ACOUSTICS AND BUILDING PHYSICS
NOISE CONTROL
ENVIRONMENTAL TECHNOLOGY
FIRE SAFETY

PEUTZ

Member ONRI
ISO-9001: 2000 certified

Report

Laboratory for Acoustics

Determination of the reduction of impact noise by single and multi-layered floor coverings

Report number A 1403-1E dd. 12 October 2007

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1. INTRODUCTION

At the request of Estilon BV based in Eindhoven (The Netherlands) sound measurements have been carried out in order to determine the reduction of transmitted impact noise by several

floor coverings

in the Laboratory for Acoustics of Peutz bv, at Mook, The Netherlands (see figure 1).

For this type of measurements the Laboratory for Acoustics has been accredited by the Dutch "Stichting Raad voor Accreditatie" (RvA).
The RvA is member of the EA MLA[1]

[1] **EA MLA**: **E**uropean **A**ccreditation Organisation **M**ulti**L**ateral **A**greement: http://www.european-accreditation.org

EA: "*Certificates and reports issued by bodies accredited by MLA and MRA members are considered to have the same degree of credibility, and are accepted in MLA and MRA countries.*"

2. NORMS AND GUIDELINES

The measurements have been carried out according to the Quality Manual of the Laboratory for Acoustics aswell as:

ISO 140-6:1998	Acoustics - Measurement of sound insulation in building and of building elements - Part 6: Laboratory measurements of impact sound insulation of floors
Note:	*This international norm is accepted by all members of the European Union as European Norm EN ISO 140-6:1998*
ISO 140-8:1997	Acoustics - Measurement of sound insulation in buildings and of building elements - Part 8: Laboratory measurements of the reduction of transmitted impact noise by floor coverings on a heavy-weight floor
Note:	*This international norm is accepted by all members of the European Union as European Norm EN ISO 140-8:1997*

Other related norms:

ISO 140-1:1997	Acoustics - Measurement of sound insulation in buildings and of building elements - Part 1: Requirements for laboratory test facilities with suppresed flanking transmission
Note:	*This international norm is accepted by all members of the European Union as European Norm EN ISO 140-1:1997*
ISO 140-2:1991	Acoustics - Measurement of sound insulation in buildings and of building elements - Part 2: Determination, verification and application of precision data
Note:	*This international norm is accepted by all members of the European Union as European Norm EN 20140-2:1993*
ISO 717-2:1996	Acoustics - Rating of sound insulation in buildings and of building elements - Part 2: Impact sound insulation
Note:	*This international norm is accepted by all members of the European Union as European Norm EN ISO 717-2:1996*

3. TESTED CONSTRUCTION

The following data have been provided by the principal, supplemented by observations in the laboratory where applicable.

In total 15 variants have been investigated with directly on top of the concrete laboratory floor a single resilent layer or a multi-layered floor covering. The following variants are tested (description from top to bottom):

Variant 1:
Resilent layer: Elastilon Basic;
Thickness: 3 mm;
Mass: 0,23 kg/m^2 (weighted).

Variant 2:
Resilent layer: Elastilon Strong;
Thickness: 3 mm;
Mass: 0,30 kg/m^2 (weighted).

Variant 3:
Resilent layer: Elastilon Basic;
Thickness: 5 mm;
Mass: 0,28 kg/m^2 (weighted).

Variant 4:
Resilent layer: Carpet tiles (heavy duty);
Mass: 4,13 kg/m^2 (weighted).

Variant 5:
Wooden floor: type Equi, t = 10,9 mm;
Resilent layer: Elastilon Strong, t =3 mm (glued at the Equi);
Total mass: 9,18 kg/m^2 (weighted).

Variant 6:
Wooden floor: type Equi, t = 10,9 mm;
Resilent layer: Elastilon Strong, t =3 mm (glued at the Equi);
Total mass: 9,18 kg/m^2 (weighted);
Extra layer: rubber, type Universal, t = 2,5 mm, m = 2,77 kg/m^2 (weighted).

Variant 7:

Wooden floor:	type Equi, t = 10,9 mm;
Resilent layer:	Elastilon Strong, t =3 mm (glued at the Equi);
Total mass:	9,18 kg/m^2 (weighted);
Extra layer 1:	rubber, type Universal, t = 2,5 mm, m = 2,77 kg/m^2 (weighted);
Extra layer 2:	soft fibreboard panels, t = 10,3 mm, m = 3,49 kg/m^2 (weighted).

Variant 8:

Wooden floor:	type Equi, t = 10,9 mm;
Resilent layer:	Elastilon Strong, t =3 mm (glued at the Equi);
Total mass:	9,18 kg/m^2 (weighted);
Extra layer:	resilent material, type Akoestilon, t = 1,4 mm, m = 2,33 kg/m^2 (weighted).

Variant 9:

Wooden floor:	type Cosmo, t = 10 mm;
Resilent layer:	Elastilon Strong , t =3 mm (glued at the Cosmo);
Total mass:	6,91 kg/m^2 (weighted).

Variant 10:

Wooden floor:	type Cosmo, t = 10 mm;
Resilent layer:	Elastilon Strong , t =3 mm (glued at the Cosmo);
Total mass:	6,91 kg/m^2 (weighted).
Extra layer:	rubber, type Universal, t = 2,5 mm, m = 2,77 kg/m^2 (weighted);

Variant 11:

Wooden floor:	type Cosmo, t = 10 mm;
Resilent layer:	Elastilon Strong , t =3 mm (glued at the Cosmo);
Total mass:	6,91 kg/m^2 (weighted).
Extra layer 1:	rubber, type Universal, t = 2,5 mm, m = 2,77 kg/m^2 (weighted);
Extra layer 2:	soft fibreboard panels, t = 10,3 mm, m = 3,49 kg/m^2 (weighted).

Variant 12:

Wooden floor:	type Lopark Royal Plus, t = 9,8 mm;
Resilent layer:	Elastilon Strong , t =3 mm (glued at the Lopark Royal Plus);
Total mass:	6,86 kg/m^2 (weighted).

Variant 13:

Wooden floor:	type Lopark Royal Plus, t = 9,8 mm;
Resilent layer:	Elastilon Strong , t =3 mm (glued at the Lopark Royal Plus);
Total mass:	6,91 kg/m^2 (weighted).
Extra layer:	rubber, type Universal, t = 2,5 mm, m = 2,77 kg/m^2 (weighted);

Variant 14:

Wooden floor:	type Lopark Royal Plus, t = 9,8 mm;
Resilent layer:	Elastilon Strong , t =3 mm (glued at the Lopark Royal Plus);
Total mass:	6,91 kg/m^2 (weighted).
Extra layer 1:	rubber, type Universal, t = 2,5 mm, m = 2,77 kg/m^2 (weighted);
Extra layer 2:	soft fibreboard panels, t = 10,3 mm, m = 3,49 kg/m^2 (weighted).

Variant 15:

Wooden floor:	type Lopark Royal Maxi, t = 11 mm;
Resilent layer:	Elastilon Strong , t =3 mm (glued at the Lopark Royal Maxi);
Total mass:	7,45 kg/m^2 (weighted).
Extra layer 1:	rubber, type Universal, t = 2,5 mm, m = 2,77 kg/m^2 (weighted);
Extra layer 2:	soft fibreboard panels, t = 10,3 mm, m = 3,49 kg/m^2 (weighted).

The results as presented here relate only to the tested items and laboratory conditions as described in this report. The laboratory can make no judgement about the representativity of the tested samples.

4. MEASUREMENTS

4.1. Method

The tests were conducted in accordance with the provisions of the test method ISO 140-8. A detailed description of the test set up has been given in the figures 1 and 2 of this report.

Two vertically adjacent rooms are used, the upper one being designated the "source room" and the lower one the "receiving room". The rooms are separated by a so called "heavyweight standard floor" on which the covering under test is installed. This floor is a 140 mm thick concrete floor. By means of an "impact sound generator" as defined in ISO 140-8 Annex A (also called "tapping machine") the impact sound is generated. This tapping machine has five steel hammers which continuously and in turn fall on the floor in such a way that the floor is excited with a frequency of 10 strokes per second. The impact sound generator's mass is about 12 kg and it is supported by three points resting on the floor or on the covering under test.

The tapping machine is positioned at 6 or more different positions on the standard floor as well as on the covering under test.

In the receiving room the resulting sound pressure level is measured by means of a microphone on a continuously rotating boom, so the (time- and space-) averaged sound pressure level in this room is determined.

The reverberation time of the receiving room is also measured.

4.2. Calculations

The measurements as well as the calculations are made with a 1/3-octave bandwidth from 100 to 5000 Hz. Where applicable octave-band values are calculated from those 1/3-octave bands.

4.2.1. Normalized impact sound level

From the reverberation measurements the equivalent sound absorption A (per frequency-band) is determined (and expressed in m^2) according to the next equation:

$$A = \frac{0,16\,V}{T} \qquad (1)$$

in which:

A = the equivalent sound absorption [m^2]
V = the volume of the receiving room [m^3]
T = the reverberation time in the receiving room [s]

Subsequently the normalized impact sound level L_n is calculated according to:

$$L_n = L_i + 10\ lg\left(\frac{A}{A_0}\right) \quad (2)$$

in which:

L_n = the normalized impact sound level [dB]

L_i = the average sound pressure level in the receiving room as a result of the impact sound generator on 6 positions [dB]

A = the equivalent sound absorption of the receiving room [m^2]

A_0 = the reference sound absorption (= 10 m^2)

4.2.2. Reduction of transmitted impact noise

By comparison of the normalized impact sound level of the bare standard floor and of the standard floor with the covering under test the relative reduction in transmitted impact noise can be determined. This procedure will result in the frequency dependant reduction of transmitted impact noise ΔL. The calculations are made according to:

$$\Delta L = L_{n1} - L_{n2} \quad (3)$$

in which:

ΔL = the reduction of transmitted impact noise

L_{n1} = the normalized impact sound level in the receiving room while the tapping machine is on the standard floor

L_{n2} = the normalized impact sound level in the receiving room while the tapping machine is on the covering under test applied on top of the standard floor

4.3. Accuracy

The accuracy of the results may be expressed in terms of repeatability (within one laboratory) and the reproducibility (between different laboratories)

4.3.1. Repeatability r

When: - two tests are performed on identical test material - within a short period of time - by the same person or team - using the same instrumentation - under unchanged environmental conditions - the probability will be 95% that the difference between the two test results will be less than or equal to r.

In order to determine the repeatability of this type of measurements carried out at adviesbureau Peutz a series of measurements were made according to ISO 140-2. From the results it can be concluded that the repeatability r is 1,9 dB (maximum) for the frequency-bands 100 to 250 Hz and 1,0 dB (maximum) for the frequency bands 315 to 3150 Hz.

De repeatability regarding the single number rating L_n is 0,3 dB (maximum), after rounding to an integer dB (as demanded by ISO 717) a repeatability of ±1 dB may be assumed.

From those results it is clear that the repeatability is in agreement with the demands of ISO 140-2.

4.3.2. Reproducibility R

When: - two tests are performed on identical test material - in different laboratories – by different person(s) - under different environmental conditions - the probability will be 95% that the difference between the two test results will be less than or equal to R

Based on various series of measurements ISO 140-2 points out what level of reproducibility may be expected. The reproducibility R of the single number rating ΔL_w will be about 2 dB.

4.4. Environmental conditions during the measurements

room	temperature [°C]	Relative humidity [%]
1	19,4	57
9	19,2	56

4.5. Results

In figure 3 the normalized impact sound level of the standard laboratory floor with its related single number ratings are presented. The results of the measurements of the floor coverings under test are presented in table 2 to 4 and in figure 4 to 18 of this report.

