TABLE 13. PROPERTIES OF DRY AIR[a]

Barometric Pressure 29.921 In.

TEMPERATURE, DEG. FAHR.	WEIGHT PER CUBIC FOOT, POUND	RATIO OF VOLUME TO VOLUME AT 70 DEG. FAHR.	B.T.U. ABSORBED BY 1 CU. FT. DRY AIR PER DEG. FAHR.	CUBIC FEET DRY AIR WARMED 1 DEG. PER B.T.U.
−50	0.09690	0.7735	0.02335	42.82
−45	0.09573	0.7829	0.02307	43.34
−40	0.09459	0.7924	0.02280	43.87
−35	0.09348	0.8018	0.02253	44.39
−30	0.09239	0.8112	0.02226	44.91
−25	0.09133	0.8206	0.02201	45.43
−20	0.09029	0.8301	0.02176	45.96
−15	0.08927	0.8396	0.02151	46.48
−10	0.08828	0.8490	0.02127	47.00
− 5	0.08731	0.8585	0.02104	47.52
0	0.08636	0.8680	0.02080	48.08
5	0.08544	0.8772	0.02060	48.55
10	0.08453	0.8867	0.02039	49.05
15	0.08363	0.8962	0.02018	49.56
20	0.08276	0.9057	0.01998	50.05
25	0.08190	0.9152	0.01977	50.58
30	0.08107	0.9246	0.01957	51.10
35	0.08025	0.9340	0.01938	51.60
40	0.07945	0.9434	0.01919	52.11
45	0.07866	0.9530	0.01900	52.64
50	0.07788	0.9624	0.01881	53.17
55	0.07713	0.9718	0.01863	53.68
60	0.07640	0.9811	0.01846	54.18
65	0.07567	0.9905	0.01829	54.68
70	0.07495	1.0000	0.01812	55.19
75	0.07424	1.0095	0.01795	55.72
80	0.07356	1.0190	0.01779	56.21
85	0.07289	1.0283	0.01763	56.72
90	0.07222	1.0380	0.01747	57.25
95	0.07157	1.0472	0.01732	57.74
100	0.07093	1.0570	0.01716	58.28
105	0.07030	1.0660	0.01702	58.76
110	0.06968	1.0756	0.01687	59.28
115	0.06908	1.0850	0.01673	59.78
120	0.06848	1.0945	0.01659	60.28
125	0.06790	1.1040	0.01645	60.79
130	0.06732	1.1133	0.01631	61.32
135	0.06675	1.1230	0.01618	61.81
140	0.06620	1.1320	0.01605	62.31
145	0.06565	1.1417	0.01592	62.82
150	0.06510	1.1512	0.01578	63.37
160	0.06406	1.1700	0.01554	64.35
170	0.06304	1.1890	0.01530	65.36
180	0.06205	1.2080	0.01506	66.40
190	0.06110	1.2270	0.01484	67.40
200	0.06018	1.2455	0.01462	68.41
220	0.05840	1.2833	0.01419	70.48
240	0.05673	1.3212	0.01380	72.46
260	0.05516	1.3590	0.01343	74.46
280	0.05367	1.3967	0.01308	76.46
300	0.05225	1.4345	0.01274	78.50
350	0.04903	1.5288	0.01197	83.55
400	0.04618	1.6230	0.01130	88.50
450	0.04364	1.7177	0.01070	93.46
500	0.04138	1.8113	0.01018	98.24
550	0.03932	1.9060	0.00967	103.42
600	0.03746	2.0010	0.00923	108.35
700	0.03423	2.1900	0.00847	118.07
800	0.03151	2.3785	0.00782	127.88
900	0.02920	2.5670	0.00728	137.37
1000	0.02720	2.7560	0.00680	147.07
1200	0.02392	3.1335	0.00603	165.83

[a]From *Mechanical Equipment of Buildings*, Vol. 1, by Harding and Willard, second edition, 1929.

Chapter 3

HEAT LOSSES BY TRANSMISSION

Transmission Coefficients by Test; Transmission Coefficients by Computation; Areas Where Transmission Losses Occur; Calculations for Transmission Losses; Economic Value of Insulation.

THE heat losses of a building are of two kinds: (1) the transmission losses through the walls, floors, roof, ceiling and windows, and (2) the infiltration losses through the cracks, crevices, etc., around doors and windows and through solid materials. Infiltration losses are treated in Chapter 4.

The transmission losses are computed by taking into account the heat transmission coefficients (See par. 5, p. 81) of the walls, roofs, etc., of the building. These coefficients may be determined experimentally by test, or they may be computed with sufficient accuracy when certain physical constants are known.

TRANSMISSION COEFFICIENTS BY TEST

Hot-Box Method: The standard method of testing built-up wall sections is by means of the guarded hot-box[1], which consists of an insulated outer box about 5 ft. x 5 ft. x 5 ft., and an inner box about 3 ft. x 3 ft. x 3 ft., also insulated. The wall specimen is clamped to the open side of the outer box and in this position must come in firm contact with the edges of the open side of the inner box. The air in the inner box is heated by means of a resistance coil wound on a cubical frame, and the temperatures in the two boxes controlled thermostatically to maintain the same temperature in each. Fans are installed to maintain uniform temperatures in these two spaces with a minimum circulation of air.

The heat transferred through the wall specimen is readily estimated from the heat input of the inner box, and the air-to-air coefficient of the specimen for still-air conditions determined by dividing this heat-loss by the area of the specimen through which the heat passes, the temperature difference of the air on the two sides of the specimen and the number of hours of the test.

Nicholls Heat Meter: The Research Laboratory of the AMERICAN SOCIETY OF HEATING AND VENTILATING ENGINEERS has developed an apparatus known as the Nicholls heat meter for the determination of the heat transmission coefficient of any type of construction under natural weather conditions.[2] The Nicholls heat meter consists essentially of a

[1]See *Standard Code for Heat Transmission through Walls* (A.S.H.V.E. TRANSACTIONS, Vol. 34, 1928).

[2]See *Measuring Heat Transmission in Building Structures and a Heat Transmission Meter*, by P. Nicholls (A.S.H.V.E. TRANSACTIONS, Vol. 30, 1924).