The radiation under black-body conditions, or for an emissivity of 1.0, is given in Table 1 for cold surfaces as low as − 39 F to warmer surfaces as high as 139 F. The emissivities of a number of surfaces ordinarily encountered in engineering practice are shown in Table 2[1].

For horizontal cylinders, the value of $C = 1.016$ has been well established by various investigations. For vertical plates, the value of $C =$

TABLE 1. HEAT TRANSMISSION BY RADIATION FOR BLACK-BODY CONDITIONS[a]

Expressed in Btu per square foot per hour

TEMP. DEG F	0	−1	−2	−3	−4	−5	−6	−7	−8	−9
−30	59.3	58.7	58.2	57.7	57.2	56.7	56.2	55.7	55.2	54.7
−20	65.2	64.7	64.1	63.5	62.9	62.3	61.7	61.1	60.5	59.9
−10	71.4	70.8	70.1	69.5	68.9	68.3	67.7	67.1	66.4	65.8
0	78.0	77.4	76.7	76.0	75.4	74.7	74.0	73.4	72.7	72.1
	0	+1	+2	+3	+4	+5	+6	+7	+8	+9
0	78.0	78.7	79.4	80.1	80.8	81.5	82.2	82.9	83.6	84.3
10	85.0	85.7	86.5	97.2	88.0	88.7	89.4	90.2	90.9	91.7
20	92.4	93.3	94.0	94.8	95.6	96.4	97.2	98.0	98.8	99.6
30	100	101	102	103	104	105	105	106	107	108
40	109	110	111	112	112	113	114	115	116	117
50	118	119	120	121	122	123	123	124	125	126
60	127	128	129	130	131	132	133	134	135	136
70	137	138	139	140	142	143	144	145	146	147
80	148	149	150	151	152	153	154	155	156	157
90	159	160	161	162	163	164	166	167	168	169
100	170	171	173	174	175	176	178	179	180	182
110	183	184	185	187	188	189	191	192	193	195
120	196	197	199	200	201	203	204	206	207	209
130	211	212	214	215	217	218	220	221	222	224

[a]*Example:* Radiation from walls of room at 32 F to surface at − 25 F for effective emissivity of 0.95 = (102 − 62.3) 0.95 = 37.7 Btu per square foot per hour.

TABLE 2. EMISSIVITY VALUES FOR VARIOUS SURFACES

SURFACE	TEMPERATURE, DEG F			
	100	200	300	400
Bright galvanized iron	0.14	0.15	0.16	0.17
Badly tarnished galvanized iron	0.53	0.53	0.53	0.53
Very bright copper	0.07	0.07	0.07	0.11
Tarnished copper	0.43	0.44	0.46	0.48
Aluminum foil	0.06	0.06	0.07	.....
Aluminum paint	0.28	0.28	0.28	.....
Asbestos lumber (smooth side)	0.79	0.79	0.79	0.79
Hardwood (sanded)	0.90	0.90	.....	.....
Black Feltex paper	0.87	0.89	.....	.....
Mica-surfaced asphalt roofing	0.76	0.76	.....	.....
Window glass	0.88	0.89	0.90	0.90
White canvas	0.88	0.88	0.89	.....

[1]Heat Insulation in Air Conditioning, by R. H. Heilman (*Industrial and Engineering Chemistry*, Vol. 28, July 1936, p. 782).

1.394 has been fairly well established. A value of $C = 1.79$ for horizontal plates warmer than the surrounding air facing upward and 0.89 for horizontal plates warmer than air facing downward is indicated by recent investigations[2].

The heat transmission by free convection from vertical walls 24 in. or more in height is given in Table 3 as calculated from Equation 2 for ambient air temperature of 80 F. The values in Table 3 will not be changed appreciably by a considerable change in air temperature for a given temperature excess. For instance, a change in air temperature from 80 to 40 F will increase the heat transmission given in Table 3 by only 1.3 per cent.

TABLE 3. HEAT TRANSMISSION BY FREE CONVECTION FOR LARGE VERTICAL SURFACES

Expressed in Btu per square foot per hour

TEMP. DEG F	TEMPERATURE DIFFERENCE BETWEEN BODY AND SURROUNDING STILL AIR AT 80 F													
	0	10	20	30	40	50	60	70	80	90	100	110	120	130
0	0	4.4	10.4	17.4	25.0	33.2	41.8	50.6	59.9	69.4	79.4	89.2	99.4	109.8
1	0.3	4.9	11.1	18.1	25.8	34.1	42.6	51.5	60.8	70.3	80.4	90.2	100.4	110.9
2	0.6	5.5	11.8	18.9	26.7	34.9	43.5	52.4	61.8	71.3	81.4	91.2	101.5	112.0
3	1.0	6.0	12.5	19.7	27.5	35.7	44.3	53.4	62.7	72.3	82.4	92.2	102.6	113.0
4	1.4	6.6	13.2	20.5	28.3	36.6	45.2	54.3	63.7	73.3	83.3	93.3	103.6	114.1
5	1.8	7.3	13.9	21.2	29.2	37.4	46.1	55.2	64.6	74.3	84.2	94.3	104.7	115.2
6	2.3	7.9	14.6	22.0	30.0	38.3	47.0	56.1	65.6	75.3	85.2	95.3	105.7	116.3
7	2.8	8.5	15.3	22.7	30.8	39.1	47.8	57.1	66.5	76.3	86.2	96.3	106.7	117.3
8	3.3	9.1	16.0	23.5	31.6	40.0	48.7	58.0	67.5	77.4	87.2	97.4	107.8	118.4
9	3.8	9.7	16.7	24.3	32.4	40.9	49.7	59.0	68.4	78.4	88.2	98.4	108.8	119.5

TABLE 4. FREE CONVECTION FACTORS FOR VARIOUS SHAPES

SHAPES	FACTOR
Horizontal cylinders 24 in. in diam. or over	0.73
Long vertical cylinders 24 in. in diam. or over	0.88
Vertical plates 24 in. in height or over	1.00
Horizontal plates warmer than air facing upward	1.28
Horizontal plates warmer than air facing downward	0.64
Horizontal plates cooler than air facing upward	0.64
Horizontal plates cooler than air facing downward	1.28

TABLE 5. FREE CONVECTION FACTORS FOR VARIOUS DIAMETER PIPES OR VARIOUS HEIGHT PLATES

Actual o. d., or height, in	1	2	3	4	5	6	7	8
Factor	1.88	1.64	1.52	1.43	1.37	1.32	1.28	1.25
Actual o. d. or height, in	9	10	12	14	16	18	20	22
Factor	1.22	1.19	1.15	1.11	1.09	1.06	1.04	1.02

[2]The Transmission of Heat by Radiation and Convection, by Griffith and Davis (*Special Report* No. 9, 1922, *Department of Scientific and Industrial Research*, His Majesty's Stationery Office, London, England).