In the tables as well as in the graphs the calculated values are presented in 1/3 octave bands. From those values the following single number rating has been calculated and presented:

- the “weighted reduction of impact sound pressure level $\triangle L_W$“ according to ISO 717-2;

- the "single number reduction based on the unweighted linear impact sound pressure level $\triangle L_{lin}$" according to ISO 717-2, Annex A.

Table 1 Measurement results

	the reduction of transmitted impact noise ΔL [dB]									
variant nr.	1		2		3		4		5	
record nr.	#64		#65		#66		#67		#68	
Toplayer	Elastilon Basic t = 3 mm		Elastilon Strong t = 3 mm		Elastilon Basic t = 5 mm		Carpet tiles		Wooden floor type Equi	
Underlayer	-		-		-		-		Elastilon Strong, t = 3 mm	
See figure	4		5		6		7		8	
frequency [Hz]	1/3 oct.	1/1 oct.	1/3 oct.	1/1 oct.	1/3 oct.	1/1 oct.	1/3 oct.	1/1 oct.	1/3 oct.	1/1 oct.
100	0,5		2,3		5,6		1,5		0,6	
125	4,6	3,0	4,7	4,2	10,6	8,9	3,3	2,5	3,2	2,0
160	6,0		6,6		15,5		2,8		2,5	
200	10,4		11,0		25,0		5,7		3,8	
250	15,4	13,7	16,5	14,5	31,9	28,5	6,4	6,8	4,0	4,6
315	20,7		23,3		34,0		9,0		6,4	
400	24,2		25,3		40,2		12,0		9,2	
500	29,3	27,6	31,0	28,9	42,4	42,1	14,2	14,0	12,5	11,6
630	35,3		41,0		45,1		17,4		14,9	
800	40,9		42,1		47,0		21,3		18,1	
1000	46,1	44,1	49,2	45,6	51,3	49,3	25,5	24,4	24,0	21,7
1250	49,8		50,5		51,1		31,8		30,1	
1600	53,9		53,5		53,7		38,4		37,3	
2000	58,9	57,0	57,7	56,3	56,7	56,0	45,2	42,1	42,3	40,4
2500	61,8		60,5		59,8		50,3		45,5	
3150	60,5		60,0		59,6		53,8		49,0	
4000	59,2	59,3	58,6	58,7	59,2	58,9	54,5	54,5	50,9	50,6
5000	58,5		57,8		58,1		55,3		52,7	
ΔL_{lin}	13 dB		14 dB		19 dB		10 dB		9 dB	
ΔL_w	25 dB		26 dB		33 dB		21 dB		20 dB	

Table 2 Measurement results

	the reduction of transmitted impact noise ΔL [dB]									
variant nr.	6		7		8		9		10	
record nr.	#69		#78		#142		#102		#94	
Wooden floor	Equi		Equi		Equi		Cosmo		Cosmo	
Resilent layer	Elastilon Strong		Elastilon Strong		Elastilon Strong		Elastilon Strong		Elastilon Strong	
Extra layer 1	Universal		Universal		Akoestilon		-		Universal	
Extra layer 2	-		Soft Fibreboard		-		-		-	
See figure	9		10		11		12		13	
frequency [Hz]	1/3 oct.	1/1 oct.	1/3 oct.	1/1 oct.	1/3 oct.	1/1 oct.	1/3 oct.	1/1 oct.	1/3 oct.	1/1 oct.
100	1,8		0,3		1,9		0,9		2,8	
125	2,4	2,3	3,0	2,0	3,2	2,7	4,1	2,5	4,7	3,8
160	2,9		3,4		3,2		3,3		4,1	
200	3,8		6,8		5,7		6,5		6,5	
250	4,3	4,7	8,9	8,9	6,0	6,5	6,4	7,3	6,7	7,3
315	6,4		12,9		8,1		9,7		9,4	
400	8,8		18,4		11,4		13,3		12,5	
500	13,7	12,1	23,7	21,7	14,2	13,7	16,4	15,5	16,4	15,5
630	19,1		28,3		17,4		18,0		22,4	
800	22,4		31,4		21,0		20,5		24,6	
1000	27,8	25,7	34,2	33,3	26,7	24,5	23,9	23,3	28,6	27,5
1250	32,0		35,3		32,1		30,0		32,7	
1600	36,9		36,9		36,9		36,3		38,8	
2000	40,0	39,1	40,7	39,9	38,7	38,0	42,9	40,0	42,3	41,3
2500	41,7		48,0		38,8		48,6		45,3	
3150	44,4		53,7		41,7		52,9		48,0	
4000	47,8	47,1	55,2	54,7	45,3	44,4	54,5	54,0	51,3	50,4
5000	52,2		55,5		49,7		54,9		53,6	
ΔL_{lin}	9 dB		11 dB		10 dB		10 dB		11 dB	
ΔL_w	20 dB		22 dB		21 dB		22 dB		22 dB	

Table 3 Measurement results

	the reduction of transmitted impact noise ΔL [dB]									
variant nr.	11		12		13		14		15	
record nr.	#86		#134		#126		#118		#110	
Wooden floor	Cosmo		Lopark Royal Plus		Lopark Royal Plus		Lopark Royal Plus		Lopark Royal Maxi	
Resilent layer	Elastilon Strong		Elastilon Strong		Elastilon Strong		Elastilon Strong		Elastilon Strong	
Extra layer 1	Universal		-		Universal		Universal		Universal	
Extra layer 2	Soft Fibreboard		-		-		Soft Fibreboard		Soft Fibreboard	
See figure	14		15		16		17		18	
frequency [Hz]	1/3 oct.	1/1 oct.	1/3 oct.	1/1 oct.	1/3 oct.	1/1 oct.	1/3 oct.	1/1 oct.	1/3 oct.	1/1 oct.
100	1,5		0,7		0,2		-0,3		0,3	
125	3,7	3,0	1,7	1,4	2,7	1,7	2,1	1,2	1,9	1,4
160	4,2		1,8		2,6		2,5		2,1	
200	8,2		3,4		4,3		5,3		5,1	
250	9,8	10,0	3,0	3,6	3,6	4,5	7,5	7,3	7,0	7,0
315	13,9		4,6		6,0		10,8		10,5	
400	19,0		7,5		9,9		15,3		14,8	
500	24,5	22,4	10,3	10,0	13,9	12,8	19,9	18,5	18,7	17,8
630	29,9		15,7		19,0		25,6		24,7	
800	32,5		18,1		21,0		29,5		30,4	
1000	35,0	34,4	19,9	20,3	26,9	24,5	33,5	32,3	33,2	32,3
1250	36,7		26,3		32,4		37,1		34,2	
1600	40,2		31,6		37,4		40,3		35,6	
2000	42,6	42,4	39,4	35,5	40,0	39,4	41,2	41,4	40,7	39,0
2500	46,8		44,6		42,1		43,4		46,8	
3150	53,1		49,2		45,0		48,8		49,6	
4000	55,3	54,5	51,9	51,1	48,8	47,8	52,7	51,5	53,2	52,1
5000	55,6		53,0		52,8		55,6		55,4	
ΔL_{lin}	12 dB		8 dB		9 dB		10 dB		10 dB	
ΔL_w	23 dB		19 dB		20 dB		21 dB		21 dB	

These results were obtained using a tapping machine with steel hammers and under laboratory conditions.
The reduction of transmitted impact noise is depending on the floor on which this covering will be installed. If that situation differs from the laboratory conditions, different results may be expected.

Mook,

Th. Scheers
Laboratory Supervisor

ir. M.L.S Vercammen
Manager

This report contains: 13 pages and 18 figures.

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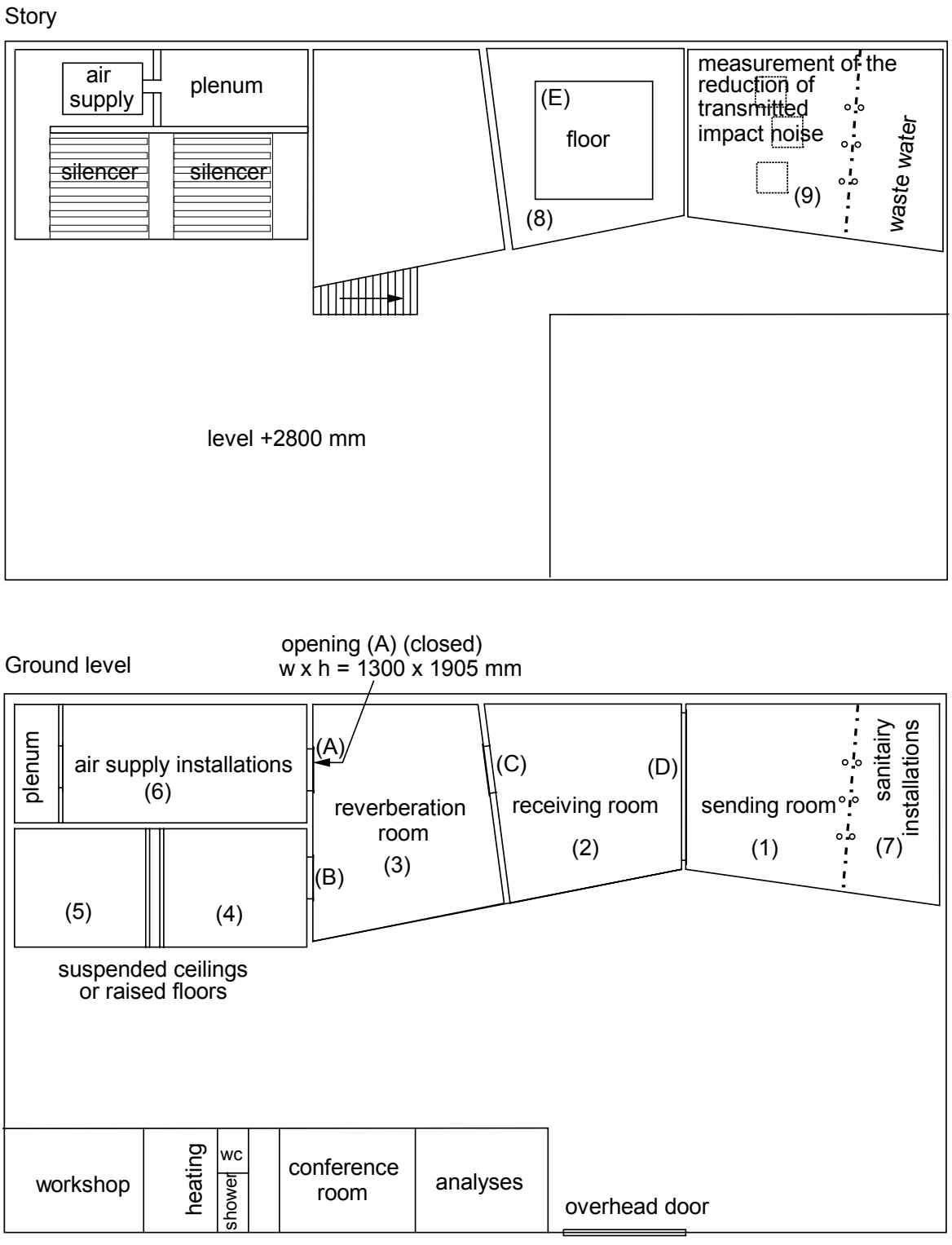
OVERVIEW



TEST OPENINGS (w x h in mm)
(B) 1000 x 2200
(C) 1500 x 1250
(D) 4300 x 2800
(E) 4000 x 4000

