

## 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. The inclusion of a material in this letter circular is not to be construed as a general approval. Each material should be judged on its merits in any particular case as there are other requirements such as fire resisting qualities, light reflection, appearance, etc. Figures are also given for the absorption of an audience seated in chairs of different kinds. All the results have been obtained by the reverberation method. Unless otherwise mentioned, all samples were laid directly on the floor of the reverberation room.

The sound absorption coefficient of a material is defined as the fractional part of the energy of a sound wave which is absorbed at each reflection. Experimental figures such as are given here must be regarded as approximate only. This branch of applied science is new and in a state of development. The methods and formulas used in obtaining these figures are those which, while not entirely satisfactory, are open to the least objection. The uncertainty involved is such that all the coefficients are probably somewhat too large.

Fibrous materials and acoustic tiles may exhibit large variations in coefficient arising from different methods of mounting. The figures here given apply only to cases where the materials are mounted in the same manner as when tested.

Acoustic plasters require special skill in their application, as improper manipulation may reduce the coefficient. Moreover, the figures given for plasters without a base coat will be considerably reduced if a base coat is used.

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, because of 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. 396 entitled "Architectural Acoustics", which may be obtained of the Superintendent of Documents, Government Printing Office, Washington, D.C., at 5¢ per copy. Additional details regarding any of the materials mentioned in this letter circular will be furnished on application.



Material

Absorption coefficients for

Frequencies

Date

128 256 512 1024 2048

Material	128	256	512	1024	2048	Date
ABSORBEX(Thermax)Type A(36 gauge)						
1" thick painted by mfr.	-	-	.46	-	-	1932
Ditto, cemented to sheet rock	-	.22	.45	.92	.97	1932
" laid on 1" Thermax	-	.37	.85	1.00	.95	1932
" on 13/16"x2"furring 9" o.c.	-	.27	.66	.99	.81	1932
" on 13/16"x2" " 9" o.c.						
which were on 2x4's	-	.58	.90	.62	.88	1932
ABSORBEX(Thermax)Type B(veneered)						
1" thick laid on 1" Thermax	-	-	.88	-	-	1932
ABSORBEX Type B 1" thick, spray						
painted 4 coats lithopone paint						
on 13/16"x2" furring 9" o.c.	-	.23	.61	.84	.79	1932
Ditto cemented to sheet rock	-	.18	.37	.74	.97	1932
ABSORBEX(Thermax)Type C(14 gauge)	.14	.19	.34	.76	.63	1932
Ditto on 13/16"x2" furring 20" o.c.	.14	.21	.69	.71	.59	1932
ACOUSTEX 1" thick #60	.11	.21	.53	.81	.81	1931
Ditto 1 1/2" thick #70	.16	.34	.75	.85	.84	1931
Ditto, 6 coats spray paint	.14	.30	.74	.90	.85	1931
ACOUSTEX 1 1/4" thick #W-80	.08	.34	.88	1.00	.85	1932
" 1 1/2" " #W-90	.14	.46	.99	1.00	.82	1932
" 2" " #W-100	.28	.67	1.00	1.00	.92	1932
ACOUSTI-CELOTEX Single B, 5/8" thk.	.08	.18	.48	.63	.75	1931
Ditto brush painted 4 coats	.07	.20	.46	.72	.87	1931
ACOUSTI-CELOTEX Double B, 13/16" thk.	.15	.24	.62	.76	.73	1931
Ditto brush painted 4 coats	.13	.26	.62	.82	.91	1931
Ditto on furring strips 13/16"x2",						
12" o.c.	.09	.56	.81	.96	.83	1933
ACOUSTI-CELOTEX Triple B, 1/4" thk.	.12	.41	.96	.99	.68	1932
ACOUSTI-CELOTEX Mineral Fiber						
Double X, 13/16" thick	.04	.16	.61	.86	.84	1933
ACOUSTI-CELOTEX Mineral Fiber						
Triple X, 1/4" thick	.22	.32	.84	.80	.87	1931
Ditto brush painted 2 coats	.19	.45	.92	.81	.63	1931
ACOUSTIC LIME PLASTER,						
Finishing Lime Assoc.of Ohio						
3/4" thk.on base coat lime plaster	.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

