The internal resistance of a material is equal to the reciprocal of its so-called internal conductivity (k) multiplied by its thickness and is represented by the fraction $\frac{x}{k}$, or $\frac{1}{C}$, in the case of materials for which the conductance is given in terms of the construction or thickness stated. For example: The internal resistance of 12 in. of brickwork on the basis of a value of k of 5.0 is $\frac{12}{5}$ or 2.40. The internal resistance of 2-in. hollow clay tile based on the value of C of 1.18 is $\frac{1}{1.18}$ or 0.847.

In the resistance method, the sum of the internal resistances of all the materials entering into the construction, is added to the sum of the surface resistances, which are the reciprocals of the surface coefficients or $\frac{1}{f}$. The resistance of a surface in still air, based on the average value of f_i or 1.34 is $\frac{1}{1.34}$ or 0.746. The resistance of an outside surface exposed to the wind, based on the average value of f_o or 4.02 (3 × 1.34) is $\frac{1}{4.02}$ or 0.249. The computed value of U obtained by the resistance method is obtained by taking the reciprocal of the sum of the internal and surface resistances of the construction. The solution of Example V in Fig. 3, by means of the resistance method is given in the following summary:

MATERIAL	THICKNESS INCHES	INTERNAL CONDUCTIVITY OR CONDUCTANCE	SURFACE COEFFICIENTS f_i or f_o	INTERNAL RESISTANCE	SURFACE RESISTANCE
Brickwork	12	5.0 (k)	4.02 (f_o)	2.400	0.249
Cement Mortar	½	8.0 (k)	....	0.063	....
Hollow Clay Tile	2	1.18 (C)		0.847	....
Plaster (gypsum)	½	2.32 (k)	1.34 (f_i)	0.215	0.746
				3.525	0.995
					3.525
Total resistance (R)					4.520

$$U = \frac{1}{R} = \frac{1}{4.520} = 0.221$$ B.t.u. per hour per square foot per 1 deg. fahr. difference in temperature between the air on the two sides of the wall.

In computing heat transmission coefficients of floors laid directly on the ground (Table 31), only one surface coefficient (f_i) is used. For example, the value of U for a 1 in. yellow pine floor (actual thickness, $\frac{25}{32}$ in.) placed directly on 5 in. concrete on the ground, is determined as follows:

$$U = \frac{1}{\frac{1}{1.34} + \frac{0.781}{1.00} + \frac{5.0}{8.30}} = 0.472$$ B.t.u. per hour per square foot per 1 deg. fahr. difference in temperature between the ground and the air immediately above the floor.

TABLE 7. CONDUCTIVITIES (k) AND CONDUCTANCES (C) OF BUILDING MATERIALS AND INSULATIONS

Based on Tests Conducted at the U. S. Bureau of Standards[p]

Note.—THE COEFFICIENTS IN TABLES 7-11, INCL., ARE EXPRESSED IN B.T.U. PER HOUR PER SQUARE FOOT, PER 1 DEG. FAHR., PER 1 IN. THICKNESS UNLESS OTHERWISE INDICATED BY NOTE b.