0 1 2 3 4 5 m
scale

PEUTZ bv
Lindenlaan 41, NL-6584 AC MOLENHOEK (LB), NETHERLANDS

DETERMINATION OF THE REDUCTION OF TRANSMITTED IMPACT NOISE

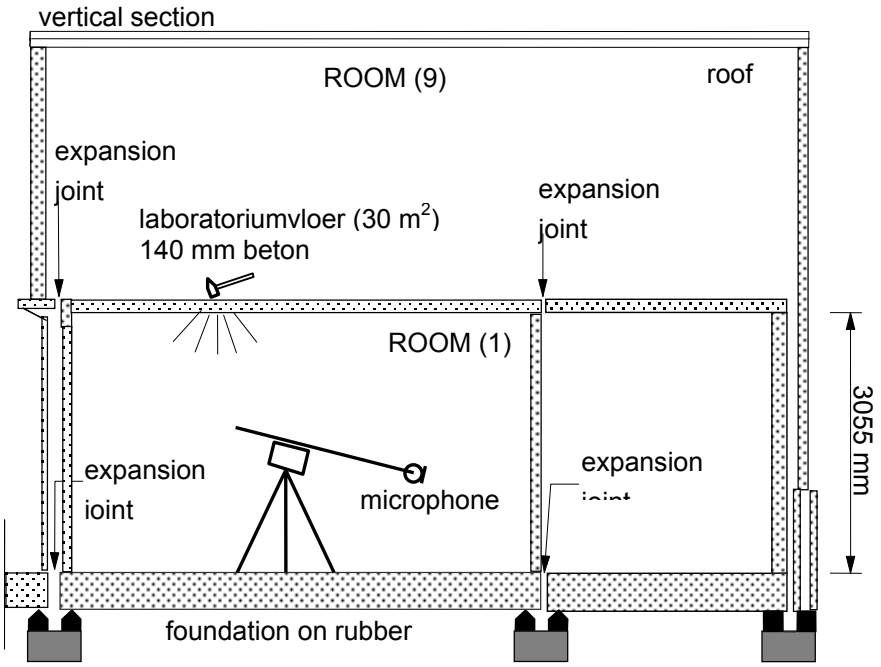
The testrooms meet the requirements ISO 140

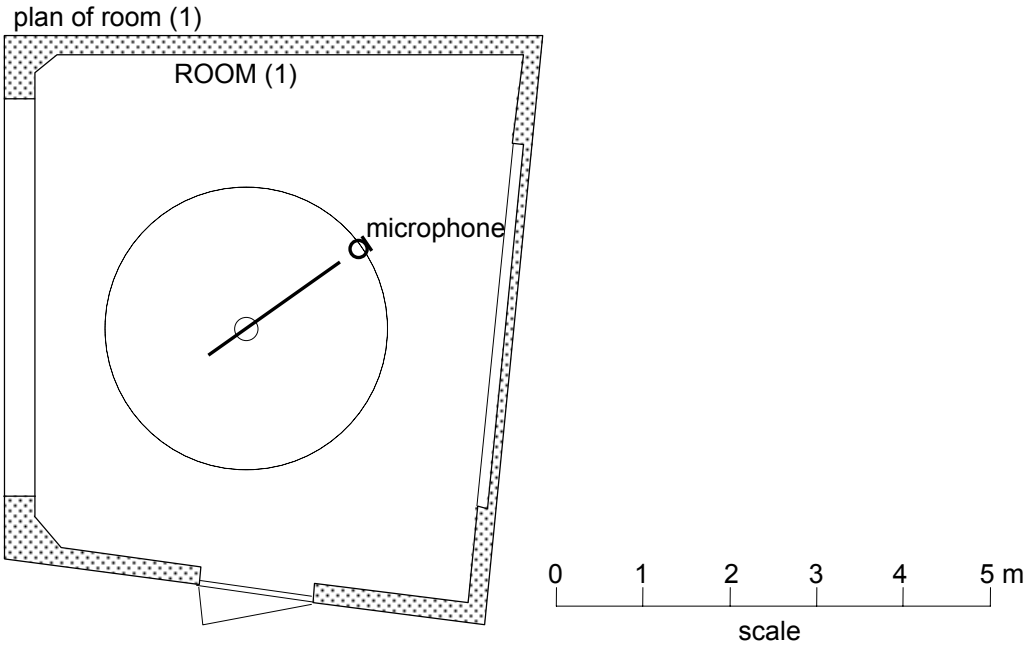
Additional data:

- volume of room (1): 94 m^3

reverbration time of room (1) measured at 24-06-2004

frequency (1/1 oct.)	125	250	500	1000	2000	4000	Hz
reverberation time	2,37	2,27	2,34	2,21	2,01	1,61	s





Insulat rel. 2.4, mode 8 file: a1403_T#1-12

THE NORMALIZED IMPACT SOUND PRESSURE LEVEL L_n OF A FLOOR ACCORDING TO ISO 140-6:1998
principal: Elastilon BV

TESTING RvA L 334

construction tested: heavyweight standard floor

volume measuring room: 94 m^3

surface area floor: 30 m^2

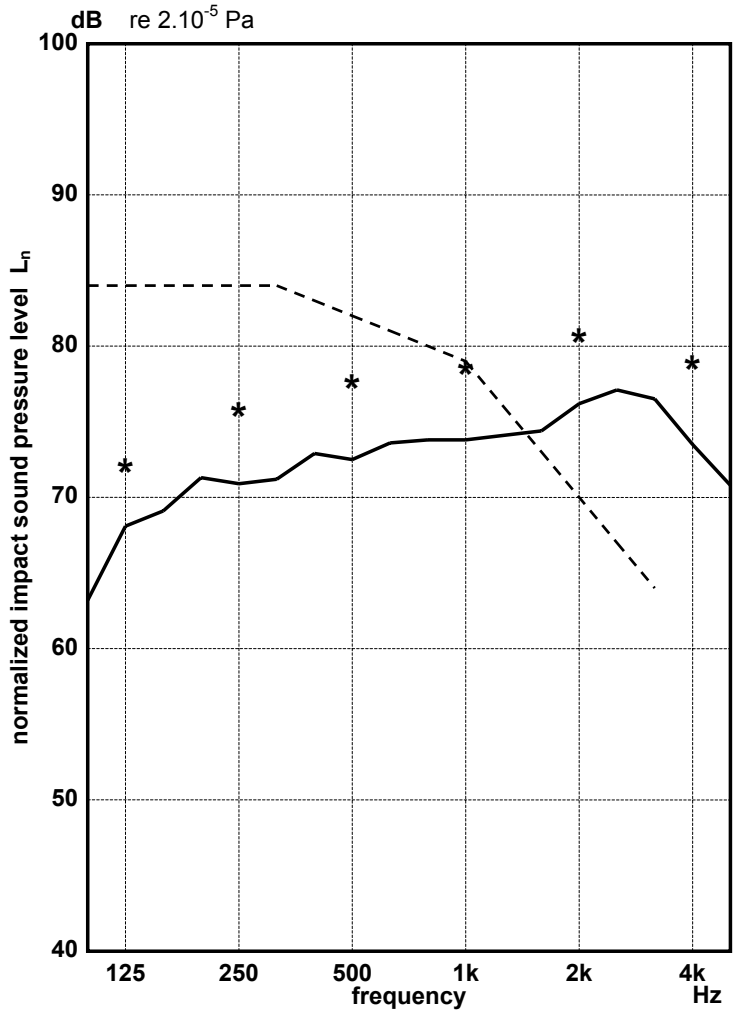
measured at:
Peutz Laboratory for Acoustics

signal: tapping machine

bandwidth: 1/3 octave

A_0 = 10.0 m^2

ISO 717-2:1996
$L_{n,w}(C_I)$ = 82(-12) dB



——— 1/3 oct.
* 1/1 oct.
– – – – ref. curve (ISO 717)

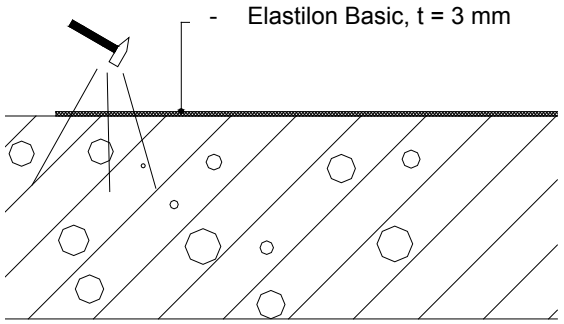
		63,2	71,3	72,9	73,8	74,4	76,5
	1/3 oct.	68,1	70,9	72,5	73,8	76,2	73,5 dB
		69,1	71,2	73,6	74,1	77,1	70,8
	1/1 oct.	**72,2**	**75,9**	**77,8**	**78,7**	**80,8**	**79,0 dB**

Mook, 24-06-2004

DETERMINING THE REDUCTION OF TRANSMITTED IMPACT NOISE BY FLOOR COVERINGS ACCORDING TO ISO 140-8:1997
principal: Elastilon BV

TESTING RvA L 334

construction tested: variant 1



volume measuring room: 94 m^3

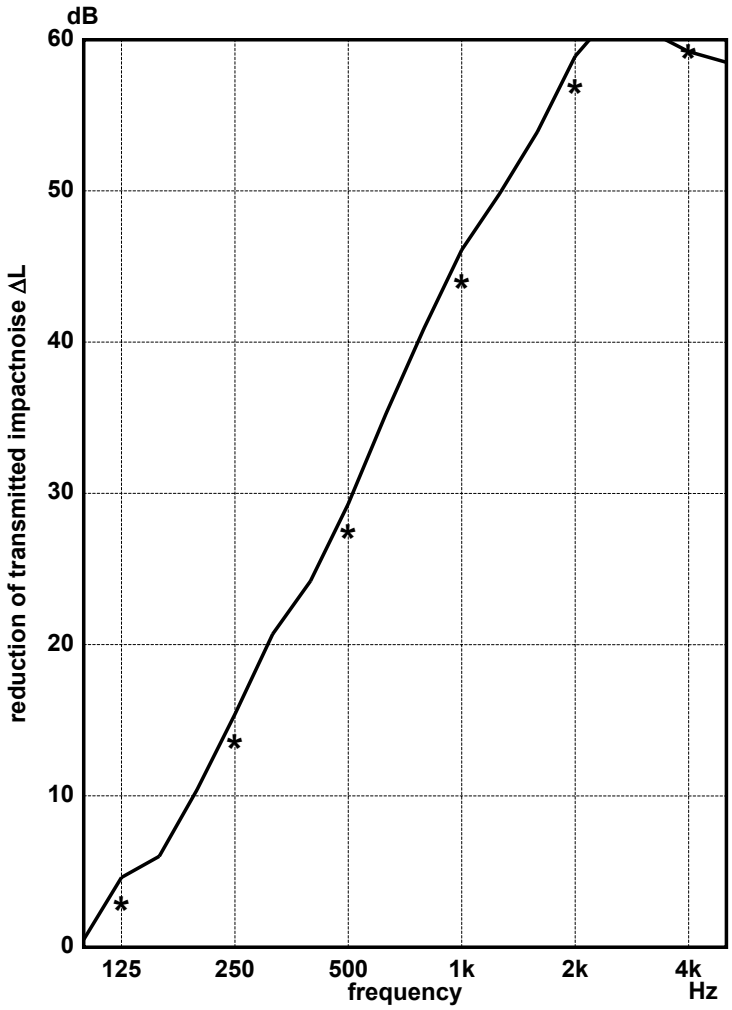
surface area floor: 15 m^2

measured at:
Peutz Laboratory for Acoustics

signal: tapping machine

bandwidth: 1/3 octave

ISO 717-2:1996
ΔL_{lin} = 13 dB
ΔL_w = 25 dB



——— 1/3 oct.
* 1/1 oct.