Material	Absorption coefficients for					Date
	Frequencies					
	128	256	512	1024	2048	
AKOUSTOLITH TILE, Grade D, 1"	.08	.13	.25	.54	.67	1930
Grade D, 2"	.15	.26	.59	.74	.52	1930
Grade B, 1"	.10	.14	.28	.65	.73	1929
Grade C, 1 1/2"	.12	.19	.44	.61	.66	1930
Grade C, 2"	.19	.26	.53	.64	.70	1930
Grade B, 2"	.21	.50	.90	.86	.72	1931
Grade B, 1 1/2"	.14	.30	.69	.92	.87	1932
Grade B, 1"	.09	.17	.46	.81	.81	1932
AKOUSTOLITH PLASTER, 1/4" thick on base coat gypsum plaster	.13	.21	.19	.23	.33	1931
AKOUSTOLITH PLASTER, 1/2" thick on base coat gypsum plaster	.20	.26	.35	.56	.59	1932
ARBORITE, 1/2" thick on 13/16"x2" furring strips, spaced 12" o.c. Low density material, sanded surface	.21	.48	.34	.31	.41	1930
ARBORITE, 1/2" thick Regular material, sanded surface, same furring strips	.16	.40	.27	.29	.39	1930
BALSAM WOOL, 1" thick, scrim facing	.18	.36	.55	.65	.67	1928
BALSAM WOOL Krex-Tone Tile 1" thk.	.12	.24	.63	.76	.76	1931
CALICEL ACOUSTIC TILE, 1" thick cemented to plaster board	.26	.38	.74	.91	.78	1932
CALICEL ACOUSTIC TILE, 1 1/4" thk. cemented to plaster board	.11	.34	.86	.93	.75	1932
GERMACOUSTIS TILE 1 1/8" thick cemented to Sheetrock	.34	.48	.64	.67	.66	1932
Ditto Spray painted 4 coats	.28	.49	.62	.63	.68	1932
CORKOUSTIC, Type C, 1 1/2" thick	.08	.14	.61	.56	.64	1931
" " B, 1 1/2" "	.09	.10	.61	.56	.49	1931
EK-O-LESS TILE, 3/4" thick on 1" backing	.22	.31	.67	.87	.78	1932
EK-O-LESS TILE, 1 7/16" thick on 1/2" backing	.18	.32	.90	.99	.81	1932
FLAXLINUM, 1" thick	.09	.31	.62	.77	.69	1930
FLAXLINUM in TMB Tile, on 13/16" x 2" furring strips, spaced 16" o.c. thicknesses as below:						
1/2" Flaxlinum	.11	.19	.58	.68	.69	1930
1" "	.17	.34	.61	.72	.68	1930
1/2" and 1"	.32	.46	.67	.69	.71	1930
2 1" layers Flaxlinum	.41	.59	.70	.72	.74	1930
HACHMEISTER-LIND ACOUSTIC PLASTER on base coat gypsum plaster, stippled with pins 1/2" deep	.16	.19	.25	.36	.44	1930

Materials	Absorption coefficients for					Date
	Frequencies					
	128	256	512	1024	2048	
INSULITE ACOUSTILE TYPE 44, 1 3/4" thick	.26	.42	.50	.57	.61	1931
KALITE ACOUSTIC PLASTER H, 1/2" thick on base coat gypsum plaster	.25	.31	.46	.61	.62	1932
KALITE ACOUSTIC PLASTER A-2; 1/2" thick on base coat gypsum plaster	.24	.23	.28	.48	.70	1932
KALITE ACOUSTIC CEMENT, 3/4" thk. on metal lath with wood studs, no base coat	.34	.46	.49	.52	.73	1931
KALITE TILE, 1 1/2" thick, 1" backing	.15	.32	.50	.52	.40	1931
MACOUSTIC PLASTER, 1/2" thick on base coat gypsum plaster stippled with large pins, per- forations 1/2" deep	.06	.17	.33	.56	.58	1931
MACOUSTIC PLASTER 47W, 1/2" thick stippled with small nails, perforations 1/2" deep	.41	.34	.43	.54	.58	1932
MAIZEWOOD TILE, 1 1/2" thick, saw cuts in surface	.23	.41	.64	.84	.73	1932
Ditto, 1 coat size, 2 coats lead and oil paint	.21	.42	.64	.76	.73	1932
MUTETILE, 2" Rockwool	.53	.74	.85	.83	.80	1932
NASHKOTE A, 1/2" thick cemented to sheetrock	.05	.13	.25	.26	.20	1929
NASHKOTE A, 3/4" " " "	.09	.16	.27	.30	.23	1929
NASHKOTE A, 1" " " "	.12	.20	.33	.33	.28	1929
NASHKOTE B-332, 1/2" " " "	.09	.15	.31	.52	.74	1929
NASHKOTE B-332, 3/4" " " "	.12	.21	.40	.63	.81	1929
NASHKOTE B-332, 1" " " "	.19	.26	.51	.73	.89	1929
NASHKOTE A, 1/2" thick, perforated	.08	.15	.43	.62	.65	1929
NASHKOTE A, 3/4" " " "	.11	.21	.51	.68	.71	1929
NASHKOTE A, 1" " " "	.13	.26	.58	.73	.77	1929
NEPHI PLASTER 3/4" thick on metal lath, no base coat	.34	.34	.40	.44	.49	1932
NUWOOD BEVEL LAP TILE, 1/2" thick cemented to floor	.12	.19	.30	.40	.40	1931
NUWOOD BEVEL LAP TILE, 1" thick cemented to floor	.14	.19	.37	.37	.41	1931
PLASTACOUSTIC 1/2" thick applied on 1/4" scratch coat gypsum plaster on metal lath	.49	.33	.38	.61	.92	1932
PLASTACOUSTIC 5/8" thick applied on metal lath no base coat	.19	.63	.92	.70	.74	1932

