Table 3 .... Surface Conductances and Resistances for Still Air

All conductance values expressed in Btu per (hr) (sq ft) (F deg temp diff)

SECTION A. Surface Conductances for Still Air[a, b]

Position of Surface	Direction of Heat Flow	Surface Emissivity: Non-reflective ϵ = 0.90 C	Non-reflective ϵ = 0.90 R	Reflective ϵ = 0.20 C	Reflective ϵ = 0.20 R	Reflective ϵ = 0.05 C	Reflective ϵ = 0.05 R
Horizontal	Upward	1.63	0.61	0.91	1.10	0.76	1.32
Sloping—45 deg	Upward	1.60	0.62	0.88	1.14	0.73	1.37
Vertical	Horizontal	1.46	0.68	0.74	1.35	0.59	1.70
Sloping—45 deg	Downward	1.32	0.76	0.60	1.67	0.45	2.22
Horizontal	Downward	1.08	0.92	0.37	2.70	0.22	4.55

SECTION B. Reflectivity and Emissivity Values of Various Surfaces[c] and Effective Emissivities of Air Spaces

Surface	Reflectivity in percent	Average Emissivity ϵ	Effective Emissivity E of Air Space: With one surface having emissivity ϵ and other 0.90	Effective Emissivity E of Air Space: With both surfaces of emissivity ϵ
Aluminum foil, bright	92 to 97	0.05	0.05	0.03
Aluminum sheet	80 to 95	0.12	0.12	0.06
Aluminum coated paper, polished	75 to 84	0.20	0.20	0.11
Steel, galvanized, bright	70 to 80	0.25	0.24	0.15
Aluminum paint	30 to 70	0.50	0.47	0.35
Building materials: wood, paper, glass, masonry, nonmetallic paints	5 to 15	0.90	0.82	0.82

[a] For ventilated attics or spaces above ceilings under summer conditions (heat flow down) see Table 17.

[b] Conductances are for surfaces of the stated emissivity facing surroundings having an emissivity equal to 0.9 and at the same temperature as the ambient air. Values are based on a surface-air temperature difference of 10 deg and for surface temperature of 70 F. (See Table 4 for surface conductances for moving air.)

[c] See also Chapter 5, Table 3.

SECTION C. Thermal Conductances and Resistances of a Plane[d, e] Air Space[e]

Position of Air Space	Heat Flow	Air Space: Thickness,[e] inches	Mean temp,[f] F	Temp diff[f] deg	Thermal Conductance-C Value of E[f, g]: 0.05	0.2	0.5	0.82	Thermal Resistance-R Value of E[g]: 0.05	0.2	0.5	0.82
Horiz.	Up	¾ to 4	50	10	0.41	0.55	0.82	1.11	2.44	1.83	1.22	0.90
			50	30	0.54	0.68	0.95	1.24	1.84	1.47	1.05	0.80
			90	10	0.41	0.58	0.92	1.28	2.47	1.73	1.09	0.78
45° Slope	Up	¾ to 4	50	10	0.35	0.49	0.76	1.05	2.84	2.05	1.31	0.95
			50	30	0.48	0.62	0.89	1.18	2.08	1.62	1.13	0.85
			90	10	0.35	0.52	0.86	1.23	2.85	1.92	1.16	0.81
Vert.	Horiz.	¾ to 4	50	10	0.28	0.42	0.69	0.99	3.52	2.37	1.44	1.02
			50	30	0.38	0.52	0.79	1.03	2.64	1.94	1.27	0.92
			90	10	0.29	0.46	0.80	1.16	3.49	2.19	1.25	0.86
45° Slope	Down	¾ to 4	50	10	0.24	0.38	0.65	0.94	4.14	2.65	1.54	1.06
			50	30	0.30	0.43	0.71	1.00	3.36	2.30	1.41	1.00
			90	10	0.25	0.42	0.76	1.12	4.07	2.40	1.32	0.89
Horiz.	Down[h]	¾	50	20	0.28	0.42	0.69	0.98	3.57	2.38	1.45	1.02
		1½	50	20	0.18	0.31	0.58	0.87	5.56	3.23	1.73	1.15
		4	50	20	0.11	0.25	0.52	0.81	8.94	4.03	1.92	1.23
		¾	90	20	0.31	0.48	0.82	1.18	3.23	2.08	1.22	0.85
		1½	90	20	0.20	0.37	0.71	1.07	5.00	2.70	1.41	0.93
		4	90	20	0.13	0.30	0.64	1.01	7.82	3.35	1.56	0.99

Notes:

[d] Spaces of uniform thickness, bounded by moderately smooth surfaces.

[e] Where a range of thickness is given, the given conductance is the average over the range; extreme values within the range differ therefrom by less than 10 percent.

[f] Interpolation, and moderate extrapolation, of conductance values are permissible for other values of mean temperature, temperature difference and effective emissivity E.

[g] Effective emissivity of space, E, is given by $\frac{1}{E} = \frac{1}{\epsilon_1} + \frac{1}{\epsilon_2} - 1$ where ϵ_1 and ϵ_2 are the emissivities of the surfaces of the air space. (See Section B, above.)

[h] The conductances of horizontal spaces with heat flow downward are substantially independent of temperature difference.

[i] Based on National Bureau of Standards data presented in *Housing Research Paper No. 32*, Housing and Home Finance Agency, 1954 (U. S. Government Printing Office, Washington, D. C.).

