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DEPARTMENT OF COMMERCE
BUREAU OF STANDARDS
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# SOUND ABSORPTION COEFFICIENTS OF THE MORE COMMON MATERIALS.

The following figures have been obtained at the Bureau of Standards for the sound absorption coefficients of a number of materials now on the market as acoustic correctives. Figures are also given for the absorption of an audience seated in chairs of different kinds. The results have all been obtained by the reverberation method.

Acoustic correctives may be classified in general as fibrous materials, tiles and acoustic plasters. Materials of the first two classes are usually supplied in a form which needs no special experience for its application. With acoustic plasters the case is different. If improperly applied the coefficient of absorption may be considerably less than the values here given.

It is not necessarily the case that the materials of highest coefficient are the most advantageous. When there is room enough to apply the requisite quantity, a material of low coefficient will give better results than one of higher absorption, due to the more uniform distribution of material.

For the foregoing reasons it is advisable in drawing up specifications for auditoriums to lay emphasis upon the reverberation time desired rather than upon coefficients of material. See Bureau of Standards Circular No. 380 entitled Architectural Acoustics, which may be obtained of the Superintendent of Documents, Government Printing Office, Washington, D.C.

Additional details regarding any of the materials mentioned in this Letter Circular will be furnished on application.

| Material | Absorption Coefficients for Frequencies 128 | 256 | 512 | 1024 | 2048 | Date |
|---|---|---|---|---|---|---|
| ACOUSTEX 1" thick #60 | .11 | .21 | .53 | .81 | .81 | 1931 |
| " 1 1/2" " #70 | .16 | .34 | .75 | .85 | .84 | 1931 |
| " ditto, 6 coats spray paint | .14 | .30 | .74 | .90 | .85 | 1931 |
| ACOUSTIC LIME PLASTER, Finishing Lime Assoc. of Ohio, 3/4" thick | .17 | .23 | .28 | .36 | .64 | 1930 |
| ACOUSTOLIC (Maftex) nailed on 2x4's, spaced 2 ft. on centers | | | | | | |
| Without surface treatment | .44 | .24 | .31 | .44 | .48 | 1930 |
| Tinted with water soluble aniline color | | .29 | .28 | .41 | | 1930 |
| Tinted with water color paint | .40 | .33 | .31 | .38 | .37 | 1930 |
| ACOUSTONE | | | | | | |
| 1/2" thick | .09 | .20 | .48 | .64 | .66 | 1931 |
| 3/4" " | .13 | .28 | .61 | .73 | .73 | 1930 |
| 1" " | .18 | .38 | .64 | .73 | .73 | 1930 |
| AKOUSTOLITH TILE, Grade D, 1" thk. | .08 | .13 | .25 | .54 | .67 | 1930 |
| " " " D, 2" " | .15 | .26 | .59 | .74 | .52 | 1930 |
| " " " B, 1" " | .10 | .14 | .28 | .65 | .73 | 1929 |
| " " " C, 1 1/2" | .12 | .19 | .44 | .61 | .66 | 1930 |
| " " " C, 2" thk. | .19 | .26 | .53 | .64 | .70 | 1930 |
| AKOUSTOLITH PLASTER, 1/4" thick | .13 | .21 | .19 | .23 | .33 | 1931 |
| ARBORITE, on 13/16" x 2" furring strips, spaced 12" on centers | | | | | | |
| Low density material, sanded surface | .21 | .48 | .34 | .31 | .41 | 1930 |
| Regular material, sanded surface | .16 | .40 | .27 | .29 | .39 | 1930 |
| BALSAM WOOL, 1" thick, scrim facing | .18 | .36 | .55 | .65 | .67 | 1928 |
| CELOTEX | | | | | | |
| Single B, 5/8" thick | .08 | .18 | .48 | .63 | .75 | 1931 |
| " 4 coats paint | .07 | .20 | .46 | .72 | .87 | 1931 |
| Double B, 13/16" thick | .15 | .24 | .62 | .76 | .73 | 1931 |
| " 4 coats paint | .13 | .26 | .62 | .82 | .91 | 1931 |
| Triple B, 1 1/4" thick | .18 | .33 | .84 | .97 | .76 | 1931 |
| CORKOUSTIC D | .03 | .10 | .59 | .39 | .44 | 1931 |

