Max Planck Research Group
Epistemes of Modern Acoustics

Sound & Science: Digital Histories

Archives NAG: Results Paul E. Sabine, Riverbank Laboratories, Geneva, Ill, 15.07.1927. Geneva: 1927.

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MAX PLANCK INSTITUTE
FOR THE HISTORY OF SCIENCE

RESULTS

Multiplying the average logarithms as defined above by 10 gives a figure which corresponds closely to the reduction in the loudness of sound in what telephone engineers have called "sensation units". A "sensation unit" is the logarithm of the ratic of intensities of two sounds, one of which is just perceptibly louder than the other. A decrease of about 60 Sensation Units reduces the loudness of conversational speech as heard at a distance of a few feet to inaudibility.

In the following table the reductions in Sensation Units by various standard walls are given in comparison with the results of the present tests on Masonite partitions.

Partition	Wt.per sq.ft.	Reduction in Sensation Units
3" Solid Gypsum Tile, plastered	25.4	32.8
4" Clay Tile, plastered	28.0	34.0
2½" solid plaster on metal lath and channels	23.2	32.4
Wood stud, wood lath gypsum plaster	18.0	28.0
Wood stud, Masonite gypsum plaster	17.0	35.1
Wood stud, Masonite, gypsum plaster, with Masonite strips between studs	16.8	35.8

N.V. Hollandsche Handel & Agentuur Mij. ROTTERDAM (Holland Trading & Agency Co.)

Conversational speech was heard faintly but was unintelligible through the Masonite partitions. The sound of a phonograph was almost inaudible.

TESTS no. 3 and no. 4.

In test no. 3 Masonite 7/16" Board was nailed directly to wood 2 x 4" studs spaced 16" on centers, forming a test surface 48.2 sq.ft. in area.

A steel door closed over this surface reduced the Sound Chamber to its standard condition. In test no. 4, the Masonite was applied to 2 x 1" furring strips nailed onto a plastered wall. The reverberation times of the Sound Chamber, first in its standard condition with the steel door closed, and second with the steel door open, were determined. From the difference in these times and the original calibration of the Sound

Chamber, the absorption coefficients of the Masonite surface were computed. Tests were made at octave intervals from C below middle C to four octaves above middle C.

RESULTS

In the following table, the values of the absorption coefficients for Masonite and for other similar materials are given :

Tone Frequency	C2 128	C3 256	C4 512	C5 1024	C6 2048	C7 4096
Material						
Masonite on 2 x 4" studs	.18	.245	.31	.34	.30	.24
Masonite on 2x1" furring	.17	.24	.28	.295	.30	.28
½" felt	.06	.08	.17	.47	.52	.52
1" felt	.10	.31	.49	.62	.52	.38
3/8" standard Celotex		.15	.20	.19	.16	.15
9/16" Flax Linum	.082	.14	.31	.54	.51	.45

The value of the coefficient at C4, 512 viberations per second, is that commonly used in computing the reverberation in audience rooms by the Sabine formule. The coefficients for Masonite mounted as described at this frequencyb are .31 and .28 respectively.

Respectfully submitted,

PAUL E. SABINE

Riverbank Laboratories,
Geneva, III.
July 15, 1927.

N.V. Hollandsche Handel & Agentuur Mij
ROTTERDAM
(Holland Trading & Agency Co.)

JULY 16, 1927.

Mason Fibre Co.,
111 West Washington St.,
Chicago.

Gentlemen,

The enclosed report gives in detail an account of the method and the results of the tests conducted in this laboratory to determine the sound absorption coefficients of Masonite Board 7/16" thick, when used as the exposed finished wall or ceiling surfaces as a means of preventing excessive reflection of sound and reverberation in rooms.

The following table of coefficients covers theentire range of tones encountered in music and speech.

Tone Frequency	C2 128	C3 256	C4 512	C5 1024	C6 2048	C7 4096
Material						
Masonite on 2 x 4 " studs	.18	.245	.31	.34	.30	.24
Masonite on 2 x 1 "furrings	.17	.24	.28	.295	.30	.28

The value of the coefficient at C4, 512 vibrations per second, is that commonly used in figuring the reverberation in rooms according to the formula of W.C. Sabine,

Very truly yours,

Paul E. Sabine

TO
DOR THE RIVERBANK LABORATRIES.

N.V. Hollandsche Handel & Agentuur Mij.
ROTTERDAM
(Holland Trading & Agency Co.)

RIVERBANK LABORATORIES

Geneva III.

Department of Accustics

July 16, 1927

Mason Fibre Co.
111,West Washington St.
Chicago.

Gentlemen,

Enclosed is a detailed report of the tests made in this laboratory on the reduction of sound intensity by partition walls in which Masonite Structural Insulation was used as a plaster base.

