going from 0.24 in Column 2 to 0.103 in Column 4. Use 0.10.

Example 6: Again considering the wall of *Example 3*, assume that one-inch blanket insulation is to be installed in mid-space, leaving equal air spaces on the two sides. The coefficient U_i is desired for two cases in which:

(*a*) the blanket has non-reflective surfaces on both sides, so that both air spaces are non-reflective ($E = 0.82$) and,
(*b*) the blanket has one highly reflective surface, so that one of the air spaces is highly reflective ($E = 0.05$).

Solution:

(*a*) In Table 16, Part A, when U without added insulation is 0.24, U_i for one inch of fibrous insulation and one non-reflective air space, is 0.127 in Column 3. To add the second non-reflective air space, enter Column 6 at 0.127 and, by interpolating, find $U_i = 0.112$ in Column 9. Use 0.11.
(*b*) U_i for one inch of fibrous insulation and one non-reflective air space is 0.127 as in (*a*). To add one $E = 0.05$ air space, enter Column 8 at 0.127 and, by interpolating, find $U_i = 0.092$ in Column 11. Use 0.09.

CORRECTION FOR FRAMING

Correction for parallel heat flow through framing and insulated areas may be made by using Fig. 4. Correction for the effect of framing should be applied after final U_i and U_s values have been obtained for a given construction. In many cases this correction may be omitted.

Example 7: Consider a frame wall with 2-in. blanket insulation which has a U_i value of 0.08. By calculation it is found that heat loss from the area backed by framing members (U_s) is 0.13. U_s/U_i is 1.63. From Fig. 4, if 15 percent of wall area is backed by framing, the value $U_{(av)}/U_i = 1.1$. $U_{(av)}$ is therefore $1.1 \times 0.08 = 0.088$.

(*Continued on p. 434*)