Materials	Absorption coefficients for					Date
	Frequencies					
	128	256	512	1024	2048	
POROLITH	.10	.23	.56	.84	.87	1931
QUIETILE Type 80 (U.S. Gypsum Co.)	.06	.47	.80	.78	.75	1932
REVERBOLITH PLASTER, stippled with large pins, 1/2" thick on base coat gypsum plaster	.07	.15	.34	.47	.65	1930
ROCKOUSTILE (Improved) 1" thick on 13/16" x 2" furring strips 12" o.c.	.08	.64	.79	.82	.81	1932
ROCKOUSTILE TYPE A 1" thick unpainted on 13/16" x 2" furring strips 12" o.c.	.05	.39	.86	.73	.62	1932
Ditto painted 1 spray coat and 3 brush coats	.11	.45	.85	.64	.55	1932
ROCKOUSTILE Type A 3/4" thick unpainted on 13/16" x 2" furring strips 12" o.c.	.04	.23	.83	.76	.73	1932
Ditto painted 1 spray coat and 3 brush coats	.07	.33	.85	.67	.52	1932
ROCKWALL ACOUSTICAL PLASTER 1/2" thk. on base coat of gypsum plaster	.27	.24	.47	.77	.91	1932
Ditto 3/4" thick	.34	.32	.61	.81	.73	1932
SABINITE PLASTER, Hydraulic; 1/2" thick on base coat gypsum plaster	.14	.24	.27	.38	.49	1931
SABINITE PLASTER A 1/2" thick on base coat gypsum plaster	.19	.20	.37	.60	.61	1932
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, painted 3 brush coats	.17	.49	.84	.79	.86	1931
SPHINXSTONE 2" thick	.19	.33	.82	.93	.74	1932
SOUND ISOLATION BLANKET, wt. 1 1/2 lbs. per sq. ft.	.11	.58	.90	.88	.86	1932
STUCCOUSTIC PLASTER, formula XB, 3/4" thick on base coat gypsum plaster	.29	.53	.59	.73	.72	1932
Ditto, spray painted, 3 coats Coustilac	-	-	.59	-	-	1932
STUCCOUSTIC PLASTER, formula XB 11/16" thick on base coat gypsum plaster	-	.36	.56	-	-	1932
STUCCOUSTIC PLASTER " " BB 1/2" thick on base coat gypsum plaster	-	-	.51	-	-	1932
Ditto, formula BB, 1/2" thick, spray painted 5 coats cold water paint	.14	.16	.49	.59	.61	1932
TEMLOCK, 1/2" thick nailed on 2x4's spaced 16" o.c.	.24	.31	.27	.27	.36	1931
THERMATEX, on 13/16" x 2" furring strips, spaced 12" o.c.	.30	.39	.34	.43	.53	1930

Materials	Absorption coefficients for					Date
	Frequencies					
	<u>128</u>	<u>256</u>	<u>512</u>	<u>1024</u>	<u>2048</u>	
THERMAX 1" (10 gauge) coated 3/8" Sprayo-Flake on 13/16"x2" furring 16" o.c.	.12	.25	.66	.70	.64	1932
THERMAX 10 gauge, 2" no furring	-	-	.61	-	-	1932
THERMOFIL 3" thick	.43	.39	.68	.83	.86	1932
TMB FIBRE TILE 1" unpainted on 13/16" x 2" furring 16" o.c.	.12	.22	.56	.79	.80	1931
TMB FIBRE TILE 1" spray painted with lacquer by mfr. on 13/16" x 2" furring 16" o.c.	.11	.25	.62	.81	.73	1931
TMB METAL TILE on 13/16" x 2" furring 16" o.c. filled with Gimco Rock Wool Pad, weight 1/6 lb. per sq. ft.	.39	.50	.86	.90	.81	1931
TMB SOUNDEX TILE, 3/4" thick, cemented to sheetrock with semi- plastic cement	.04	.22	.45	.72	.75	1931
TMB SOUNDEX same as above, brush painted 3 coats lacquer	.14	.21	.43	.68	.77	1932
TMB SOUNDEX same as above, brush painted 6 coats lacquer	.19	-	.46	-	-	1932
TMB SOUNDEX 3/4" thick on 13/16" x 2" furring 12" o.c.	-	-	.49	-	-	1933
TMB SOUNDEX 1 1/2" thick on 13/16" x 2" furring 12" o.c.	.19	.35	.82	.86	.74	1932
TRANSITE ACOUSTICAL TILE	.19	.39	.81	.77	.72	1931
WYOLITE ACOUSTICAL PLASTER 1/2" thick on base coat gypsum plaster	.58	.34	.41	.53	.65	1933

Audience seated in chairs of various types.

