

mately 15 miles per hour. The conductance of air spaces $\frac{1}{2}$ in. or more in width was taken to be 1.10 B.t.u. per hour per square foot per degree fahrenheit difference between the two sides enclosing the air space. (See Table 3.)

Problems involving the determination of the value of U from the conductivity constants can also be solved by what is sometimes known as the resistance method which is readily derived from the basic equation No. 5 as follows:

$$\frac{1}{U} = \frac{1}{f_i} + \frac{1}{f_o} + \frac{x}{k} = \Sigma [R_i + R_o + R_r] \quad (9)$$

or

$$U = \frac{1}{\Sigma [R_i + R_o + R_r]}$$

The internal resistance of a material is equal to the reciprocal of its so-called internal conductivity (k) multiplied by its thickness and is rep-

TABLE 5. CONDUCTIVITIES (k) AND CONDUCTANCES (C) OF BUILDING MATERIALS AND INSULATIONS

Based on Tests Conducted at the University of Illinois,
By A. C. Willard, L. C. Lichty and L. A. Harding ^d

MATERIAL	DESCRIPTION	DENSITY (LB. PER CU. FT.)	MEAN TEMP. (DEG. FAHR.)	CONDUCT- IVITY (k) OR CONDUCT- ANCE (C)
Asbestos.....	Sheet.....	48.3	110	0.29
Asbestos Board.....	Corrugated.....	20.4	110	0.48
Brickwork.....	Mortar bond and dry conditions.....	132.0	100	4.00
Brickwork.....	Damp or wet.....	.....	.....	5.00 ⁱ
Cement mortar.....	.....	.....	.....	8.00 ⁱ
Concrete.....	Stone 1-2-4 mix.....	140.0	110	8.30
Corkboard.....	Pure; no added binder.....	9.7	.....	0.32
2 in. hollow clay tile, $\frac{1}{2}$ in. plaster both sides.....	.....	120.0	110	1.00 ^b
4 in. hollow clay tile, $\frac{1}{2}$ in. plaster both sides.....	.....	127.0	100	0.60 ^b
6 in. hollow clay tile, $\frac{1}{2}$ in. plaster both sides.....	.....	124.3	105	0.47 ^b
Magnesia Board.....	.....	13.5	110	0.51
Plaster.....	Cement.....	.....	.....	8.00 ⁱ
Roofings.....	Built-up bitumen and felt, gravel or slag surfaced.....	.....	.....	1.325 ^d
Roofings.....	Built-up bitumen and felt, gravel or slag surfaced.....	.....	.....	5.30 ^{d-b}
Stucco.....	.....	.....	.....	8.00 ^f
Wood (Fir, one- surface finished.....	Across grain.....	33.4	.....	1.00

^aIn 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.

^bFor thickness stated or used in construction, not per 1 in. thickness.

^cCalculated from 2 in. tile tests.

^dCement mortar and stucco assumed same as cement plaster.

^eRoofing, 0.15 in. thick (1.34 lb. per sq. ft.), covered with gravel (0.83 lb. per sq. ft.), combined thickness assumed 0.25.

^fThe 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 $\frac{1}{2}$ in. thick, this material does not appreciably effect the overall transmission of a construction, excepting in the case of thin uninsulated walls.

^gRecommended value. See *Mechanical Equipment of Buildings*, by Harding and Willard, Vol. I, second edition, 1929, p. 182.

^hSee 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.

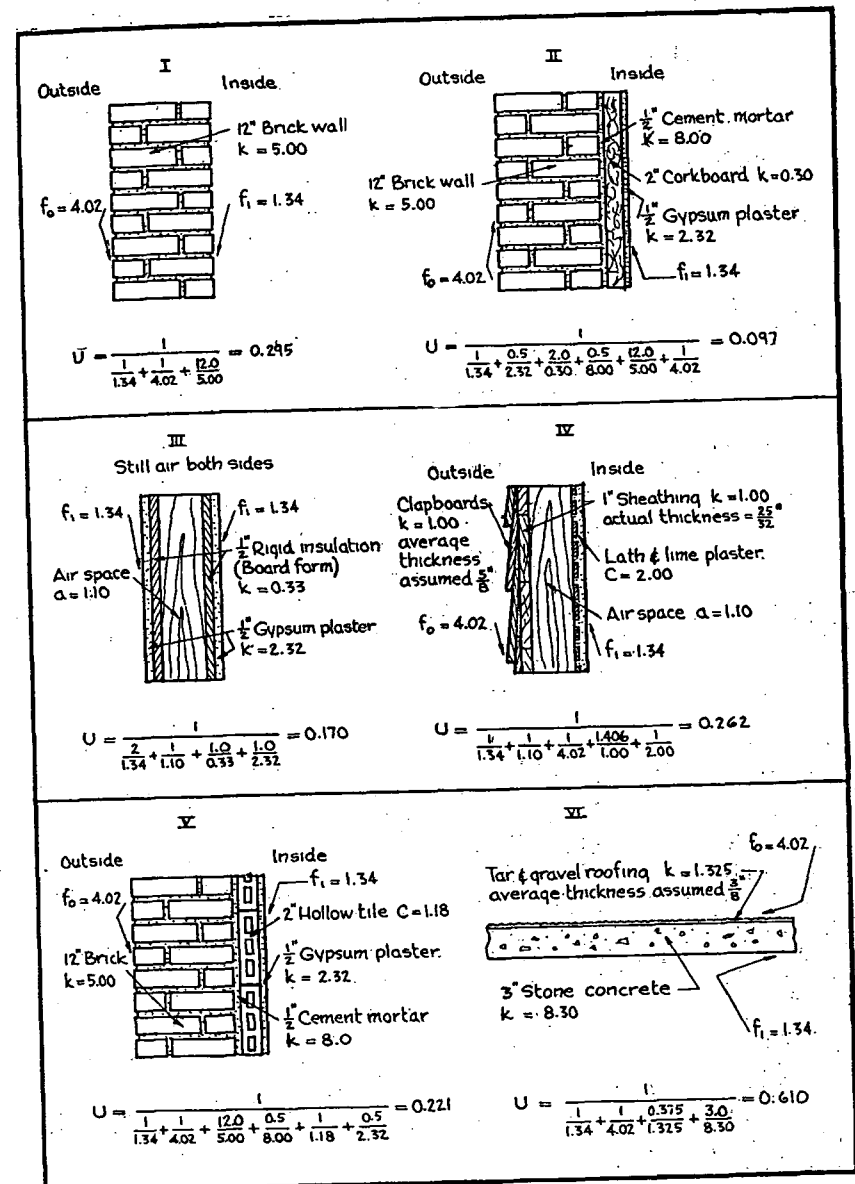


FIG. 2. EXAMPLES SHOWING METHOD OF COMPUTING HEAT TRANSMISSION COEFFICIENTS OF VARIOUS TYPES OF CONSTRUCTION