		0,5	10,4	24,2	40,9	53,9	60,5
	1/3 oct.	4,6	15,4	29,3	46,1	58,9	59,2 dB
		6,0	20,7	35,3	49,8	61,8	58,5
	1/1 oct.	**3,0**	**13,7**	**27,6**	**44,1**	**57,0**	**59,3 dB**

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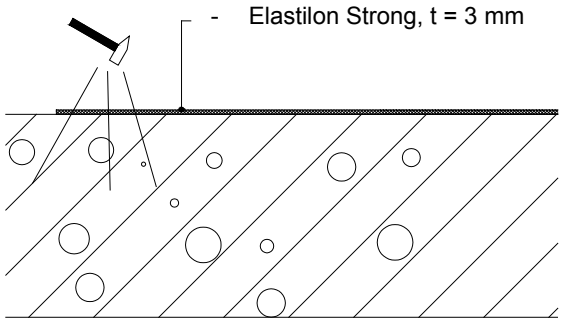
DETERMINING THE REDUCTION OF TRANSMITTED IMPACT NOISE BY FLOOR COVERINGS ACCORDING TO ISO 140-8:1997
principal: Elastilon BV

TESTING RvA L 334

construction tested: variant 2



volume measuring room: 94 m^3

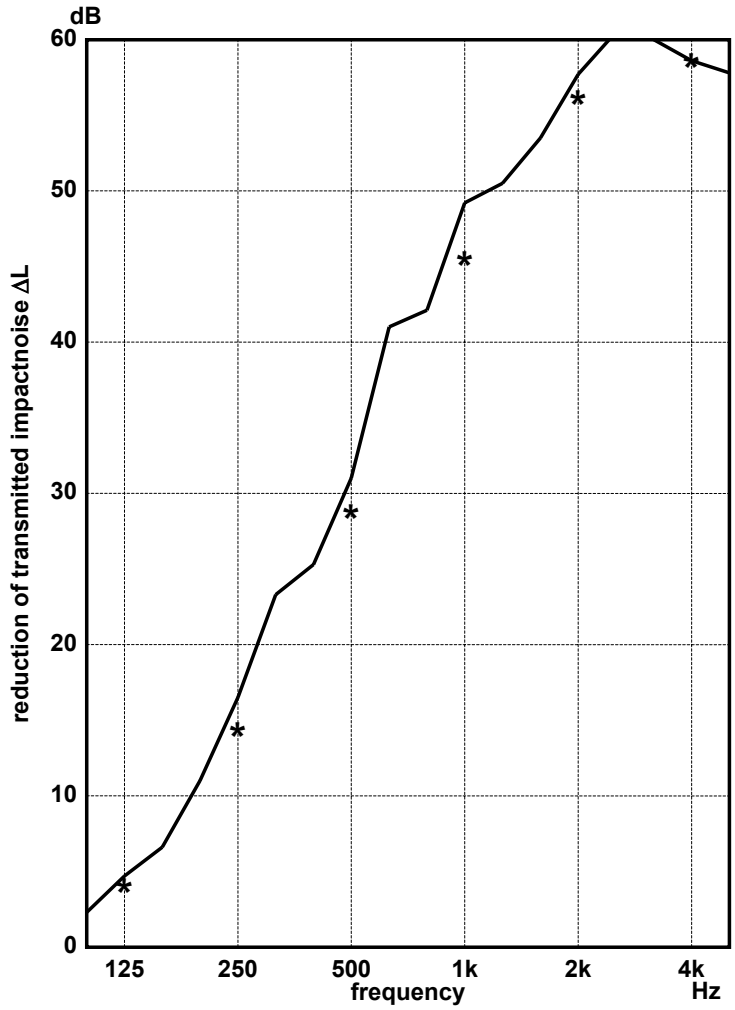
surface area floor: 15 m^2

measured at:
Peutz Laboratory for Acoustics

signal: tapping machine

bandwidth: 1/3 octave

ISO 717-2:1996
ΔL_{lin} = 14 dB
ΔL_w = 26 dB



——— 1/3 oct.
* 1/1 oct.

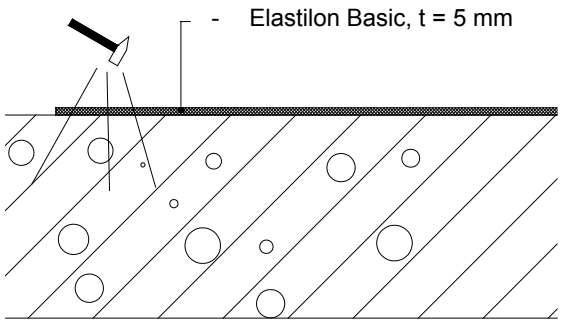
		2,3	11,0	25,3	42,1	53,5	60,0
	1/3 oct.	4,7	16,5	31,0	49,2	57,7	58,6 dB
		6,6	23,3	41,0	50,5	60,5	57,8
	1/1 oct.	**4,2**	**14,5**	**28,9**	**45,6**	**56,3**	**58,7 dB**

Mook, 24-06-2004

DETERMINING THE REDUCTION OF TRANSMITTED IMPACT NOISE BY FLOOR COVERINGS ACCORDING TO ISO 140-8:1997
principal: Elastilon BV

TESTING RvA L 334

construction tested: variant 3



volume measuring room: 94 m^3

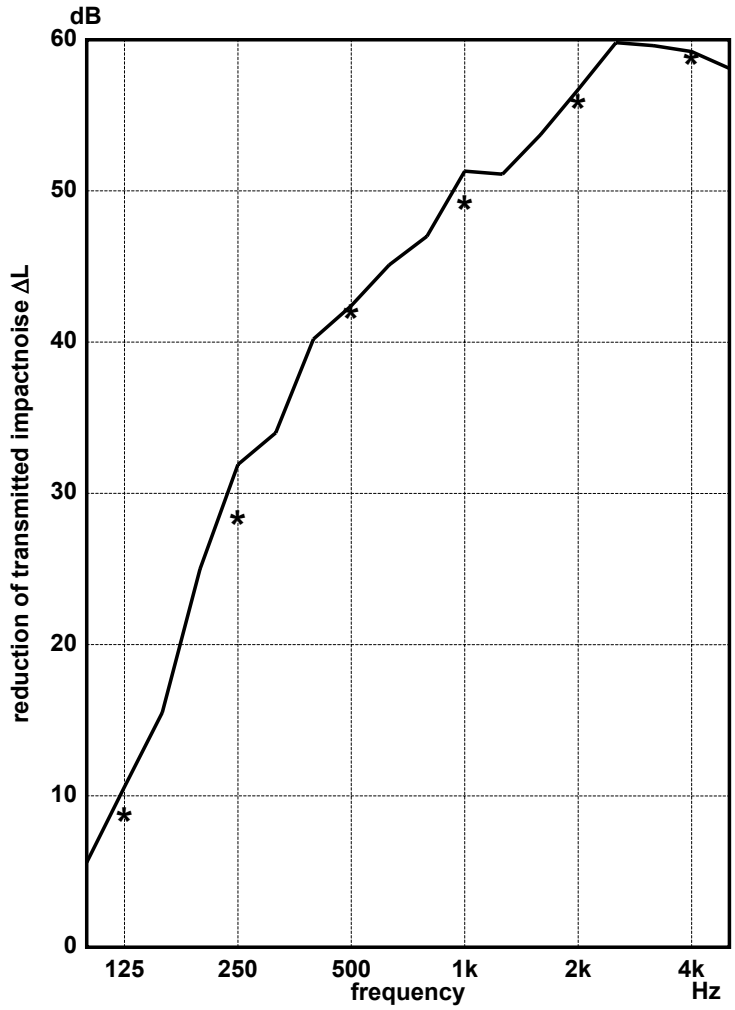
surface area floor: 15 m^2

measured at:
Peutz Laboratory for Acoustics

signal: tapping machine

bandwidth: 1/3 octave

ISO 717-2:1996
ΔL_{lin} = 19 dB
ΔL_w = 33 dB



——— 1/3 oct.
* 1/1 oct.

		5,6	25,0	40,2	47,0	53,7	59,6
	1/3 oct.	10,6	31,9	42,4	51,3	56,7	59,2 dB
		15,5	34,0	45,1	51,1	59,8	58,1
	1/1 oct.	**8,9**	**28,5**	**42,1**	**49,3**	**56,0**	**58,9 dB**

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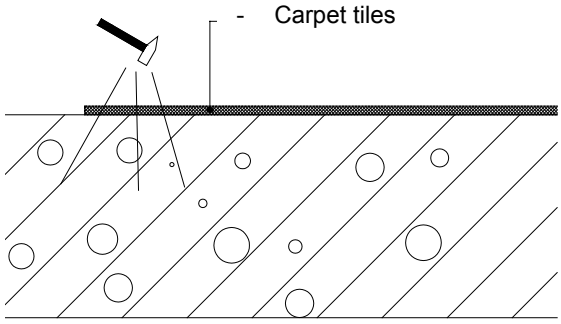
Mook, 24-06-2004

DETERMINING THE REDUCTION OF TRANSMITTED IMPACT NOISE BY FLOOR COVERINGS ACCORDING TO ISO 140-8:1997
principal: Elastilon BV

TESTING RvA L 334

construction tested: variant 4



volume measuring room: 94 m^3

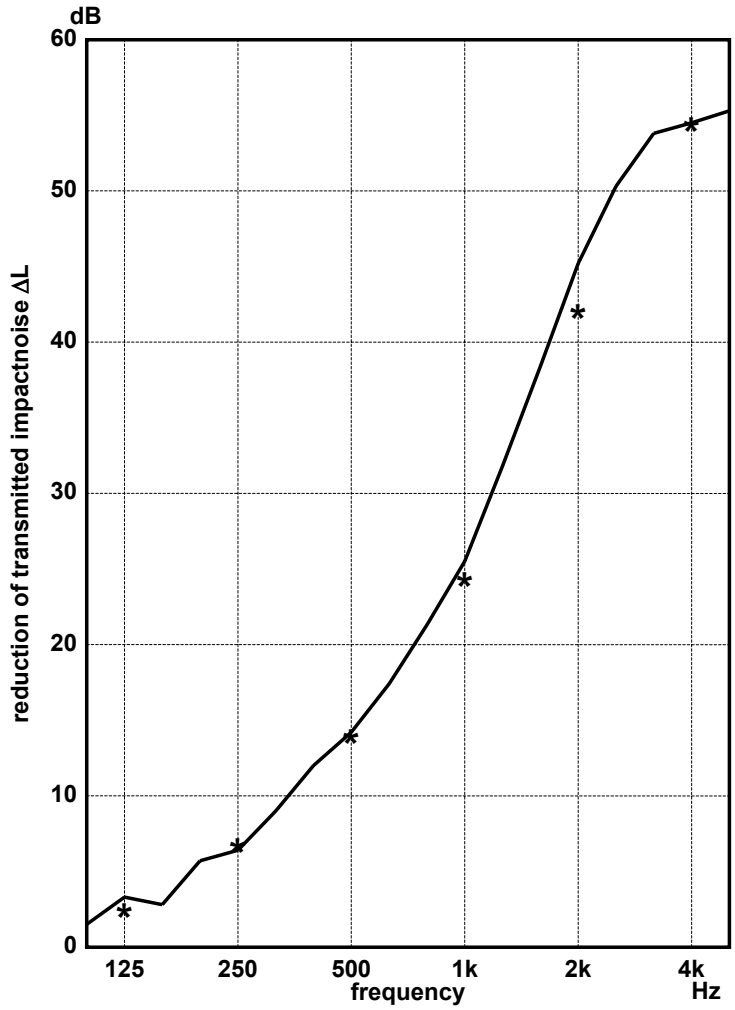
surface area floor: 8,8 m^2

measured at:
Peutz Laboratory for Acoustics

signal: tapping machine

bandwidth: 1/3 octave

ISO 717-2:1996
ΔL_{lin} = 10 dB
ΔL_w = 21 dB



——— 1/3 oct.
* 1/1 oct.