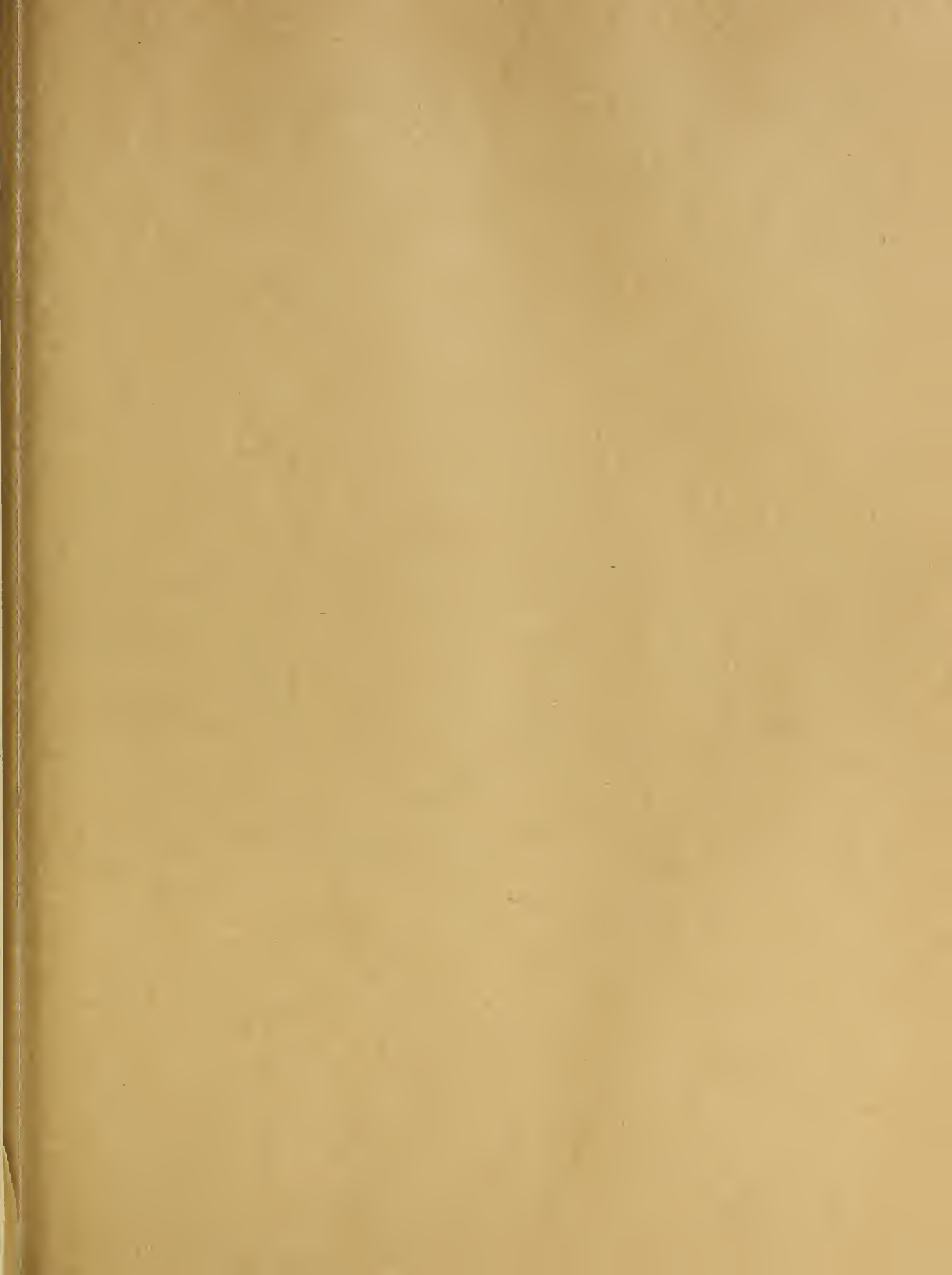
- A = cane seat chairs, open back  
 B = theatre chairs, box spring seat, heavily padded back  
 C = same as B, but single layer of padding on back  
 D = Church pews, seating five.

