## TABLE 4. INTERNAL CONDUCTIVITIES OF BUILDING MATERIALS AND INSULATIONS[1]

NOTE.—The internal conductivities in this table are expressed in B.t.u. per hour, per square feet, per 1 deg. fahr., per 1 in. thickness unless otherwise stated

### *A. Building Materials*

| MATERIAL | DESCRIPTION | DENSITY (LB. PER CU. FT.) | MEAN TEMP. OF SAMPLE (DEG. FAHR.) | INTERNAL CONDUCTIVITY (*C* OR *Cu*) | AUTHORITY[14] |
|---|---|---|---|---|---|
| Asbestos | Sheet | 48.3 | 110 | 0.29 | Willard, Lichty & Harding |
| Asbestos Board | Corrugated | 20.4 | 110 | 0.48 | Willard, Lichty & Harding |
| Asbestos Wood | Asbestos and cement compressed. | 123.0 | 86 | 2.70 | Bureau of Standards |
| Asbestos Mill Bd. | Pressed Asbestos | 60.5 | 86 | 0.843 | Bureau of Standards |
| Asbestos Shingles | | 65.0 | 75 | 6.00[2] | Peebles, Armour Institute |
| Asphalt Shingles | | 70.0 | 75 | 6.50[2] | Peebles, Armour Institute |
| Brickwork | Mortar Bond and dry conditions. | 132.0 | 100 | 4.00 | Willard, Lichty & Harding |
| Brickwork | Damp or wet | | | 5.00 | Recommended by Harding & Willard[12] |
| Cement Mortar | | | | 8.00[7] | Willard, Lichty & Harding |
| Concrete | Stone 1-2-4 mix | 140.0 | 110 | 8.30 | Willard, Lichty & Harding |
| Concrete | Stone | 145.0 | 75 | 6.30 | Peebles, Armour Institute |
| Concrete | Stone 1-2-5 mix | | 95[3] | 6.27 | C.L. Norton, Boston, Mass. |
| Concrete | Cinder 1-2-4 mix | | 122 | 2.35 | C.L. Norton, Boston, Mass. |
| Concrete | Cinder | 110.0 | 75 | 5.20 | Peebles, Armour Institute |
| Concrete Blocks | Stone Dry | 103.6 | 68 | 4.84 | Hencky |
| Cornell Wood Board | Ground Wood pulp (½" thick). | | 75 | 2.50[2] | Peebles, Armour Institute |
| Gyplap | Gypsum between layers of heavy paper (⅛" thick) | 53.5 | 90 | 2.60[2] | Bureau of Standards |
| Gypsum | Building—oven dried 3 weeks. | 78.0 | 68 | 2.99 | Poensgen |
| Gypsum | Building—mixed with 15 per cent wood fiber. | | | 2.30 | Calculated[9] |
| Gypsum Partition Tile. | Hollow | | 75 | 1.00 | Peebles, Armour Institute |
| Gypsum Roof Tile. | Reinforced | | 75 | 1.20 | Peebles, Armour Institute |
| 2 in. Hollow Clay Tile, ½ in. plaster both sides | | 120.0 | 110 | 1.00[2] | Willard, Lichty & Harding |
| 4 in. Hollow Clay Tile, ½ in. plaster both sides | | 127.0 | 100 | 0.60[2] | Willard, Lichty & Harding |
| 6 in. Hollow Clay Tile, ½ in. plaster both sides | | 124.3 | 105 | 0.47[2] | Willard, Lichty & Harding |
| 2 in. Hollow Clay Tile | | | | 1.14[2] | Calculated[4] |

[1]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.

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

[3]Hot side of plate.

[4]Estimated from values reported in University of Illinois Engineering Station, Bulletin No. 102, for hollow clay tile plastered both sides, assuming the conductivity of cement plaster = 8.0 per 1 in. thickness.

[5]Calculated from 2 in. tile tests.

[6]Average of several values.

[7]Cement mortar and stucco assumed same as cement plaster.

[8]Roofing, 0.15 in. thick (1.34 lb. per sq. ft.), covered with gravel (0.83 lb. per sq. ft.), combined thickness assumed 0.25.

[9]Estimated from value of $C = 2.99$ for gypsum and $c = 1.0$ for wood.

[10]Not compressed.

[11]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.

[12]See "Mechanical Equipment of Buildings" by Harding and Willard, page 56.

[13]Thickness of lime plaster and wood lath from back of lath to face of plaster, about ⅞ in.

[14]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. F. B. Rowley of the Engineering Experiment Station of the University of Minnesota, and Prof. A. J. Wood of the Engineering Experiment Station of Pennsylvania State College.