Table 4 .... Conductivities (k), Conductances (C), and Resistances (R) of Building and Insulating Materials (Design Values)[a]

These constants are expressed in Btu per (hour) (square foot) (Fahrenheit degree temperature difference). Conductivities (k) are per inch thickness and, conductances (C) are for thickness or construction stated, not per inch thickness

Material	Description	Density (lb per Cu Ft)	Conductivity or Conductance (k)	Conductivity or Conductance (C)	Resistance[b] (R): Per inch thickness $\left(\frac{1}{k}\right)$	Resistance[b] (R): For thickness listed $\left(\frac{1}{C}\right)$
AIR SPACES[b]	See Table 3—Section B					
	Position / Heat Flow / Thickness					
	Horizontal / Up (winter) / ¾–4 in.	—	—	1.18	—	0.85
	Horizontal / Up (summer) / ¾–4 in.	—	—	1.28	—	0.78
	Horizontal / Down (winter) / ¾ in.	—	—	0.98	—	1.02
	Horizontal / Down (winter) / 1½ in.	—	—	0.87	—	1.15
	Horizontal / Down (winter) / 4 in.	—	—	0.81	—	1.23
	Horizontal / Down (winter) / 8 in.	—	—	0.80	—	1.25
	Horizontal / Down (summer) / ¾ in.	—	—	1.18	—	0.85
	Horizontal / Down (summer) / 1½ in.	—	—	1.07	—	0.93
	Horizontal / Down (summer) / 4 in.	—	—	1.01	—	0.99
	Sloping, 45° / Up (winter) / ¾–4 in.	—	—	1.11	—	0.90
	Sloping, 45° / Down (summer) / ¾–4 in.	—	—	1.12	—	0.89
	Vertical / Horiz. (winter) / ¾–4 in.	—	—	1.03	—	0.97
	Vertical / Horiz. (summer) / ¾–4 in.	—	—	1.16	—	0.86
AIR SURFACES[c]	See Table 3—Section A					
Still Air	Position / Heat Flow					
	Horizontal / Up	—	—	1.63	—	0.61
	Up Sloping (45°) / Up	—	—	1.60	—	0.62
	Vertical / Horizontal	—	—	1.46	—	0.68
	Sloping (45°) / Down	—	—	1.32	—	0.76
	Horizontal / Down	—	—	1.08	—	0.92
15 mph Wind	Any position—any direction (for winter)	—	—	6.00	—	0.17
7½ mph Wind	Any position—any direction (for summer)	—	—	4.00	—	0.25
BUILDING BOARD[d] Boards, Panels, Sheathing, Etc.	Asbestos-cement board	120	4.0	—	0.25	—
	Asbestos-cement board / ⅛ in.			33.		0.03
	Gypsum or plaster board / ⅜ in.	50	—	3.10	—	0.32
	Gypsum or plaster board / ½ in.	50	—	2.25	—	0.45
	Plywood	34	0.80	—	1.25	—
	Plywood / ½ in.	34	—	3.20	—	0.31
	Plywood / ⅝ in.	34	—	2.12	—	0.47
	Plywood / ¾ in.	34	—	1.60	—	0.63
	Plywood or wood panels / ¾ in.	—	—	1.07	—	0.94
	Wood fiber board, laminated or homogeneous	26	0.42	—	2.38	—
		31	0.50	—	2.00	—
		65	1.40	—	0.72	—
	Wood fiber—hardboard type	65	—	5.60	—	0.18
	Wood fiber—hardboard type / $\frac{25}{32}$ in.	—	—	1.02	—	0.98
	Wood—fir or pine sheathing / 1⅛ in.	—	—	0.49	—	2.03
BUILDING PAPER	Vapor—permeable felt	—	—	16.70	—	0.06
	Vapor—seal, 2 layers of mopped 15 lb felt	—	—	8.35	—	0.12
	Vapor—seal, plastic film	—	—	—	—	Negl
FLOORING MATERIALS	Asphalt tile / ⅛ in.	120	—	24.80	—	0.04
	Carpet and fibrous pad	—	—	0.48	—	2.08
	Carpet and rubber pad	—	—	0.81	—	1.23
	Ceramic tile / 1 in.	—	—	12.50	—	0.08
	Cork tile	25	0.45	—	2.22	—
	Cork tile / ⅛ in.	—	—	3.60	—	0.28
	Felt, flooring	—	—	16.70	—	0.06
	Floor tile or linoleum—av. value / ⅛ in.	—	—	20.00	—	0.05
	Linoleum / ⅛ in.	80	—	12.00	—	0.08
	Plywood subfloor / ⅜ in.	—	—	1.28	—	0.78
	Rubber or plastic tile / ⅛ in.	110	—	42.40	—	0.02
	Terrazzo / 1 in.	—	—	12.50	—	0.08
	Wood subfloor / $\frac{25}{32}$ in.	—	—	1.02	—	0.98
	Wood, hardwood finish / ¾ in.	—	—	1.47	—	0.68
INSULATING MATERIALS Blanket and Batt	Cotton fiber[e]	0.8–2.0	0.26	—	3.85	—
	Mineral wool, fibrous form, processed from rock, slag, or glass[e]	1.5–4.0	0.27	—	3.70	—
	Wood fiber[e]	3.2–3.5	0.25	—	4.00	—
	Wood fiber, multilayer, stitched expanding[e]	1.5–2.0	0.27	—	3.70	—