	1,5	5,7	12,0	21,3	38,4	53,8
1/3 oct.	3,3	6,4	14,2	25,5	45,2	54,5 dB
	2,8	9,0	17,4	31,8	50,3	55,3
1/1 oct.	**2,5**	**6,8**	**14,0**	**24,4**	**42,1**	**54,5 dB**

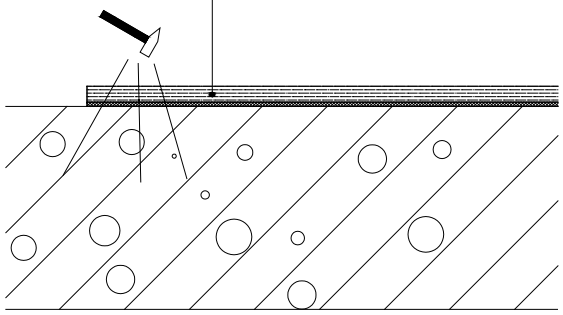
Mook, 24-06-2004

DETERMINING THE REDUCTION OF TRANSMITTED IMPACT NOISE BY FLOOR COVERINGS ACCORDING TO ISO 140-8:1997
principal: Elastilon BV

TESTING RvA L 334

construction tested: variant 5

- Wooden floor, type Equi
- Elastilon Strong, t = 3 mm



volume measuring room: 94 m^3

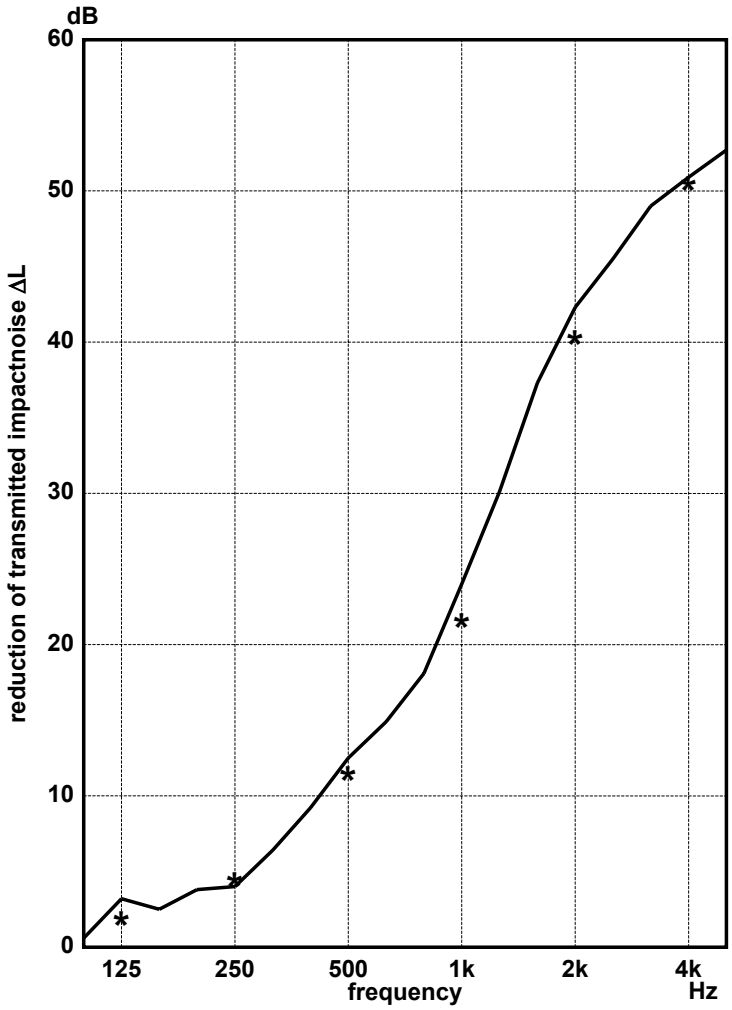
surface area floor: 11,1 m^2

measured at:
Peutz Laboratory for Acoustics

signal: tapping machine

bandwidth: 1/3 octave

ISO 717-2:1996
ΔL_{lin} = 9 dB
ΔL_w = 20 dB



——— 1/3 oct.
* 1/1 oct.

		0,6	3,8	9,2	18,1	37,3	49,0
	1/3 oct.	3,2	4,0	12,5	24,0	42,3	50,9 dB
		2,5	6,4	14,9	30,1	45,5	52,7
	1/1 oct.	**2,0**	**4,6**	**11,6**	**21,7**	**40,4**	**50,6 dB**

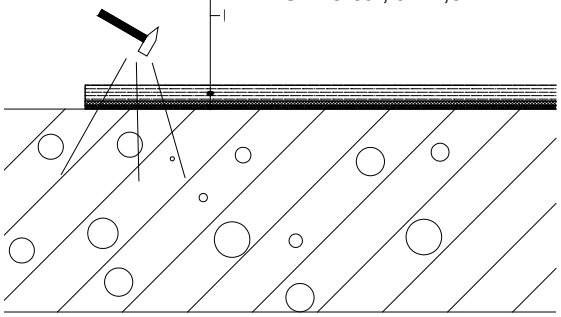
Mook, 24-06-2004

DETERMINING THE REDUCTION OF TRANSMITTED IMPACT NOISE BY FLOOR COVERINGS ACCORDING TO ISO 140-8:1997
principal: Elastilon BV

TESTING RvA L 334

construction tested: variant 6

- Wooden floor, type Equi
- Elastilon Strong, t = 3 mm
- Universal, t = 2,5 mm



volume measuring room: 94 m^3

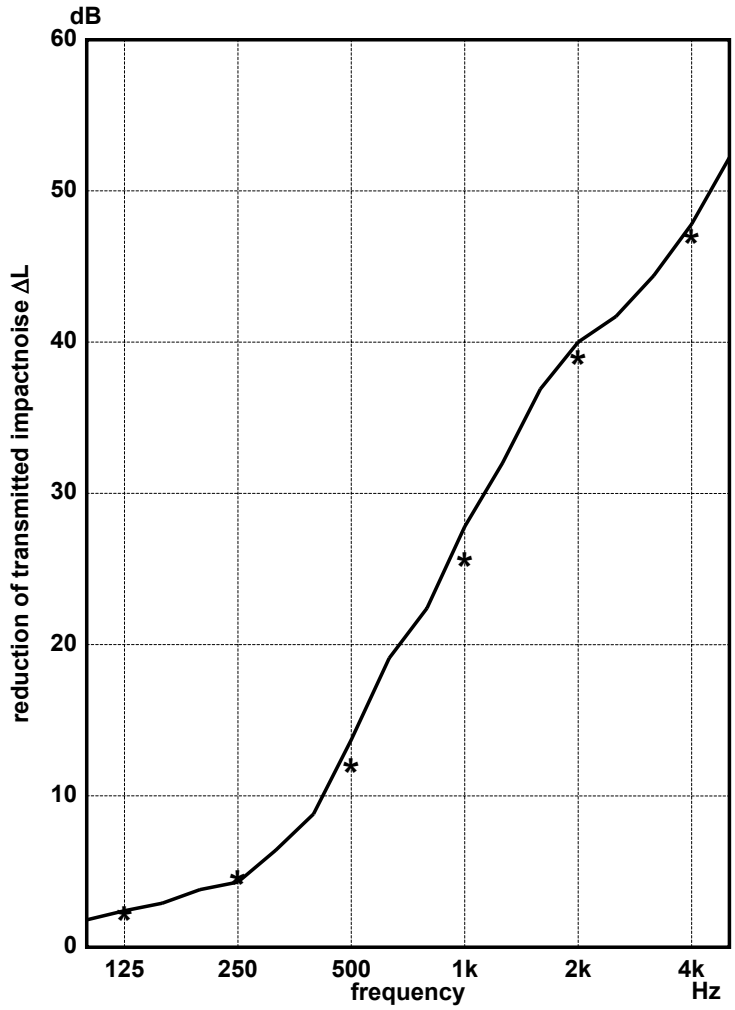
surface area floor: 11,1 m^2

measured at:
Peutz Laboratory for Acoustics

signal: tapping machine

bandwidth: 1/3 octave

ISO 717-2:1996
ΔL_{lin} = 9 dB
ΔL_w = 20 dB



——— 1/3 oct.
* 1/1 oct.

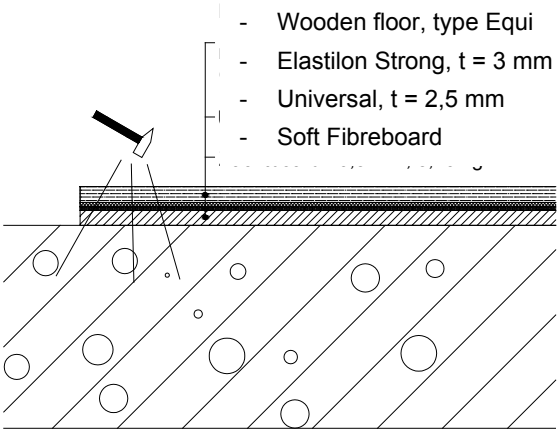
	1,8	3,8	8,8	22,4	36,9	44,4
1/3 oct.	2,4	4,3	13,7	27,8	40,0	47,8 dB
	2,9	6,4	19,1	32,0	41,7	52,2
1/1 oct.	**2,3**	**4,7**	**12,1**	**25,7**	**39,1**	**47,1 dB**

Mook, 24-06-2004

DETERMINING THE REDUCTION OF TRANSMITTED IMPACT NOISE BY FLOOR COVERINGS ACCORDING TO ISO 140-8:1997
principal: Elastilon BV

TESTING RvA L 334

construction tested: variant 7



volume measuring room: 94 m^3

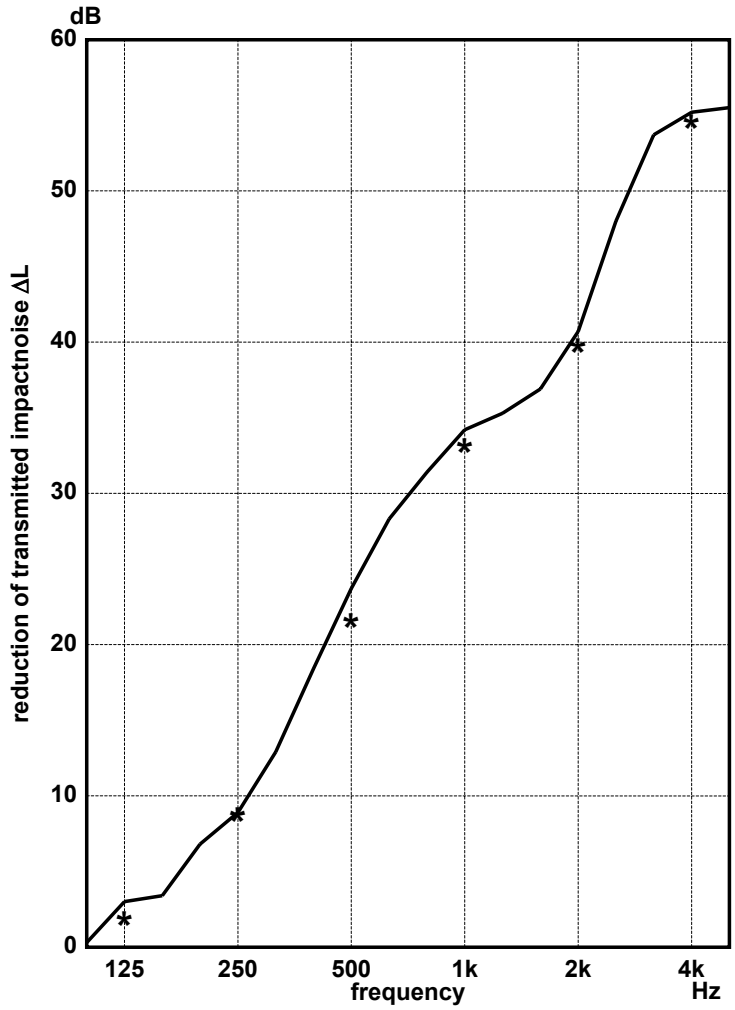
surface area floor: 11,1 m^2

measured at:
Peutz Laboratory for Acoustics

signal: tapping machine

bandwidth: 1/3 octave

ISO 717-2:1996
ΔL_{lin} = 11 dB
ΔL_w = 22 dB



——— 1/3 oct.
* 1/1 oct.

