

TABLE 1. CONDUCTANCES (C) FOR SURFACES AND AIR SPACES
All conductance values expressed in Btu per (hr) (sq ft) (F deg temp diff)
Section A. Surface Conductances for Still Air^a

POSITION OF SURFACE	DIRECTION OF HEAT FLOW	SURFACE EMISSIVITY	
		$\epsilon = 0.90$	$\epsilon = 0.05$
Horizontal	Upward	1.95	1.16
Horizontal	Downward	1.21	0.44
Vertical	Horizontal	1.52 ^b	0.74

^a 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.) 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.

^b The recommended surface conductance for calculating heat losses for still air for non-reflective surfaces is 1.65 Btu. For a 15 mph wind velocity, the recommended value is 6.0 Btu. These coefficients were derived from Fig. 4, based on tests conducted at the University of Minnesota, and apply to vertical surfaces.

Section B. Thermal Conductances and Resistances of a Plane^a Air Space^b

POSITION OF AIR SPACE	HEAT FLOW	THICKNESS ^b Inches	MEAN TEMP ^c F	TEMP DIFF ^c deg	THERMAL CONDUCTANCE-C				THERMAL RESISTANCE-R			
					Value of E_c^d				Value of E^d			
					0.05	0.2	0.5	0.82	0.05	0.2	0.5	0.82
Horiz.	Up	3/4 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	3/4 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.	3/4 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	1.08	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	3/4 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	3.38	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 ^f	3/4	50	20	0.28	0.42	0.69	0.98	3.57	2.38	1.45	1.02
		1 1/2	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
		3/4	90	20	0.31	0.48	0.82	1.18	3.23	2.08	1.22	0.85
		1 1/2	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
		3/4	50	20	0.28	0.42	0.69	0.98	3.57	2.38	1.45	1.02
		1 1/2	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

Notes: ^a Spaces of uniform thickness, bounded by moderately smooth surfaces.

^b 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.

^c Interpolation, and moderate extrapolation, of conductance values is permissible for other values of mean temperature, temperature difference and effective emissivity E .

^d 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 C, Table 1).

^f The conductances of horizontal spaces with heat flow downward are substantially independent of temperature difference.

^a 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.)

Section C. Reflectivity and Emissivity Values of Various Surfaces 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	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, non-metallic paints	5 to 15	0.90	0.82	0.82

TABLE 2. CONDUCTIVITIES (k) AND CONDUCTANCES (C) 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		RESISTANCE	
			(k)	(C)	Per Inch Thickness ($\frac{1}{k}$)	For Thickness Listed ($\frac{1}{C}$)
BUILDING BOARD ^b	Plywood	34	0.80	—	1.25	—
	Laminated or homogeneous wood fiber board	26	0.42	—	2.38	—
		31	0.50	—	2.00	—
	Wood fiber—hardboard type	65	1.40	—	0.72	—
	Gypsum or plaster board	50	—	3.10	—	0.32
SIDING MATERIALS (ON FLAT SURFACE INCLUDING BUILDING PAPER) ^c	Asbestos-cement board	50	—	2.25	—	0.45
		120	4.0	—	0.25	—
	Shingles	—	—	—	—	—
	Wood, 16-in. 7/16-in. exposure	—	—	1.10	—	0.93
	Wood, double, 16-in., 12-in. exposure	—	—	0.80	—	1.25
MASONRY MATERIALS CONCRETES	Asbestos-cement	—	—	2.85	—	0.35
	Siding	—	—	—	—	—
	Drop, 1 x 8 in.	—	—	1.18	—	0.85
	Bevel, 3/4 x 8 in., lapped	—	—	1.15	—	0.87
	Bevel, 3/4 x 10 in., lapped	—	—	0.90	—	1.11
MASONRY MATERIALS CONCRETES	Plywood, 3/4 in., lapped	—	—	1.54	—	0.65
	Asbestos-cement, 3/4 in., lapped	—	—	3.70	—	0.27
	Sand and gravel or stone aggregate	140	9.0	—	0.11	—
	Cement mortar and stucco	116	5.0	—	0.20	—
	Lightweight aggregates including expanded shale, clay or slate; expanded slags; cinders; pumice; perlite; vermiculite; also cellular concretes	120	5.2	—	0.19	—
MASONRY MATERIALS CONCRETES		100	3.6	—	0.28	—
		80	2.5	—	0.40	—
		60	1.7	—	0.59	—
		40	1.15	—	0.86	—
		20	0.60	—	1.11	—
MASONRY MATERIALS CONCRETES	Gypsum-fiber concrete: 87 1/2% gypsum, 12 1/2% wood chips	30	0.70	—	1.43	—
		51	1.66	—	0.60	—
	Common brick	120	5.0	—	0.20	—
	Face brick	130	9.0	—	0.11	—
	Three-oval core concrete blocks:	—	—	—	—	—
MASONRY MATERIALS CONCRETES	Sand & gravel aggregate	4 in.	—	1.40	—	0.71
	Sand & gravel aggregate	8 in.	—	0.90	—	1.11
	Sand & gravel aggregate	12 in.	—	0.78	—	1.28
	Cinder aggregate	4 in.	—	0.90	—	1.11
	Cinder aggregate	8 in.	—	0.58	—	1.72
MASONRY MATERIALS CONCRETES	Cinder aggregate	12 in.	—	0.53	—	1.89
	Lightweight aggregate (expanded shale, clay, slate or slag; pumice)	4 in.	—	0.67	—	1.50
		8 in.	—	0.50	—	2.00
		12 in.	—	0.44	—	2.27
	Hollow clay tile	3 in.	—	1.25	—	0.80
MASONRY MATERIALS CONCRETES	Hollow clay tile	4 in.	—	0.90	—	1.11
	Hollow clay tile	6 in.	—	0.66	—	1.52
	Hollow clay tile	8 in.	—	0.54	—	1.85
	Hollow clay tile	10 in.	—	0.45	—	2.22
	Hollow clay tile	12 in.	—	0.40	—	2.50
MASONRY MATERIALS CONCRETES	Gypsum partition tile:	—	—	—	—	—
	3 x 12 x 30 in. solid	—	—	0.79	—	1.26
	3 x 12 x 30 in. 4-cell	—	—	0.74	—	1.35
	4 x 12 x 30 in. 3-cell	—	—	0.60	—	1.67
	Gypsum plaster	105	5.6	—	0.18	—
PLASTERING MATERIALS	Sand aggregate	45	1.7	—	0.59	—
	Vermiculite aggregate	45	1.5	—	0.67	—
	Perlite aggregate	45	1.5	—	0.67	—
	Cement plaster, sand aggregate	116	5.0	—	0.20	—