ACOUSTICS AND BUILDING PHYSICS
NOISE CONTROL
ENVIRONMENTAL TECHNOLOGY
FIRE SAFETY

PEUTZ

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Report

Laboratory for Acoustics

Determination of the reduction of transmitted impact noise
by a Soluflex Cablefloor made by Van Geel Legrand B.V.

Report number A 1038-1E dd. 23 August 2007

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Index

1. INTRODUCTION

Ordered by Van Geel Legrand BV at Boxtel (The Netherlands) measurements have been carried out in order to determine the reduction of transmitted impact noise by a

Soluflex Cablefloor made by Van Geel Legrand BV

The measurements have been carried out in the Laboratory for Acoustics of "Adviesbureau Peutz & Associés B.V" at Mook (Netherlands), see figure 1

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For this type of measurements the Laboratory for Acoustics has been accredited by the Dutch "Stichting Raad voor Accreditatie". The accreditation has been registered in the "STERLAB" register for testing laboratories.

Compared with the version published on 18 February 2002, this test report is modified on the following issues:

- the name of principal.

2. NORMS AND GUIDELINES

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

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 heavyweight 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 CONSTRUCTIONS

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

Tests have been conducted on a raised floor construction (see also figure 3) composed of floorsupports with metal floortiles on top of them.

- The metal floortiles (see figure 3) made by Van Geel Legrand B.V., type Soluflex are made of 2 mm thick galvanised steelplate with folded edges, thus forming a tile of 225 x 225 mm, 12.5 mm high. The mass of the tiles is about 20 kg/m^2
- the floorsupports (see figure 3) made by Van Geel Legrand B.V., type H60 are made of PP moulded plastics; are 60 mm high and have a 100 x 100 mm tabletop
- The folded edges of the floortile fit into grooves made in the tabletop of the floorsupports
- Carpettiles 500 x 500 mm were applied in one of the tests. This carpet is of type **Aetis 33622** and is **manufactured by ESCO**

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:

$$A = \frac{0.16 \cdot V}{T} \quad (1)$$

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 frequencybands 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 testst 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	18	55
9	19	54

4.5. Results

In figure 4 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 I and in figure 5 to 7 of this report.

Table I: results

description	the reduction of transmitted impact noise ΔL [dB]					
	bare cablefloor		cablefloor covered with carpet		carpet alone	
figure	5		6		7	
Frequency [Hz]	1/3 oct.	1/1 oct.	1/3 oct.	1/1 oct.	1/3 oct.	1/1 oct.
100	-0.1		1.7		3.1	
125	2.5	1.1	4.6	3.6	4.8	4.6
160	1.2		5.6		6.4	
200	0.4		7.0		8.9	
250	2.2	2.0	12.6	10.3	13.1	11.8
315	4.3		16.3		17.4	
400	4.9		17.4		21.5	
500	7.0	6.8	19.7	19.7	25.1	24.4
630	10.0		25.2		31.1	
800	14.6		31.2		34.7	
1000	19.1	17.7	36.6	34.6	41.2	38.3
1250	23.8		41.7		44.9	
1600	27.9		44.5		48.6	
2000	31.2	30.1	47.2	46.6	51.6	50.7
2500	32.7		49.6		53.2	
3150	35.3		52.4		54.8	
4000	37.7	37.2	55.0	54.3	55.7	55.3
5000	39.8		56.4		55.4	
ΔL_w	17 dB		24 dB		25 dB	
ΔL_{lin}	7 dB		12 dB		13 dB	

In this table 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 ΔL_W" according to ISO 717-2;

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

These resultats 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.

