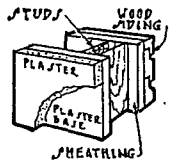
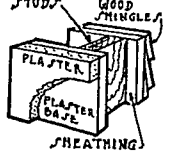
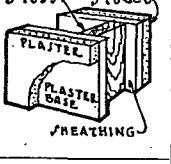
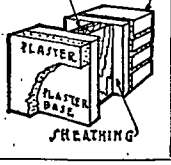


HEATING VENTILATING AIR CONDITIONING GUIDE 1944

TABLE 4. COEFFICIENTS OF TRANSMISSION (*U*) OF FRAME WALLS
Coefficients are expressed in Btu per hour per square foot per degree Fahrenheit difference in temperature between the air on the two sides, and are based on a wind velocity of 15 mph.
No INSULATION BETWEEN STUDS^a (SEE TABLE 5)

EXTERIOR FINISH	INTERIOR FINISH	TYPE OF SHEATHING				WALL NUMBER
		GYPSUM ($\frac{1}{2}$ IN. THICK)	PLY- WOOD ($\frac{1}{4}$ IN. THICK)	WOODS ($\frac{3}{4}$ IN. THICK) BLOG. PAPER	INSUL- ATING BOARD ($\frac{3}{4}$ IN. THICK)	
		A	B	C	D	
WOOD SIDING (Clapboard) 	Metal Lath and Plaster ^b	0.33	0.32	0.26	0.20	1
	Gypsum Board ($\frac{3}{8}$ in.) Decorated	0.32	0.32	0.25	0.20	2
	Wood Lath and Plaster	0.31	0.31	0.25	0.19	3
	Gypsum Lath ($\frac{3}{8}$ in.) Plastered ^c	0.31	0.31	0.25	0.19	4
	Plywood ($\frac{3}{8}$ in.) Plain or Decorated	0.30	0.30	0.24	0.19	5
	Insulating Board ($\frac{1}{4}$ in.) Plain or Decorated	0.23	0.23	0.19	0.16	6
	Insulating Board Lath ($\frac{1}{4}$ in.) Plastered ^c	0.22	0.22	0.19	0.15	7
	Insulating Board Lath (1 in.) Plastered ^c	0.17	0.17	0.15	0.12	8
WOOD SHINGLES 	Metal Lath and Plaster ^b	0.25	0.25	0.26	0.17	9
	Gypsum Board ($\frac{3}{8}$ in.) Decorated	0.25	0.25	0.25	0.17	10
	Wood Lath and Plaster	0.24	0.24	0.25	0.16	11
	Gypsum Lath ($\frac{3}{8}$ in.) Plastered ^c	0.24	0.24	0.25	0.16	12
	Plywood ($\frac{3}{8}$ in.) Plain or Decorated	0.24	0.24	0.24	0.16	13
	Insulating Board ($\frac{1}{4}$ in.) Plain or Decorated	0.19	0.19	0.19	0.14	14
	Insulating Board Lath ($\frac{1}{4}$ in.) Plastered ^c	0.19	0.18	0.19	0.13	15
	Insulating Board Lath (1 in.) Plastered ^c	0.14	0.14	0.15	0.11	16
STUCCO 	Metal Lath and Plaster ^b	0.43	0.42	0.32	0.23	17
	Gypsum Board ($\frac{3}{8}$ in.) Decorated	0.42	0.41	0.31	0.23	18
	Wood Lath and Plaster	0.40	0.39	0.30	0.22	19
	Gypsum Lath ($\frac{3}{8}$ in.) Plastered ^c	0.39	0.39	0.30	0.22	20
	Plywood ($\frac{3}{8}$ in.) Plain or Decorated	0.39	0.38	0.29	0.22	21
	Insulating Board ($\frac{1}{4}$ in.) Plain or Decorated	0.27	0.27	0.22	0.18	22
	Insulating Board Lath ($\frac{1}{4}$ in.) Plastered ^c	0.26	0.26	0.22	0.17	23
	Insulating Board Lath (1 in.) Plastered ^c	0.19	0.19	0.16	0.14	24
BRICK VENEER^d 	Metal Lath and Plaster ^b	0.37	0.36	0.28	0.21	25
	Gypsum Board ($\frac{3}{8}$ in.) Decorated	0.36	0.36	0.28	0.21	26
	Wood Lath and Plaster	0.35	0.34	0.27	0.20	27
	Gypsum Lath ($\frac{3}{8}$ in.) Plastered ^c	0.34	0.34	0.27	0.20	28
	Plywood ($\frac{3}{8}$ in.) Plain or Decorated	0.34	0.33	0.27	0.20	29
	Insulating Board ($\frac{1}{4}$ in.) Plain or Decorated	0.25	0.25	0.21	0.17	30
	Insulating Board Lath ($\frac{1}{4}$ in.) Plastered ^c	0.24	0.24	0.20	0.16	31
	Insulating Board Lath (1 in.) Plastered ^c	0.18	0.18	0.15	0.13	32