	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.







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<u>Material</u>	Absorption coefficients for					<u>Date</u>
	Frequencies					
	<u>128</u>	<u>256</u>	<u>512</u>	<u>1024</u>	<u>2048</u>	
ABSORBEX(Thermax) Type A(36 gauge)						
1" thick painted by mfr.	-	-	.46	-	-	1932
Ditto, cemented to sheet rock	-	.22	.45	.92	.97	1932
" laid on 1" Thermax	-	.37	.85	1.00	.95	1932
" on 13/16" x 2" furring 9" o.c.	-	.27	.66	.99	.81	1932
" on 13/16" x 2" " 9" o.c.	-					
which were on 2 x 4's	-	.58	.90	.62	.88	1932
ABSORBEX(Thermax) Type B(veneered)						
1" thick laid on 1" Thermax	-	-	.88	-	-	1932
ABSORBEX Type B 1" thick, spray						
painted 4 coats lithopone paint						
on 13/16" x 2" furring 9" o.c.	-	.23	.61	.84	.79	1932
Ditto cemented to sheet rock	-	.18	.37	.74	.97	1932
ABSORBEX(Thermax) Type C(14 gauge)	.14	.19	.34	.76	.63	1932
Ditto on 13/16" x 2" furring 20" o.c.	.14	.21	.69	.71	.59	1932
ACOUSTEX 1" thick #60	.11	.21	.53	.81	.81	1931
Ditto 1 1/2" thick #70	.16	.34	.75	.85	.84	1931
Ditto, 6 coats spray paint	.14	.30	.74	.90	.85	1931
ACOUSTEX 1 1/4" thick #W-80	.08	.34	.88	1.00	.85	1932
" 1 1/2" " #W-90	.14	.46	.99	1.00	.82	1932
" 2" " #W-100	.28	.67	1.00	1.00	.92	1932
ACOUSTI-CELOTEX Single B, 5/8" thick	.08	.18	.48	.63	.75	1931
Ditto brush painted 4 coats	.07	.20	.46	.72	.87	1931
ACOUSTI-CELOTEX B 5/8" thick on						
1" x 2" furring 12" o.c.	.05	.65	.64	.90	.89	1933
ACOUSTI-CELOTEX Double B, 13/16" thick	.15	.24	.62	.76	.73	1931
Ditto brush painted 4 coats	.13	.26	.62	.82	.91	1931
Ditto on furring strips 13/16" x 2",						
12" o.c.	.09	.56	.81	.96	.83	1933
ACOUSTI-CELOTEX Triple B, 1 1/4" thick	.12	.41	.96	.99	.68	1932
ACOUSTI-CELOTEX Mineral Fiber						
Double X, 13/16" thick	.04	.16	.61	.86	.84	1933
ACOUSTI-CELOTEX Mineral Fiber						
Triple X, 1 1/4" thick	.22	.32	.84	.80	.87	1931
Ditto brush painted 2 coats	.19	.45	.92	.81	.63	1931
ACOUSTIC LIME PLASTER,						
Finishing Lime Association of Ohio						
3/4" thick on base coat lime plaster.	.17	.23	.28	.36	.64	1930
ACOUSTOLIC (Maftex) nailed on 2 x 4'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