| Material | Absorption Coefficients for Frequencies 128 | 256 | 512 | 1024 | 2048 | Date |
|---|---|---|---|---|---|---|
| FLAXLINUM, 1" thick | .09 | .31 | .62 | .77 | .69 | 1930 |
| " in TMB Tile, on 13/16" x 2" furring strips, spaced 16" on centers | | | | | | |
| 1/2" Flaxlinum | .11 | .19 | .58 | .68 | .69 | 1930 |
| 1" " | .17 | .34 | .61 | .72 | .68 | 1930 |
| 1/2" and 1" Flaxlinum | .32 | .46 | .67 | .69 | .71 | 1930 |
| 2 1" layers " | .41 | .59 | .70 | .72 | .74 | 1930 |
| HACHMEISTER-LIND ACOUSTIC PLASTER, stippled with pins 1/2" deep | .16 | .19 | .25 | .36 | .44 | 1930 |
| KALITE ACOUSTIC CEMENT 3/4" thick, on metal lath with wood studs, no base coat | .34 | .46 | .49 | .52 | .73 | 1931 |
| MACOUSTIC PLASTER, 1/2" thick stippled with large pins, perforations 1/2" deep | .06 | .17 | .33 | .56 | .58 | 1931 |
| NASHKOTE A, 1/2" thick | .05 | .13 | .25 | .26 | .20 | 1929 |
| " A, 3/4" " | .09 | .16 | .27 | .30 | .23 | 1929 |
| " A, 1" " | .12 | .20 | .33 | .33 | .28 | 1929 |
| " B-332, 1/2" thick | .09 | .15 | .31 | .52 | .74 | 1929 |
| " B-332, 3/4" thick | .12 | .21 | .40 | .63 | .81 | 1929 |
| " B-332, 1" " | .19 | .26 | .51 | .73 | .89 | 1929 |
| " A, 1/2" thick, perforated | .08 | .15 | .43 | .62 | .65 | 1929 |
| " A, 3/4" " " | .11 | .21 | .51 | .68 | .71 | 1929 |
| " A, 1" " " | .13 | .26 | .58 | .73 | .77 | 1929 |
| POROLITH | .10 | .23 | .56 | .84 | .87 | 1931 |
| REVERBOLITE PLASTER, stippled with large pins, 1/2" thick | .07 | .15 | .34 | .47 | .65 | 1930 |
| ROCKOUSTILE 1" thick | .18 | .38 | .57 | .65 | .72 | 1931 |
| SABINITE PLASTER, Regular | .13 | .22 | .22 | .25 | .31 | 1931 |
| " " Hydraulic | .14 | .24 | .27 | .38 | .49 | 1931 |
| SANACOUSTIC TILE Rock Wool filler, 1 1/4" thick | .17 | .41 | .82 | .94 | .85 | 1930 |
| Ditto, on furring strips 13/16" thick, unpainted | .19 | .64 | .87 | .87 | .80 | 1931 |
| Ditto, 3 coats paint | .17 | .49 | .84 | .79 | .86 | 1931 |
| THERMATEX, on 13/16" x 2" furring strips, spaced 12" on centers | .30 | .39 | .34 | .43 | .53 | 1930 |
| THOS. MOULDING COMPANY All samples mounted on 13/16" x 2" furring strips, spaced 16" on centers. | | | | | | |
| TMB LAMINATED ACOUSTIC TILE spray painted with lacquer | | | | | | |
| 1" thick | .17 | .41 | .63 | .69 | .74 | 1931 |
| 1 1/2" thick | .27 | .58 | .72 | .77 | .81 | 1931 |

| Material | Absorption Coefficients for Frequencies 128 | 256 | 512 | 1024 | 2048 | Date |
|---|---|---|---|---|---|---|
| TMB FIBRE TILE | | | | | | |
| 1/2" thick unpainted | .07 | .15 | .28 | .51 | .71 | 1931 |
| 5/8" " " | .09 | .19 | .42 | .76 | .70 | 1931 |
| 1" " " | .12 | .22 | .56 | .79 | .80 | 1931 |
| 1 1/2" thick " | .17 | .36 | .78 | .85 | .85 | 1931 |
| 1" thick spray painted with lacquer | .11 | .25 | .62 | .81 | .73 | 1931 |
| TMB METAL TILE | | | | | | |
| filled with Gimco Rock Wool pad, weight 1.6 lbs.per sq.ft. | .39 | .50 | .86 | .90 | .81 | 1931 |
| DITTO, filled with 1 1/2" TMB fiber tile | .16 | .47 | .79 | .81 | .75 | 1931 |

The coefficients given in the above table represent the fractional part of the energy of a sound wave which is absorbed at each reflection.

Audience seated in chairs of various types.

A = cane seat chairs, open back
B = theatre chairs, box spring seat, heavily padded back
C = same as B, but single layer of padding on back
D = Church pews, seating five.

| Absorption per person (1) | Frequencies 128 | 256 | 512 | 1024 | 2048 |
|---|---|---|---|---|---|
| Women without coats, A | 0.7 | 1.3 | 2.3 | 3.6 | 4.6 |
| Women with coats, A | 1.3 | 2.4 | 4.0 | 5.8 | 6.7 |
| Men without overcoats, A | 1.3 | 2.1 | 4.1 | 5.5 | 7.4 |
| Men with overcoats, A | 2.3 | 3.2 | 4.8 | 6.2 | 7.6 |
| Mixed Audience, B | | | 3.9 | 4.7 | |
| Empty seat, B | | 3.4 | 3.0 | 3.3 | 3.6 |
| Mixed audience, C | | 3.5 | 4.1 | 4.9 | 4.2 |
| Empty seat, C | | 3.0 | 2.5 | 2.9 | 3.1 |
| Mixed audience, D | | 2.7 | 3.3 | 3.8 | 3.6 |

(1) These figures are numerically equal to the number of square feet of a material having unit absorption, which would absorb the same amount of sound energy.