		0,3	6,8	18,4	31,4	36,9	53,7
	1/3 oct.	3,0	8,9	23,7	34,2	40,7	55,2 dB
		3,4	12,9	28,3	35,3	48,0	55,5
	1/1 oct.	**2,0**	**8,9**	**21,7**	**33,3**	**39,9**	**54,7 dB**

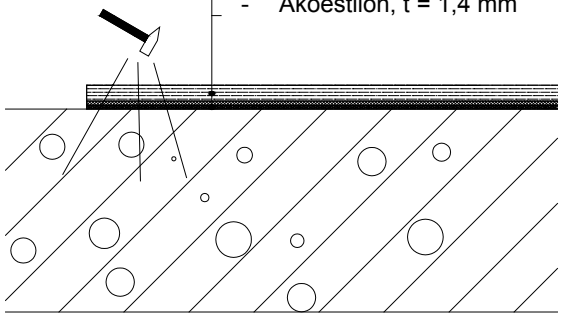
Mook, 24-06-2004

DETERMINING THE REDUCTION OF TRANSMITTED IMPACT NOISE BY FLOOR COVERINGS ACCORDING TO ISO 140-8:1997
principal: Elastilon BV

TESTING RvA L 334

construction tested: variant 8

- Wooden floor, type Equi
- Elastilon Strong, t = 3 mm
- Akoestilon, t = 1,4 mm



volume measuring room: 94 m^3

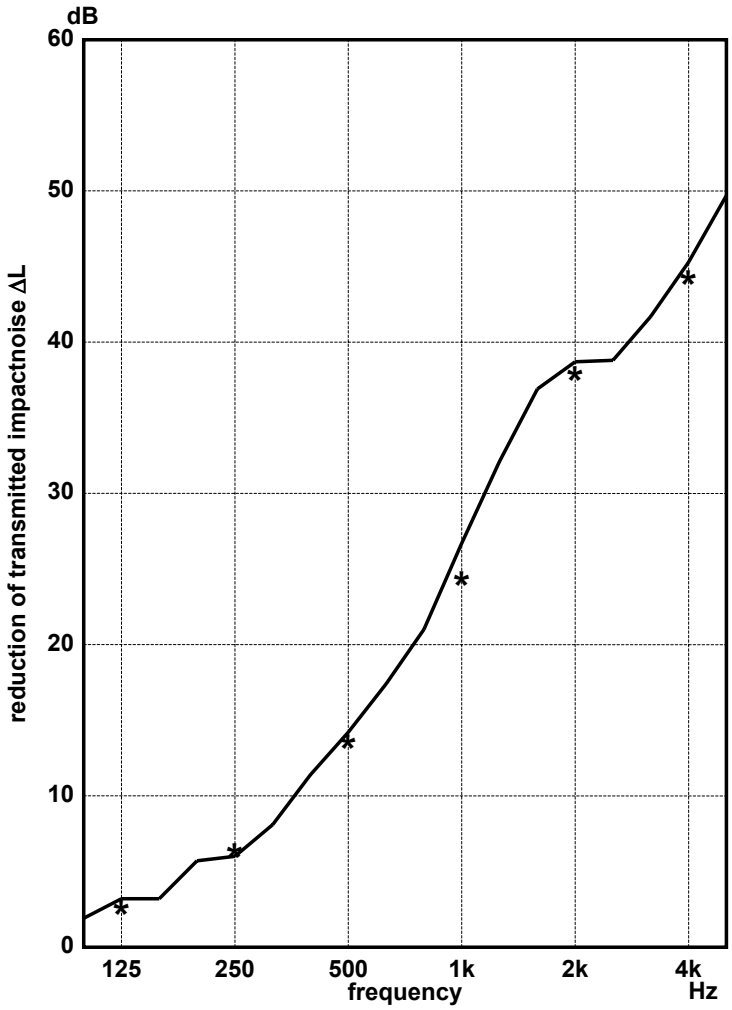
surface area floor: 10,5 m^2

measured at:
Peutz Laboratory for Acoustics

signal: tapping machine

bandwidth: 1/3 octave

ISO 717-2:1996
ΔL_{lin} = 10 dB
ΔL_w = 21 dB



——— 1/3 oct.
* 1/1 oct.

	1,9	5,7	11,4	21,0	36,9	41,7
1/3 oct.	3,2	6,0	14,2	26,7	38,7	45,3 dB
	3,2	8,1	17,4	32,1	38,8	49,7
1/1 oct.	**2,7**	**6,5**	**13,7**	**24,5**	**38,0**	**44,4 dB**

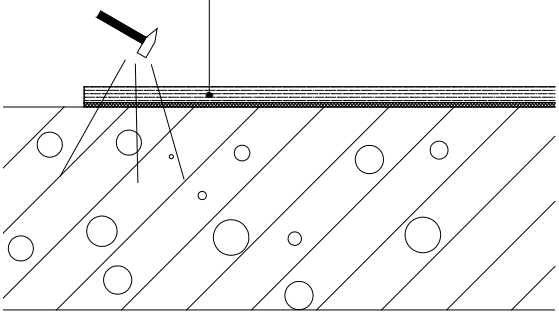
Mook, 24-06-2004

DETERMINING THE REDUCTION OF TRANSMITTED IMPACT NOISE BY FLOOR COVERINGS ACCORDING TO ISO 140-8:1997
principal: Elastilon BV

TESTING RvA L 334

construction tested: variant 9

- Wooden floor, type Cosmo
- Elastilon Strong, t = 3 mm



volume measuring room: 94 m^3

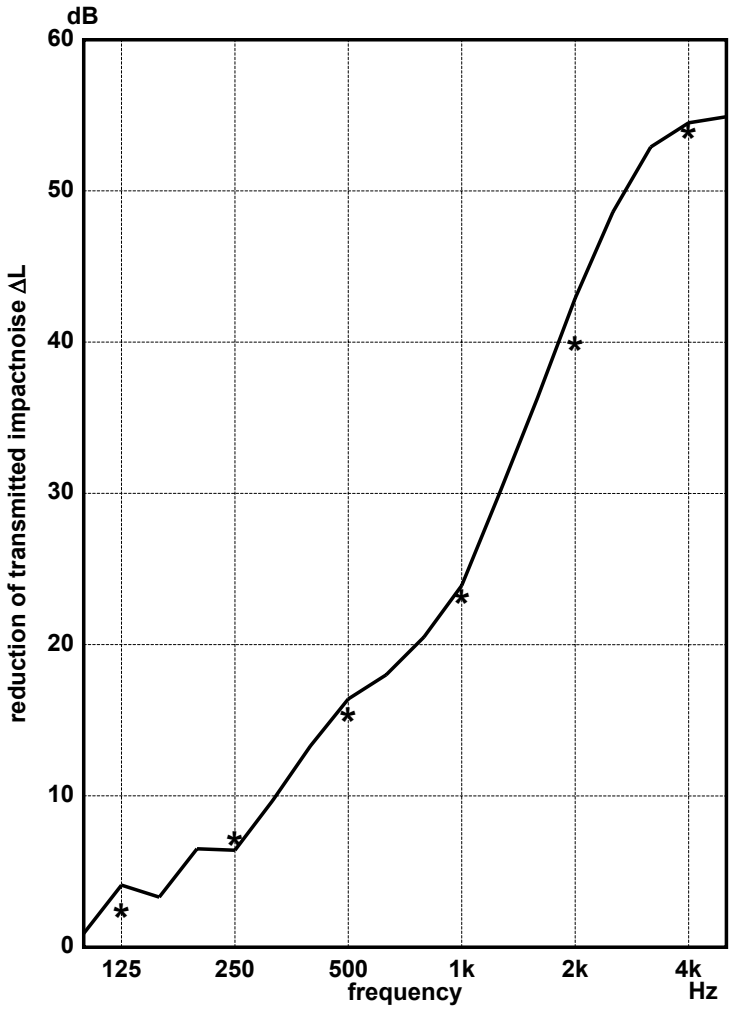
surface area floor: 11 m^2

measured at:
Peutz Laboratory for Acoustics

signal: tapping machine

bandwidth: 1/3 octave

ISO 717-2:1996
ΔL_{lin} = 10 dB
ΔL_w = 22 dB



——— 1/3 oct.
* 1/1 oct.

	0,9	6,5	13,3	20,5	36,3	52,9	
1/3 oct.	4,1	6,4	16,4	23,9	42,9	54,5	dB
	3,3	9,7	18,0	30,0	48,6	54,9	
1/1 oct.	**2,5**	**7,3**	**15,5**	**23,3**	**40,0**	**54,0**	**dB**

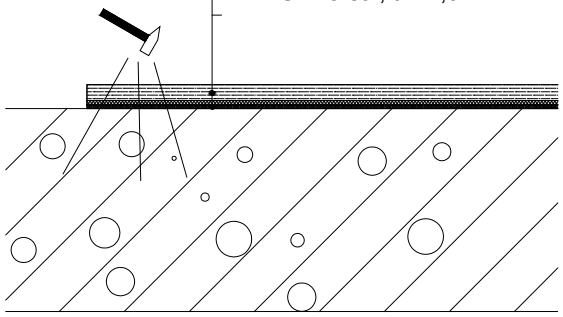
Mook, 24-06-2004

DETERMINING THE REDUCTION OF TRANSMITTED IMPACT NOISE BY FLOOR COVERINGS ACCORDING TO ISO 140-8:1997
principal: Elastilon BV