## TABLE 4. INTERNAL CONDUCTIVITIES OF BUILDING MATERIALS AND INSULATIONS[1]—Continued

| MATERIAL | DESCRIPTION | DENSITY (LB. PER CU. FT.) | MEAN TEMP. OF SAMPLE (DEG. FAHR.) | INTERNAL CONDUCTIVITY (*C* OR *Cu*) | AUTHORITY[14] |
|---|---|---|---|---|---|
| 4 in. Hollow Clay Tile | | | | 0.65[2] | Calculated[4] |
| 6 in. Hollow Clay Tile | | | | 0.50[2] | Calculated[4] |
| 8 in. Hollow Clay Tile | | | | 0.43[2] | Estimated |
| 12 in. Hollow Clay Tile | | | | 0.26[2] | Estimated |
| 16 in. Hollow Clay Tile | | | | 0.185[2] | Estimated |
| Magnesia Board | | 13.5 | 110 | 0.51 | Willard, Lichty & Harding |
| Magnesia (85 per cent) and Asbestos (15 per cent). | Rigid | 19.3 | 86 | 0.508 | Bureau of Standards |
| Plaster | Gypsum | 46.2 | 86 | 2.32[11] | Bureau of Standards |
| Plaster | Cement | | | 8.00[11] | Willard, Lichty & Harding |
| Plaster Board | | | 86 | 3.04 | Bureau of Standards |
| Roofing[8] | Built-up bitumen and felt, gravel or slag surfaced | | | 1.325[5] | Willard, Lichty & Harding |
| Roofing[8] | Built-up bitumen and felt, gravel or slag surfaced | | | 5.30[2–5] | Willard, Lichty & Harding |
| Roofing | Composition or prepared | | 75 | 6.50[2] | Peebles, Armour Institute |
| Sawdust | Ordinary | | 86 | 1.04 | Bureau of Standards |
| Shavings | Ordinary | | 86 | 0.707 | Bureau of Standards |
| Sheetrock | Gypsum mixed with sawdust between layers of heavy paper (0.39 in. thick). | 60.7 | 90 | 3.60[2] | Bureau of Standards |
| Slate | | | 201 | 10.37 | Lees & Chorlton |
| Stone | Limestone or Sandstone. | | | 10.0 | Estimated[6] |
| Stucco | | | | 8.00[7] | Willard, Lichty & Harding |
| Wood lath and plaster[13] | Lime plaster | | 75 | 2.0[2] | Peebles, Armour Institute |
| Woods: | | | | | |
| Cypress | Across grain | 28.7 | 86 | 0.668 | Bureau of Standards |
| Fir | Across grain | 33.4 | | 1.000 | Willard, Lichty & Harding |
| Maple Flooring | Across grain | 40.0 | 75 | 1.20 | Peebles, Armour Institute |
| Maple | Across grain | 44.3 | 86 | 1.103 | Bureau of Standards |
| Mahogany | Across grain | 34.3 | 86 | 0.900 | Bureau of Standards |
| Oak | | 42.0 | 75 | 1.30 | Peebles, Armour Institute |
| Virginia Pine | Across grain | 34.3 | 86 | 0.958 | Bureau of Standards |
| White Pine | Across grain | 31.2 | 86 | 0.784 | Bureau of Standards |
| Yellow Pine | Across grain | | | 1.000 | Peebles, Armour Institute |

### *B. Insulations (Dry)*

| | | | | | |
|---|---|---|---|---|---|
| Balsa wood | Across grain | 20.0 | 90 | 0.58 | Bureau of Standards |
| Balsa wood | Across grain | 8.8 | 90 | 0.38 | Bureau of Standards |
| Balsa wood | Across grain | 7.3 | 90 | 0.33 | Bureau of Standards |
| Balsam wool[10] | Chemically treated wood fiber. | 2.2 | 90 | 0.27 | Bureau of Standards |
| Cabots quilt[10] | Eel grass between Kraft paper. | 4.6 | 90 | 0.26 | Bureau of Standards |
| Cabots quilt[10] | Eel grass between Kraft paper. | 3.4 | 90 | 0.25 | Bureau of Standards |
| Celotex | Board form insulation made from sugar cane fiber. | 13.5 | 70 | 0.33 | Peebles, Armour Institute |
| Celotex | Board form insulation made from sugar cane fiber. | 13.2 | 90 | 0.34 | Bureau of Standards |
| Corkboard | Pure; no added binder. | 14.0 | 90 | 0.34 | Bureau of Standards |
| Corkboard | Pure; no added binder. | 10.6 | 90 | 0.30 | Bureau of Standards |