^aCoefficients not weighted; effect of studding neglected.

^bPlaster assumed $\frac{3}{8}$ in. thick.

^cPlaster assumed $\frac{1}{2}$ in. thick.

^dFurring strips between wood shingles and all sheathings except wood.

^eSmall air space and mortar between building paper and brick veneer neglected.

^fNominal thickness, 1 in.

CHAPTER 4. HEAT TRANSMISSION COEFFICIENTS

of combinations frequently used, but any special construction not given in Tables 4 to 16 can generally be computed by using the conductivity values given in Table 3 and the fundamental heat transfer formulas. For example, the tabulation of all of the values for multiple layers of insulating materials would present extensive and detailed problems of calculations for the varied application combinations, but the engineer having the fundamental conductivity values can quickly obtain the proper coefficients.

Attention is called to the fact that the conductivity values per inch of thickness do not afford a true basis for comparison between insulating materials as applied, although they are frequently used for that purpose. The value of an insulating material is measured in terms of the coefficient (*U*) of the insulated construction as compared to the coefficient (*U*) of the construction without insulation. Certain types of blanket insulations are designed to be installed between the studs of a frame building in such manner as to give two air spaces. In order to get the full value of such materials they should be so installed that each air space is approximately 1 in. or more in thickness and the air spaces should be sealed at the top and bottom to prevent the circulation of air from one space to the other. As previously explained there are certain other types of insulation which if extremely porous, may allow air circulation (convection) within the material, particularly when installed between ceiling joists so that the upward rate of heat flow is greater than the horizontal or the downward rate of heat flow. The engineer must carefully evaluate the economic considerations involved in the selection of an insulating material as adapted to various building constructions. Lack of good judgment in the intelligent choice of an insulating material, or its improper installation, frequently represents the difference between good or unsatisfactory results.

Computed Transmission Coefficients

Computed heat transmission coefficients of many common types of building construction are given in Tables 4 to 17, inclusive, each construction being identified by a serial number. For example, the coefficient of transmission (*U*) of an 8-in. brick wall and $\frac{1}{2}$ in. of plaster is 0.46, and the number assigned to a wall of this construction is 67-B, Table 6.

Example 1. Calculate the coefficient of transmission (*U*) of an 8-in. brick wall with $\frac{1}{2}$ in. of plaster applied directly to the interior surface, based on an outside wind exposure of 15 mph. It is assumed that the outside course is of hard (high density) brick having a conductivity of 9.20, and that the inside course is of common (low density) brick having a conductivity of 5.0, the thicknesses each being 4 in. The conductivity of the plaster is assumed to be 3.3, and the inside and outside surface coefficients are assumed to average 1.65 and 6.00, respectively, for still air and a 15 mph wind velocity.

Solution. *k* (hard high density brick) = 9.20; *x* = 4.0 in.; *k* (common low density brick) = 5.0; *x* = 4.0 in.; *k* (plaster) = 3.3; *x* = $\frac{1}{2}$ in.; *f*_i = 1.65; *f*_o = 6.0. Therefore,

$$U = \frac{1}{\frac{1}{6.0} + \frac{4.0}{9.20} + \frac{4.0}{5.0} + \frac{0.5}{3.3} + \frac{1}{1.65}} = \frac{1}{0.167 + 0.435 + 0.80 + 0.152 + 0.606}$$

$$= 0.46 \text{ Btu per hour per square foot per degree Fahrenheit difference in temperature between the air on the two sides.}$$

The coefficients in the tables were determined by calculations similar