<u>Material</u>	Absorption coefficients for					<u>Date</u>
	Frequencies					
	<u>128</u>	<u>256</u>	<u>512</u>	<u>1024</u>	<u>2048</u>	
AKOUSTOLITH TILE, Grade D, 1"	.08	.13	.25	.54	.67	1930
Grade D, 2"	.15	.26	.59	.74	.52	1930
Grade B, 1"	.10	.14	.28	.65	.73	1929
Grade C, 1 1/2"	.12	.19	.44	.61	.66	1930
Grade C, 2"	.19	.26	.53	.64	.70	1930
Grade B, 2"	.21	.50	.90	.86	.72	1931
Grade B, 1 1/2"	.14	.30	.69	.92	.87	1932
Grade B, 1"	.09	.17	.46	.81	.81	1932
AKOUSTOLITH PLASTER, 1/4" thick on base coat gypsum plaster	.13	.21	.19	.23	.33	1931
AKOUSTOLITH PLASTER, 1/2" thick on base coat gypsum plaster	.20	.26	.35	.56	.59	1932
ARBORITE, 1/2" thick on 13/16" x 2" furring strips, spaced 12" o.c. Low density material, sanded surface.	.21	.48	.34	.31	.41	1930
ARBORITE, 1/2" thick Regular material, sanded surface, same furring strips	.16	.40	.27	.29	.39	1930
BALSAM WOOL, 1" thick, scrim facing	.18	.36	.55	.65	.67	1928
BALSAM WOOL Krex-Tone Tile 1" thick	.12	.24	.63	.76	.76	1931
CALICEL ACOUSTIC TILE, 1" thick cemented to plaster board	.26	.38	.74	.91	.78	1932
CALICEL ACOUSTIC TILE, 1 1/4" thick cemented to plaster board	.11	.34	.86	.93	.75	1932
CERAMACOUSTIC TILE 1 1/8" thick cemented to Sheetrock	.34	.48	.64	.67	.66	1932
Ditto Spray painted 4 coats	.28	.49	.62	.63	.68	1932
CORKOUSTIC, Type C, 1 1/2" thick	.08	.14	.61	.56	.64	1931
" " B, 1 1/2" "	.09	.10	.61	.56	.49	1931
EK-O-LESS TILE, 3/4" thick on 1" backing	.22	.31	.67	.87	.78	1932
EK-O-LESS TILE, 1 7/16" thick on 1/2" backing	.18	.32	.90	.99	.81	1932
FLAXLINUM, 1" thick	.09	.31	.62	.77	.69	1930
FLAXLINUM in TMB Tile, on 13/16" x 2" furring strips, spaced 16" o.c. thicknesses as below:						
1/2" Flaxlinum.	.11	.19	.58	.68	.69	1930
1" "	.17	.34	.61	.72	.68	1930
1/2" and 1"	.32	.46	.67	.69	.71	1930
2 1" layers Flaxlinum	.41	.59	.70	.72	.74	1930
HACHMEISTER-LIND ACOUSTIC PLASTER on base coat gypsum plaster, stippled with pins 1/2" deep	.16	.19	.25	.36	.44	1930
HAWAIIAN CANE TILE 1" thick cemented to plaster board	.10	.40	.71	.83	.81	1933

Material	Absorption coefficients for					Date
	Frequencies					
	128	256	512	1024	2048	
INSULITE ACOUSTILE TYPE 44, 1 3/4" thick	.26	.42	.50	.57	.61	1931
KALITE ACOUSTIC PLASTER H, 1/2" thick on base coat gypsum plaster	.25	.31	.46	.61	.62	1932
KALITE ACOUSTIC PLASTER A-2, 1/2" thick on base coat gypsum plaster	.24	.23	.28	.48	.70	1932
KALITE ACOUSTIC CEMENT, 3/4" thick on metal lath with wood studs, no base coat	.34	.46	.49	.52	.73	1931
KALITE TILE, 1 1/2" thick, 1" backing	.15	.32	.50	.52	.40	1931
MACOUSTIC PLASTER, 1/2" thick on base coat gypsum plaster stippled with large pins, per- forations 1/2" deep	.06	.17	.33	.56	.58	1931
MACOUSTIC PLASTER 47W, 1/2" thick stippled with small nails, perforations 1/2" deep	.41	.34	.43	.54	.58	1932
MAIZEWOOD TILE, 1 1/2" thick, saw cuts in surface	.23	.41	.64	.84	.73	1932
Ditto, 1 coat size, 2 coats lead and oil paint	.21	.42	.64	.76	.73	1932
MUTETILE, 2" Rockwool	.53	.74	.85	.83	.80	1932
NASHKOTE A, 1/2" thick cemented to sheetrock	.05	.13	.25	.26	.20	1929
NASHKOTE A, 3/4" " " "	.09	.16	.27	.30	.23	1929
NASHKOTE A, 1" " " "	.12	.20	.33	.33	.28	1929
NASHKOTE B-332, 1/2" thick " "	.09	.15	.31	.52	.74	1929
NASHKOTE B-332, 3/4" " " "	.12	.21	.40	.63	.81	1929
NASHKOTE B-332, 1" " " "	.19	.26	.51	.73	.89	1929
NASHKOTE A, 1/2" thick, perforated	.08	.15	.43	.62	.65	1929
NASHKOTE A, 3/4" " " "	.11	.21	.51	.68	.71	1929
NASHKOTE A, 1" " " "	.13	.26	.58	.73	.77	1929
NEPHI PLASTER 3/4" thick on metal lath, no base coat	.34	.34	.40	.44	.49	1932
NUWOOD BEVEL LAP TILE, 1/2" thick cemented to floor	.12	.19	.30	.40	.40	1931
NUWOOD BEVEL LAP TILE, 1" thick cemented to floor	.14	.19	.37	.37	.41	1931

