TECHNICAL INFORMATION ON BUILDING MATERIALS

TIBM - 4

FOR USE IN THE DESIGN OF LOW-COST HOUSING

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THE NATIONAL BUREAU OF STANDARDS
UNITED STATES DEPARTMENT OF COMMERCE
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THERMAL INSULATION

Insulating Values of Thermal Insulating Materials, Building Materials and Basic Wall Units

This is a brief presentation of thermal insulating values of commercial thermal insulations, building materials and basic wall units, based on tests conducted by the National Bureau of Standards, and presented in detail in Bureau of Standards former Letter Circular No. 227 (April 19, 1927), "Thermal Insulation";[1] and Bureau of Standards Research Paper No. 291 (August 6, 1930), "Heat Transfer Through Building Walls";[2] by M. S. Van Dusen and J. L. Finck.

In addition to providing bases for calculating thermal insulating values of component parts of various types of building walls, the data also provides bases for computing insulating values or resistances to transfer of heat by conduction, convection, and radiation through complete walls from surface to surface, i.e., from outside air on one surface to inside air on the opposite surface. Total insulating value of a wall, including total resistance of the two surfaces, calculated from air to air may be taken as 1 plus the insulating value from surface to surface (a reasonably good average value for ordinary temperatures and air velocities).

[1] Out of print.

[2] Out of print and not available by purchase but may be consulted in Government depository libraries.

TABLE I

Average Insulating Values of Insulating Materials*

Types of Insulation	Values for Thickness Stated in Inches			
	1/2	3/4	1	3 5/8**
Fills (loose materials)	1.73***	2.59***	3.45***	12.50
Flexible Insulation (Quilts, blankets or bats)	1.85	2.78	3.70	13.40
Rigid Insulation Boards	1.52	2.27	3.03	11.00***

TABLE II

Insulating Values of Building Materials and Basic Wall Units*

Description of Material or Unit	Insulating Values for Material or Unit Described
3/4" Plaster (with or without metal lath)	0.33
3/4" Plaster and Wood Lath	0.52
1/2" Plaster Board or Wall Board	0.38
2" x 4" Studs (4" air space in outside walls)	1.09
3/4" Sheathing and Building Paper	0.75
7/8" Furring Air Space	1.03
3/4" Siding or Clapboards	1.10
Wood Shingles	1.41
3/4" Stucco (with or without metal lath)	0.20
3/4" Stucco and Wood Lath	0.50
4" Brick Veneer	0.52
8" Solid Brick Wall	1.04
12" Solid Brick Wall	1.56

*Insulating values are expressed in terms of hours resistance, per degree Fahrenheit, to the passage of 1 Btu of heat through 1 square foot of material per thickness given or basic unit described.

**Depth of air space between 2" x 4" studs (wall thick) usually filled with loose or flexible insulation when such insulation is used.

***Insulating values for 1/2", 3/4" and 1" fills; and 3 5/8" of rigid insulation boards are given for comparative purposes only, as materials of such thickness would not ordinarily be used in general practice.