In the following table the results of these tests are given together with the results of similar tests made under identical conditions upon other standard types of partitions. In this table the average decrease of sound intensity over the entire range of tones from 128 to 4096 vibrations per second is given in Sensation Units, a Sensation Unit being defined as ten times the logarithm of the ratic of intensities of two sounds one of which is just perceptibly louder than the other.

Partition	Wt.per sq.ft.	Reduction in Sensation Units
3" Solid Gypsum Tile, plastered	25.4	32.8
4" Clay Tile,plastered	28.0	34.0
2½" solid plaster on metal lath and channels	23.2	32.4
Wood stud,wood lath, gypsum plaster	18.0	28.0
Wood stud,Masonite, gypsum plaster	17.0	35.1
Wood stud, Masonite gypsum plaster,with Masonite strips between studs	16.8	35.8

Conversational speech was heard faintly but was unintelligible through the Masonite partitions. The sound of a phonograph was almost inaudible.

N.V. Hollandsche Handel & Agentuur Mij
ROTTERDAM
(Holland Trading & Agency Co.)

Very truly yours,

PAUL E. SABINE

FOR THE RIVERBANK LABORATORIES.

ACOUSTICAL TESTS.

RIVERBANK LABORATORIES.

Tone	C2	C3	C4	C5	C6	C7
Frequency	128	256	512	1024	2048	4096
MASONITE	0.18	0.245	0.31	0.34	0.30	0.24
5/8 CELOTEX	0.10	0.15	0.20	0.19	0.16	0.15

BUREAU OF STANDARDS

Frequency cycles per second	297	569	1095	2190	2890
MASONITE	0.09	0.13	0.18	0.26	0.31
CELOTEX	0.06	0.06	0.06	0.07	0.10

I hope that these comparisons will explain, or answer any question which willmarise from time to time regarding the comparison of these two products.

Yours very truly,

MASON FIBRE COMPANY

R.T.MILLER

Chief Engineer

RTM:3

N.V. Hollandsche Handel & Agentuur Mij
ROTTERDAM
(Holland Trading & Agency Co.)

REPORT ON ACOUSTIC TESTS ON MASONITE 7/16" BOARD

These tests were conducted in the Sound Chamber of the Riverbank Laboratories, by the well known reverberation method. Tests no.1 and no.2 were made to determine the reduction of sound intensity in transmission trough partitions in which Masonite was used as a plaster base on ordinary wood stud partition construction. Tests no.3 and no.4 were to determine the sound absorbing efficiency of Masonite used as the exposed interior surface of rooms as a means of accoustical correction.

TESTS No.1 and No. 2.

Test no. 1 was on an ordinary 2 x 4" wood stud partition, with Masonite used as a plaster base. The test wall was built into the 6' x 8' opening between the Sound Chamber and one of the Test Chambers. The 2 x 4' s were spaced 16" O.C. and the Masonite was nailed directly to these according to the manufacturer's specification. Two coats of gypsum plaster, total thickness between 5/8 and 3/4", were applied to each face of the test wall. The weight per square foot of the finished structure was estimated by weighing samples out from the test wall after the tests were completed.

Test no.2 was on the same construction as no.1, except that strips of Masonite were stood loosely in the spaces between the studs.

The method of Test was that originally devised by Professor Wallace Sabine and described in various publications from this laboratory. It consists of producing sound of a known initial intensity in the large highly reverberant room known as the Sound Chamber. After the source of sound has stopped, the sound persists for a considerable length of time in thisroom, dying away logarithmically. By noting the times required for the sound to die away to the threshold of audibility, first in the Sound Chamber, and then in the Test Chamber on the further side of the Test Wall, the ratic of sound intensities on the two sides of the test wall can be computed. The logarithm of this ratic for any tone has been taken as a measure of the sound reduction produced by a given wall for the particular tone. Following the standard practice in such tests, 17 different tones covering the range from one octave below middle C to four octaves above middle C are employed. The average values of these logarithms is taken as a measure of the sound insulating efficiency of the partition.

Daar de metingen binnenshuis plaats vonden, konden thans tevens de filters A vergeleken worden (zie tabel 2).

TABEL 2.

Toonhoogte	A 124	A 173	A 124	A 173
125	30,0	33,5	40,0	44,0
250	30,0	33,8	40,0	44,2
500	30,0	34,2	40,0	45,1
1000	30,0	35,5	40,0	45,2
2000	30,0	34,0	40,0	44,8
3000	30,0	33,4	40,0	44,8
4000	30,0	32,2	40,0	43,0

Volgens de door A.S.A. vastgestelde curven zouden bij 1000 Hertz en 40 db onderlinge verschillen van 5,5 db mogen voorkomen. Het is echter de vraag of inderdaad de eene meter ca. 2,5 db te weinig en de andere ca. 2,5 db te veel aanwijst.

Met vriendelijke groeten, gaarne Uw dw.

w.g. Dr.H.C.Huizing.