TESTING RvA L 334

construction tested: variant 10

- Wooden floor, type Cosmo
- Elastilon Strong, t = 3 mm
- Universal, t = 2,5 mm



volume measuring room: 94 m^3

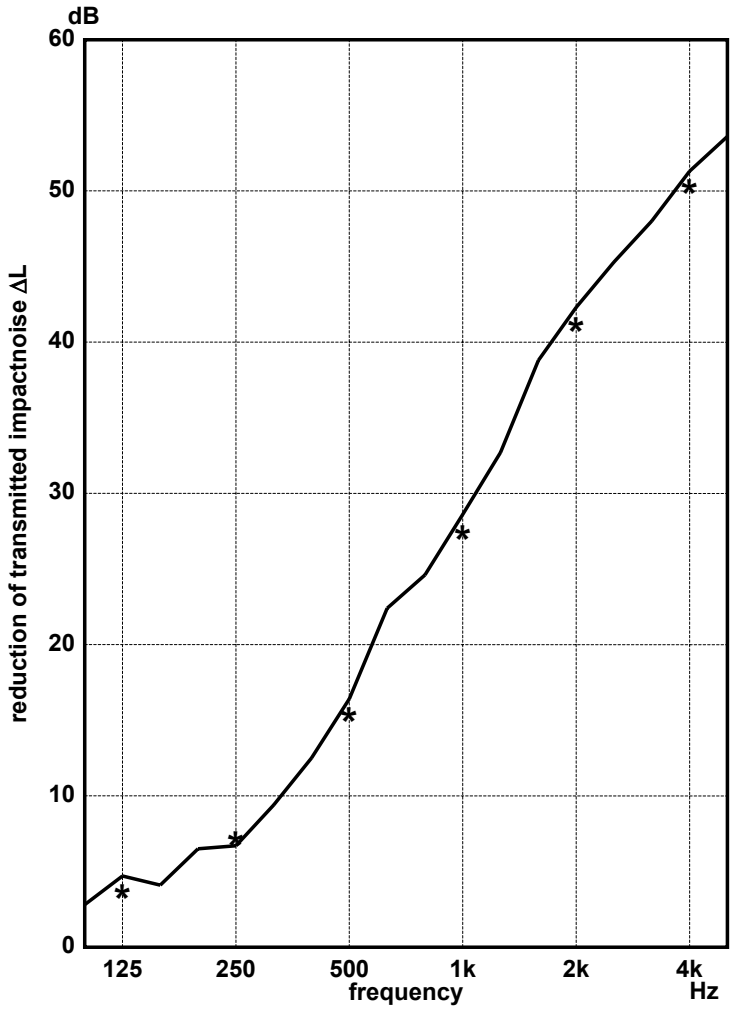
surface area floor: 11 m^2

measured at:
Peutz Laboratory for Acoustics

signal: tapping machine

bandwidth: 1/3 octave

ISO 717-2:1996
ΔL_{lin} = 11 dB
ΔL_w = 22 dB



——— 1/3 oct.
* 1/1 oct.

	2,8	6,5	12,5	24,6	38,8	48,0	
1/3 oct.	4,7	6,7	16,4	28,6	42,3	51,3	dB
	4,1	9,4	22,4	32,7	45,3	53,6	
1/1 oct.	**3,8**	**7,3**	**15,5**	**27,5**	**41,3**	**50,4**	**dB**

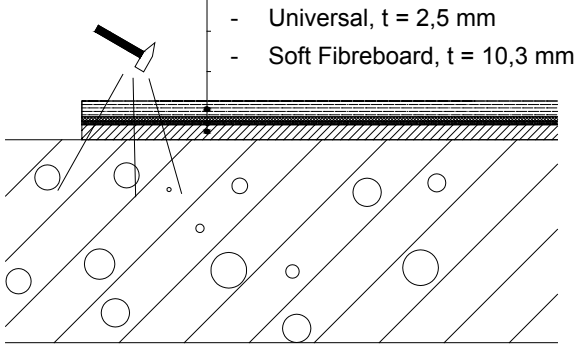
Mook, 24-06-2004

DETERMINING THE REDUCTION OF TRANSMITTED IMPACT NOISE BY FLOOR COVERINGS ACCORDING TO ISO 140-8:1997
principal: Elastilon BV

TESTING RvA L 334

construction tested: variant 11

- Wooden floor, type Cosmo
- Elastilon Strong, t = 3 mm
- Universal, t = 2,5 mm
- Soft Fibreboard, t = 10,3 mm



volume measuring room: 94 m^3

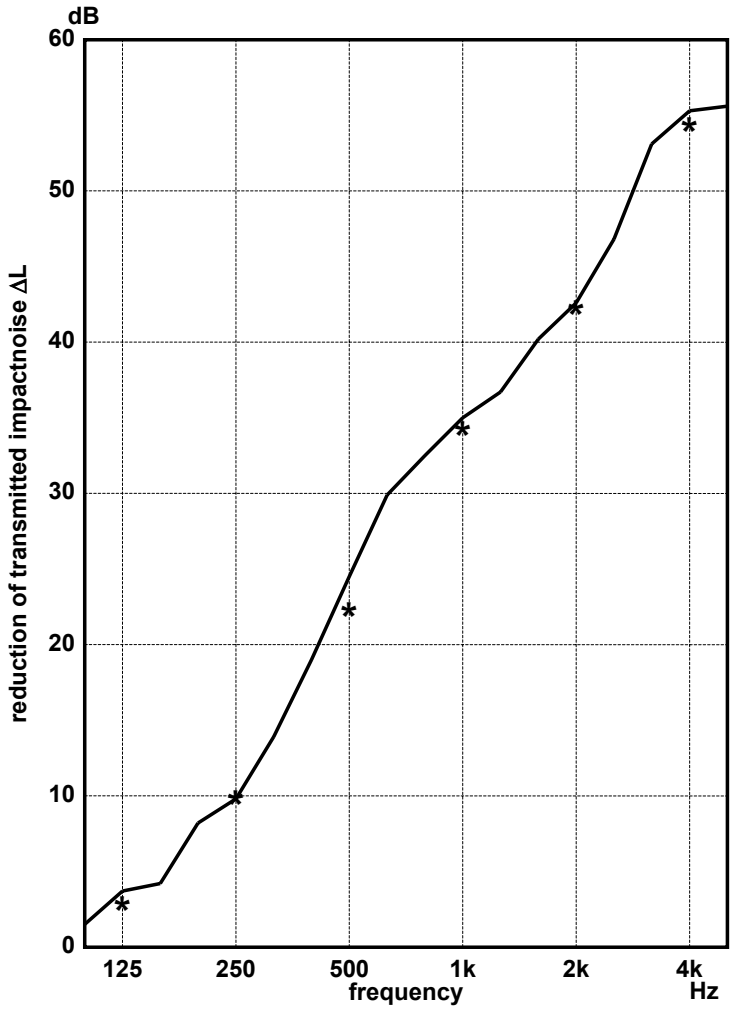
surface area floor: 11 m^2

measured at:
Peutz Laboratory for Acoustics

signal: tapping machine

bandwidth: 1/3 octave

ISO 717-2:1996
ΔL_{lin} = 12 dB
ΔL_w = 23 dB



——— 1/3 oct.
* 1/1 oct.

		1,5	8,2	19,0	32,5	40,2	53,1
	1/3 oct.	3,7	9,8	24,5	35,0	42,6	55,3 dB
		4,2	13,9	29,9	36,7	46,8	55,6
	1/1 oct.	**3,0**	**10,0**	**22,4**	**34,4**	**42,4**	**54,5 dB**

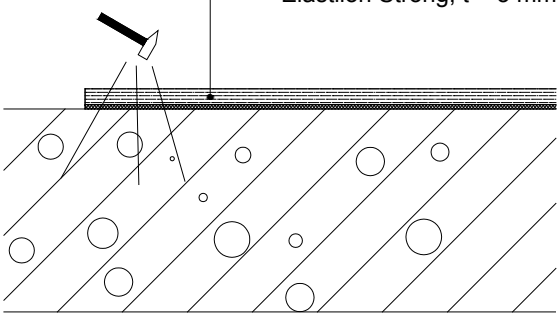
Mook, 24-06-2004

DETERMINING THE REDUCTION OF TRANSMITTED IMPACT NOISE BY FLOOR COVERINGS ACCORDING TO ISO 140-8:1997
principal: Elastilon BV

TESTING RvA L 334

construction tested: variant 12

- Wooden floor, type Lopark Royal Plus
- Elastilon Strong, t = 3 mm



volume measuring room: 94 m^3

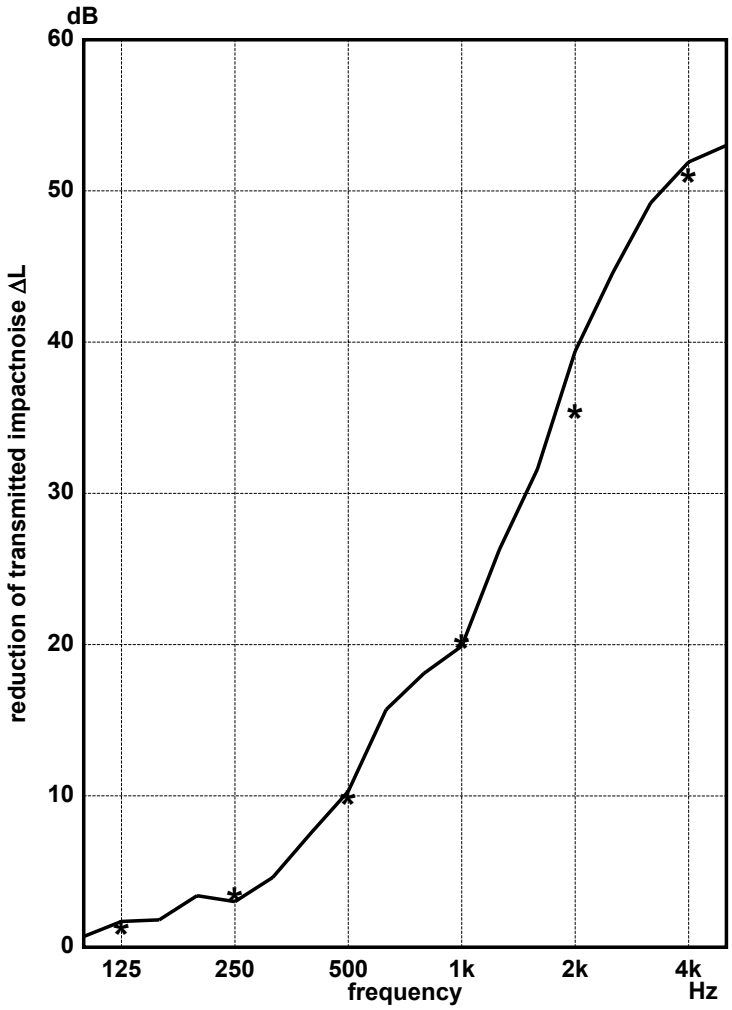
surface area floor: 11 m^2

measured at:
Peutz Laboratory for Acoustics

signal: tapping machine

bandwidth: 1/3 octave

ISO 717-2:1996
ΔL_{lin} = 8 dB
ΔL_w = 19 dB



——— 1/3 oct.
* 1/1 oct.