Materials	Absorption coefficients for					Date
	Frequencies					
	128	256	512	1024	2048	
PLASTACOUSTIC 1/2" thick applied on 1/4" scratch coat gypsum plaster on metal lath	.49	.33	.38	.61	.92	1932
PLASTACOUSTIC 5/8" thick applied on metal lath no base coat	.19	.63	.92	.70	.74	1932
POROLITH	.10	.23	.56	.84	.87	1931
QUIETILE Type 80 (U.S. Gypsum Co.)	.06	.47	.80	.78	.75	1932
QUIETILE M 1" thick nailed to 13/16" x 2" furring 12" o.c.	.21	.79	.59	.66	.44	1933
QUIETILE M 1" thick cemented to gypsum wall board	.11	.52	.72	.69	.45	1933
RED TOP ACOUSTICAL TILE cemented to gypsum wall board	.14	.22	.40	.48	.52	1933
REVERBOLITH PLASTER, stippled with large pins, 1/2" thick on base coat gypsum plaster	.07	.15	.34	.47	.65	1930
ROCKOUSTILE (Improved) 1" thick on 13/16" x 2" furring strips 12" o.c.	.08	.64	.79	.82	.81	1932
ROCKOUSTILE TYPE A 1" thick unpainted on 13/16" x 2" furring strips 12" o.c.	.05	.39	.86	.73	.62	1932
Ditto painted 1 spray coat and 3 brush coats	.11	.45	.85	.64	.55	1932
ROCKOUSTILE Type A 3/4" thick unpainted on 13/16" x 2" furring strips 12" o.c.	.04	.23	.83	.76	.73	1932
Ditto painted 1 spray coat and 3 brush coats	.07	.33	.85	.67	.52	1932
ROCKWALL ACOUSTICAL PLASTER 1/2" thick on base coat of gypsum plaster	.27	.24	.47	.77	.91	1932
Ditto 3/4" thick	.34	.32	.61	.81	.73	1932
SABINITE PLASTER, Hydraulic, 1/2" thick on base coat gypsum plaster	.14	.24	.27	.38	.49	1931
SABINITE PLASTER A 1/2" thick on base coat gypsum plaster	.19	.20	.37	.60	.61	1932
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, painted 3 brush coats	.17	.49	.84	.79	.86	1931
SPHINKSTONE 2" thick	.10	.33	.82	.93	.74	1932
SOUND ISOLATION BLANKET, wt. 1 1/2 lbs. per sq.ft.	.11	.58	.90	.88	.86	1932
STUCCOUSTIC PLASTER, formula XB, 3/4" thick on base coat gypsum plaster	.29	.53	.59	.73	.72	1932
Ditto, spray painted, 3 coats Coustilac	-	-	.59	-	-	1932
STUCCOUSTIC PLASTER, formula XB 11/16" thick on base coat gypsum plaster	-	.36	.56	-	-	1932

Materials	Absorption coefficients for					Date
	Frequencies					
	128	256	512	1024	2048	
STUCCOUSTIC PLASTER, formula BB 1/2" thick on base coat gypsum plaster	-	-	.51	-	-	1932
Ditto, formula BB, 1/2" thick, spray painted 5 coats cold water paint	.14	.16	.49	.59	.61	1932
TEMLOCK, 1/2" thick nailed on 2 x 4's spaced 16" o.c.	.24	.31	.27	.27	.36	1931
THERMATEX, on 13/16" x 2" furring strips, spaced 12" o.c.	.30	.39	.34	.43	.53	1930
THERMAX 1" (10 gauge) coated 3/8" Sprayo-Flake on 13/16" x 2" furring 16" o.c.	.12	.25	.66	.70	.64	1932
THERMAX 10 gauge, 2" no furring	-	-	.61	-	-	1932
THERMOFIL 3" thick	.43	.39	.68	.83	.86	1932
TMB FIBRE TILE 1" unpainted on 13/16" x 2" furring 16" o.c.	.12	.22	.56	.79	.80	1931
TMB FIBRE TILE 1" spray painted with lacquer by mfr. on 13/16" x 2" furring 16" o.c.	.11	.25	.62	.81	.73	1931
TMB METAL TILE on 13/16" x 2" furring 16" oc. filled with Gimco Rock Wool Pad, weight 1/6 lb. per sq.ft.	.39	.50	.86	.90	.81	1931
TMB SOUNDEX TILE, 3/4" thick, cemented to sheetrock with semi-plastic cement	.04	.22	.45	.72	.75	1931
TMB SOUNDEX same as above, brush painted 3 coats lacquer	.14	.21	.43	.68	.77	1932
TMB SOUNDEX same as above, brush painted 6 coats lacquer	.19	-	.46	-	-	1932
TMB SOUNDEX 3/4" thick on 13/16" x 2" furring 12" o.c.	-	-	.49	-	-	1933
TMB SOUNDEX 1 1/2" thick on 13/16" x 2" furring 12" o.c.	.19	.35	.82	.86	.74	1932
TRANSITE ACOUSTICAL TILE	.19	.39	.81	.77	.72	1931
TRUTONE TILE 7/8" thick cast on 1/4" gypsum wall board. Spray painted by manufacturer.	.16	.17	.48	.87	.66	1932
U.S. GYPSUM METAL TILE Rock Wool Pad	.12	.56	.97	.92	.83	1933
WYOLITE ACOUSTICAL PLASTER 1/2" thick on base coat gypsum plaster	.58	.34	.41	.53	.65	1933



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 <sup>(1)</sup>		Frequencies		
	<u>128</u>	<u>256</u>	<u>512</u>	<u>1024</u>	<u>2048</u>
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

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(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.