MATERIAL	DESCRIPTION	DENSITY (LB. PER CU. FT.)	MEAN TEMP. (DEG. FAHR.)	CONDUCTIVITY (k)[a] OR CONDUCTANCE (C)
Asbestos Wood	Asbestos and cement compressed	123.0	86	2.70
Asbestos Mill Board	Pressed asbestos	60.5	86	0.84
Balsam Wool[h]	Chemically treated wood fiber between layers of paper	2.2	90	0.27
Cabots Quilt[h]	Eel grass between Kraft paper	4.6	90	0.26
Cabots Quilt[h]	Eel grass between Kraft paper	3.4	90	0.25
Celotex	Rigid insulation made from sugar cane fiber	13.2	90	0.34
Corkboard	Pure; no added binder	14.0	90	0.34
Corkboard	Pure; no added binder	10.6	90	0.30
Corkboard	Pure; no added binder	7.0	90	0.27
Corkboard (Eureka)	Asphaltic binder	14.5	90	0.32
Dry Zero[h]	Kapok between burlap or paper	1.0	90	0.24
Fibrofelt[h]	Flax and rye fiber	13.6	90	0.32
Flaxlinum[h]	Flax fiber	13.0	90	0.31
Gyplap	Gypsum between layers of heavy paper (½ in. thick)	53.5	90	2.60[b]
Hairinsul[h]	75% hair; 25% jute	6.3	90	0.27
Hairinsul[h]	50% hair; 50% jute	6.1	90	0.26
Hair Felt[h]	Felted cattle hair	13.0	90	0.26
Hair Felt[h]	Felted cattle hair	11.0	90	0.26
Insulex or Pyrocell	Cellular gypsum—dry	30.0	90	1.00
Insulex or Pyrocell	Cellular gypsum—dry	24.0	90	0.77
Insulex or Pyrocell	Cellular gypsum—dry	18.0	90	0.59
Insulex or Pyrocell	Cellular gypsum—dry	12.0	90	0.44
Insulite	Rigid insulation made from wood pulp	16.9	90	0.34
Linofelt[h]	Flax fibers between paper	4.9	90	0.28
Lith	Rock wool, flax and straw pulp with binder	14.3	90	0.40
Magnesia (Rigid)	85% magnesia, 15% asbestos	19.3	86	0.51
Plaster	Gypsum	46.2	86	2.32[i]
Regranulated cork	About ⅜ in. particles	8.1	90	0.31
Rock cork	Rock wool block with binders	16.7	86	0.37
Rock wool	Fibrous material, made from rock	10.0	90	0.27
Rock wool	Fibrous material made from rock	14.0	90	0.28
Rock wool	Fibrous material made from rock	18.0	90	0.29
Rock wool	Fibrous material made from rock	21.0	90	0.30
Sawdust	Ordinary	......	86	1.04
Shavings	Ordinary	......	86	0.71
Sheetrock	Gypsum mixed with sawdust between layers of heavy paper (0.39 in. thick)	60.7	90	3.60[b]
Sprayo-Flake	Shredded paper with silica binder	4.2	94	0.28
Thermofelt[h]	Jute and asbestos fibers, felted	10.0	90	0.37
Thermofelt[h]	Hair and asbestos fibers, felted	7.8	90	0.28
Thermofill	Dry, fluffy, flaked gypsum	34.0	90	0.60
Thermofill	Dry, fluffy, flaked gypsum	26.0	90	0.52
Thermofill[h]	Dry, fluffy, flaked gypsum	19.8	90	0.35
Torfoleum	Peat moss compressed into sheet form	10.2	91.5	0.29
Woods:				
Balsa wood	Across grain	20.0	90	0.58
Balsa wood	Across grain	8.8	90	0.38
Balsa wood	Across grain	7.3	90	0.33
Cypress	Across grain	28.7	86	0.67
Maple	Across grain	44.3	86	1.10
Mahogany	Across grain	34.3	86	0.90
Virginia Pine	Across grain	34.3	86	0.96
White Pine	Across grain	31.2	86	0.78

[a]In addition to the conductivity values for the authorities listed, considerable work of importance pertaining to the heat transmission of various types of construction and materials has been done by the late Prof. John R. Allen and Prof. A. J. Wood of the Engineering Experiment Station of Pennsylvania State College.

[b]For thickness stated or used in construction, not per 1 in. thickness.

[h]Not compressed.

[i]The conductivity of plaster varies with the composition. Note range of values from 2.32 to 8.0. The average value for plaster is probably about 5.0. On account of the comparatively high conductivity of plaster and the fact that it is seldom applied more than ¾ in. thick, this material does not appreciably effect the overall transmission of a construction, excepting in the case of thin uninsulated walls.

[p]See Chapter LX, by Chas. H. Herter of the Report of the Insulation Committee, *A. S. R. E.*, Annual Meeting 1922, Revised to 1924, entitled, Heat Transmission of Insulating Materials for a more comprehensive collection of heat transmission data relating to building and insulating materials.