		0,7	3,4	7,5	18,1	31,6	49,2
	1/3 oct.	1,7	3,0	10,3	19,9	39,4	51,9 dB
		1,8	4,6	15,7	26,3	44,6	53,0
	1/1 oct.	**1,4**	**3,6**	**10,0**	**20,3**	**35,5**	**51,1 dB**

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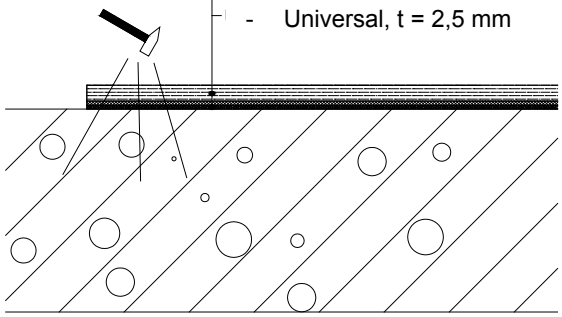
DETERMINING THE REDUCTION OF TRANSMITTED IMPACT NOISE BY FLOOR COVERINGS ACCORDING TO ISO 140-8:1997
principal: Elastilon BV

TESTING RvA L 334

construction tested: variant 13

- Wooden floor, type Lopark Royal Plus
- Elastilon Strong, t = 3 mm
- Universal, t = 2,5 mm



volume measuring room: 94 m^3

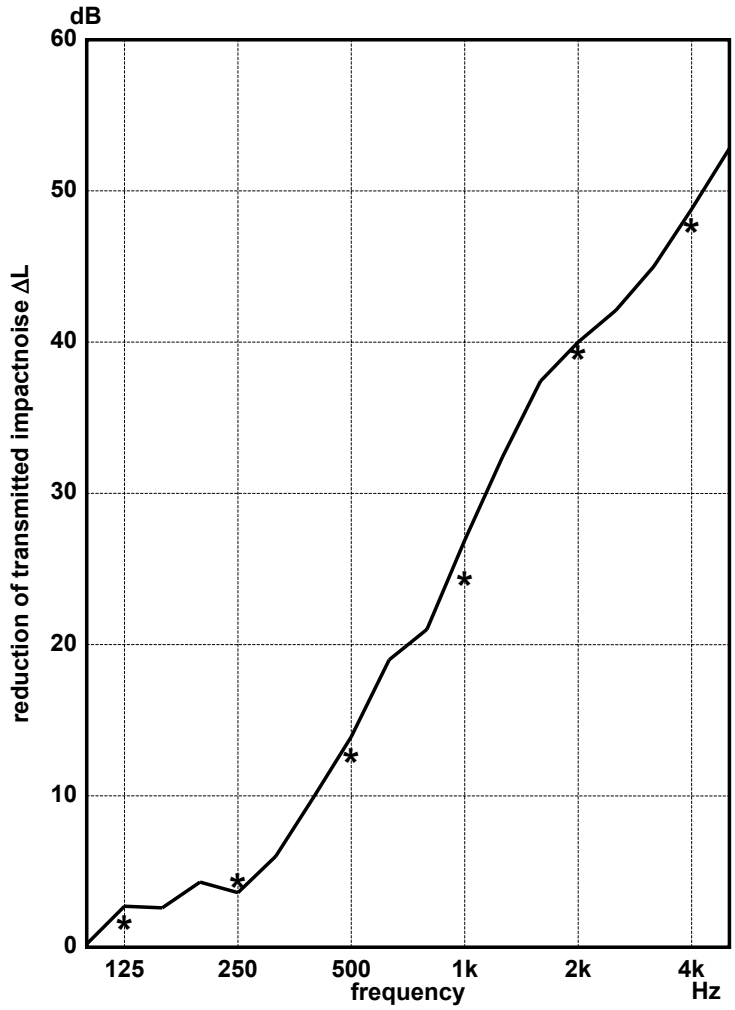
surface area floor: 10,5 m^2

measured at:
Peutz Laboratory for Acoustics

signal: tapping machine

bandwidth: 1/3 octave

ISO 717-2:1996
ΔL_{lin} = 9 dB
ΔL_w = 20 dB



——— 1/3 oct.
* 1/1 oct.

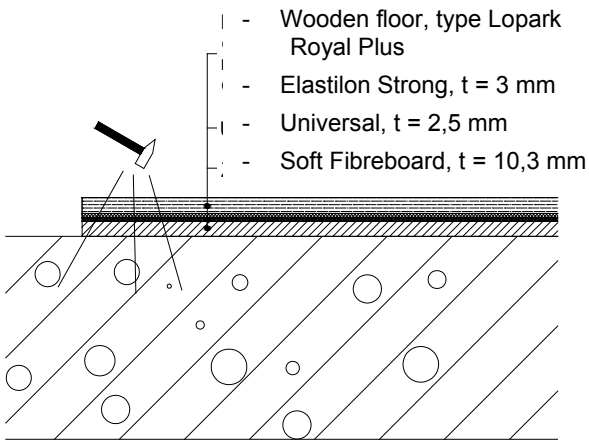
	0,2	4,3	9,9	21,0	37,4	45,0	
1/3 oct.	2,7	3,6	13,9	26,9	40,0	48,8	dB
	2,6	6,0	19,0	32,4	42,1	52,8	
1/1 oct.	**1,7**	**4,5**	**12,8**	**24,5**	**39,4**	**47,8**	**dB**

Mook, 24-06-2004

DETERMINING THE REDUCTION OF TRANSMITTED IMPACT NOISE BY FLOOR COVERINGS ACCORDING TO ISO 140-8:1997
principal: Elastilon BV

TESTING RvA L 334

construction tested: variant 14



volume measuring room: 94 m^3

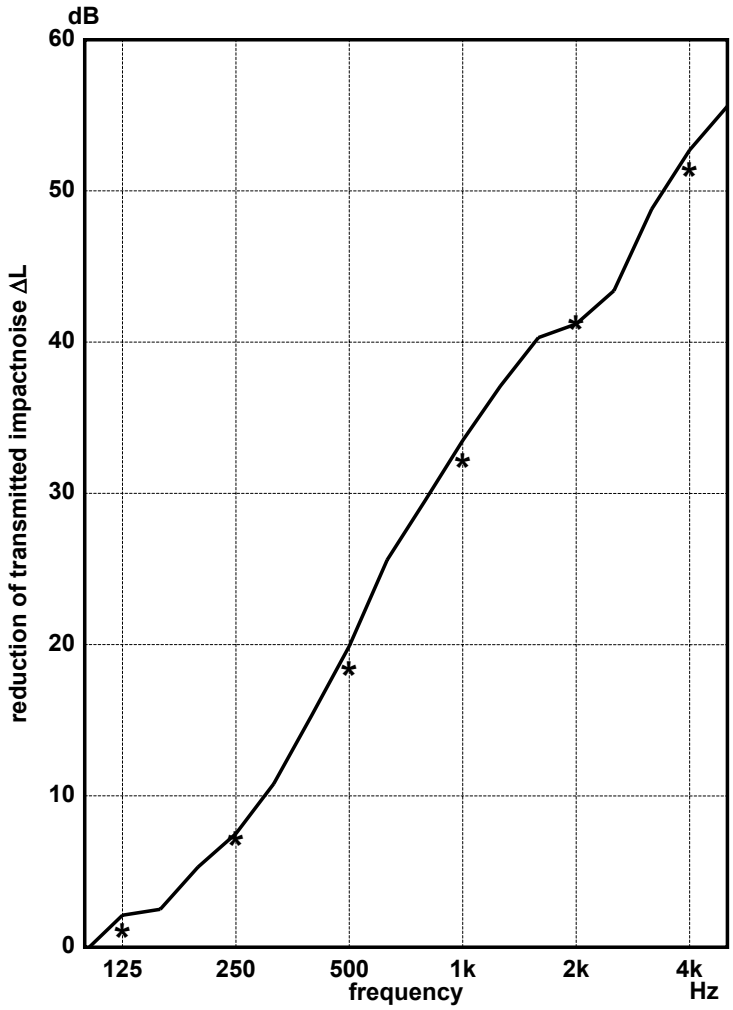
surface area floor: 10,5 m^2

measured at:
Peutz Laboratory for Acoustics

signal: tapping machine

bandwidth: 1/3 octave

ISO 717-2:1996
ΔL_{lin} = 10 dB
ΔL_w = 21 dB



——— 1/3 oct.
* 1/1 oct.

	-0,3	5,3	15,3	29,5	40,3	48,8
1/3 oct.	2,1	7,5	19,9	33,5	41,2	52,7 dB
	2,5	10,8	25,6	37,1	43,4	55,6
1/1 oct.	**1,2**	**7,3**	**18,5**	**32,3**	**41,4**	**51,5 dB**

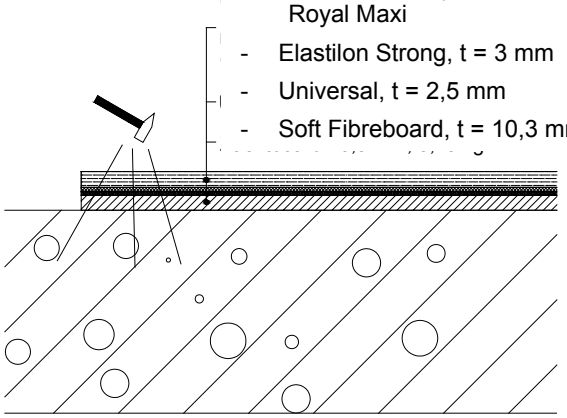
Mook, 24-06-2004

DETERMINING THE REDUCTION OF TRANSMITTED IMPACT NOISE BY FLOOR COVERINGS ACCORDING TO ISO 140-8:1997
principal: Elastilon BV

TESTING RvA L 334

construction tested: variant 15

- Wooden floor, type Lopark Royal Maxi
- Elastilon Strong, t = 3 mm
- Universal, t = 2,5 mm
- Soft Fibreboard, t = 10,3 mm



volume measuring room: 94 m^3

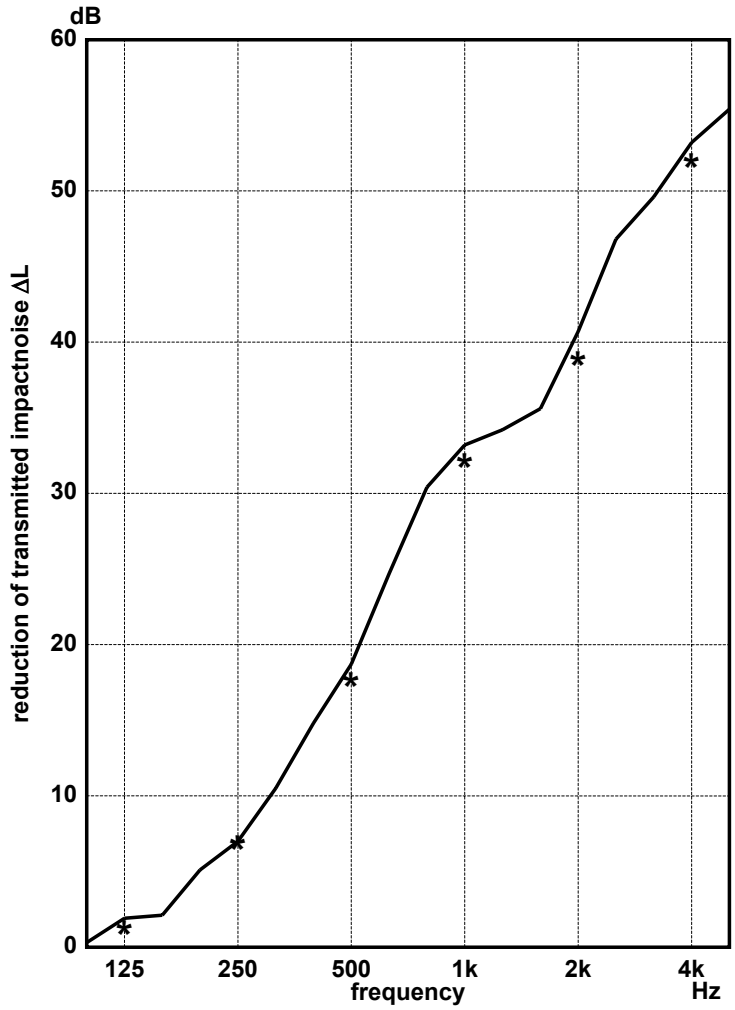
surface area floor: 10,5 m^2

measured at:
Peutz Laboratory for Acoustics

signal: tapping machine

bandwidth: 1/3 octave

ISO 717-2:1996
ΔL_{lin} = 10 dB
ΔL_w = 21 dB



——— 1/3 oct.
* 1/1 oct.

	0,3	5,1	14,8	30,4	35,6	49,6	
1/3 oct.	1,9	7,0	18,7	33,2	40,7	53,2	dB
	2,1	10,5	24,7	34,2	46,8	55,4	
1/1 oct.	**1,4**	**7,0**	**17,8**	**32,3**	**39,0**	**52,1**	**dB**

Mook, 24-06-2004