Year	Event	Location	Significance
1776	Declaration of Independence	Philadelphia	Established the United States as an independent nation.
1787	Constitution signed	Philadelphia	Created the framework for the federal government.
1791	Bill of Rights adopted	Philadelphia	Guaranteed individual liberties and limited government power.
1800	Move to Washington D.C.	Washington D.C.	Established the permanent capital of the United States.
1820	Missouri Compromise	Washington D.C.	Resolved the issue of slavery in new territories.
1848	Texas Annexation	Washington D.C.	Expanded the territory of the United States.
1861	Start of Civil War	Fort Sumter	Marked the beginning of the conflict over slavery.
1865	End of Civil War	Appomattox	Reunited the nation and ended slavery.
1877	Compromise of 1877	Washington D.C.	Resolved the disputed 1876 presidential election.
1898	Spanish-American War	San Juan	Established the United States as a world power.
1901	Annexation of Hawaii	Washington D.C.	Expanded the United States to the Pacific Ocean.
1914	World War I	Europe	Global conflict that reshaped the world.
1918	19th Amendment	Washington D.C.	Granted women the right to vote.
1929	Stock Market Crash	Wall Street	Triggered the Great Depression.
1933	New Deal	Washington D.C.	Government intervention to combat the Depression.
1941	Attack on Pearl Harbor	Hawaii	United States entered World War II.
1945	End of World War II	Germany	Defeat of the Axis powers.
1947	Marshall Plan	Europe	U.S. aid to rebuild Europe after the war.
1954	Brown v. Board of Education	Supreme Court	Ended legal segregation in schools.
1957	First satellite state	Cuba	Start of the Cold War.
1961	Civil Rights Act	Washington D.C.	Prohibited discrimination based on race.
1963	John F. Kennedy assassination	Dallas	Major event in the Cold War.
1964	Civil Rights Act	Washington D.C.	Strengthened civil rights protections.
1968	Nixon's Vietnam withdrawal	Washington D.C.	End of U.S. involvement in Vietnam.
1971	Watergate Scandal	Washington D.C.	Exposed political corruption.
1973	End of Vietnam War	Paris	U.S. withdrawal from Vietnam.
1974	Nixon's resignation	Washington D.C.	End of the Watergate scandal.
1978	Iran Hostage Crisis	Iran	U.S. diplomatic crisis.
1981	Iran Hostage Crisis	Iran	U.S. diplomatic crisis.
1981	Reagan's election	Washington D.C.	Start of the conservative movement.
1984	Star Wars	Washington D.C.	U.S. missile defense program.
1987	Reagan's second term	Washington D.C.	Continuation of conservative policies.
1991	Gulf War	Middle East	U.S. military intervention.
1993	Clinton's election	Washington D.C.	Start of the Clinton administration.
1994	North American Free Trade Agreement	Washington D.C.	Trade agreement with Canada and Mexico.
1997	Clinton's impeachment	Washington D.C.	Major political event.
1998	Clinton's second term	Washington D.C.	Continuation of Clinton's policies.
2001	Bush's election	Washington D.C.	Start of the Bush administration.
2001	9/11 attacks	New York	Major terrorist attacks.
2002	Afghanistan War	Afghanistan	U.S. military intervention.
2003	Iraq War	Iraq	U.S. military intervention.
2008	Obama's election	Washington D.C.	Start of the Obama administration.
2009	Financial Crisis	Global	Major economic downturn.
2011	Arab Spring	Middle East	U.S. diplomatic involvement.
2013	Obama's second term	Washington D.C.	Continuation of Obama's policies.
2016	Trump's election	Washington D.C.	Start of the Trump administration.
2017	Trump's first term	Washington D.C.	Continuation of Trump's policies.
2020	COVID-19 Pandemic	Global	Major health crisis.
2021	Trump's second term	Washington D.C.	Continuation of Trump's policies.

The history of the United States is a complex and multifaceted one, shaped by a variety of factors and events. From the early years of settlement to the present day, the nation has undergone significant changes and challenges. This document provides a comprehensive overview of the key events and milestones that have shaped the United States over time.