Th. Scheers
Leader of the Laboratory

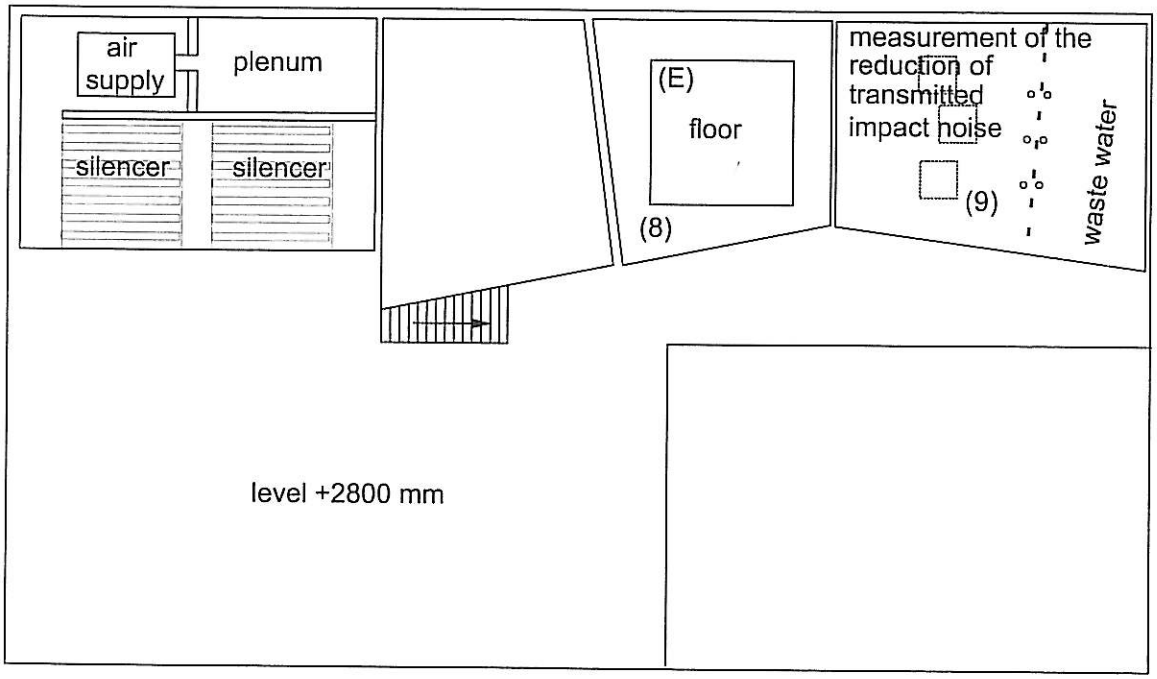
ir. M.L.S Vercammen
manager

This report contains:
10 pages
7 figures

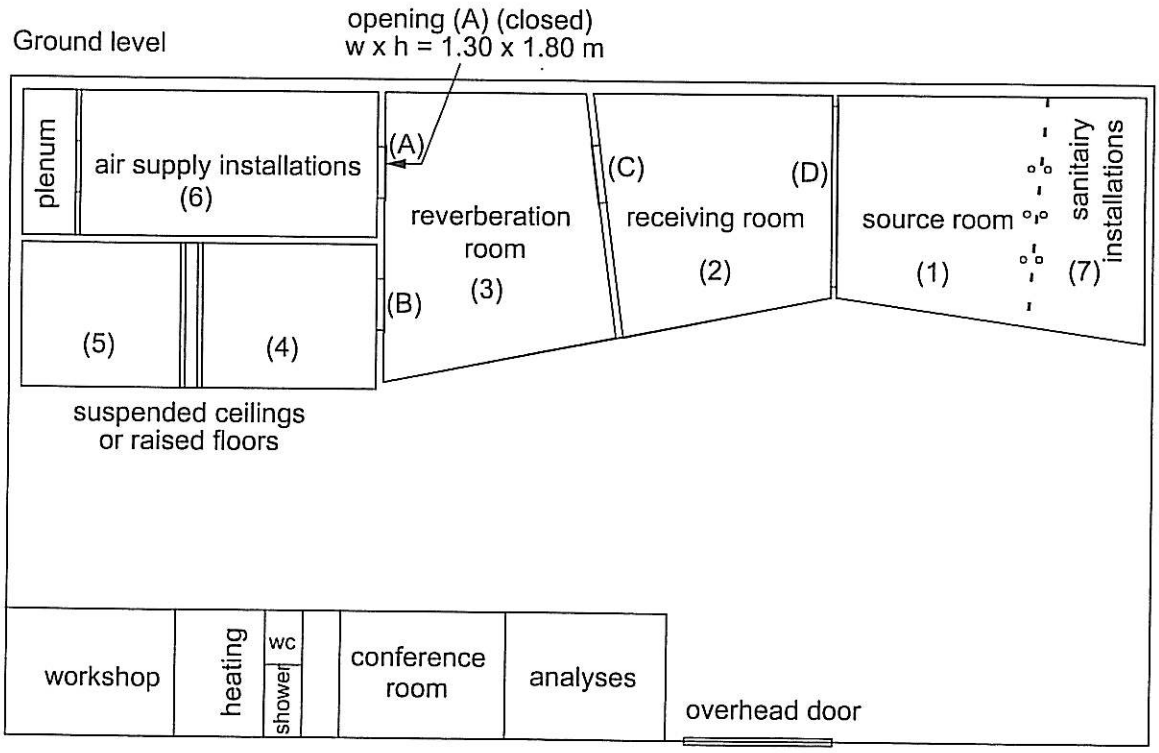
ADVIESBUREAU PEUTZ & ASSOCIES B.V.
Lindenlaan 41, NL-6584 AC MOLENHOEK (LB), NETHRLANDS

OVERVIEW

Story



Ground level



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

report nr. A 1038-1E

figure 1

ADVIESBUREAU PEUTZ & ASSOCIES B.V.
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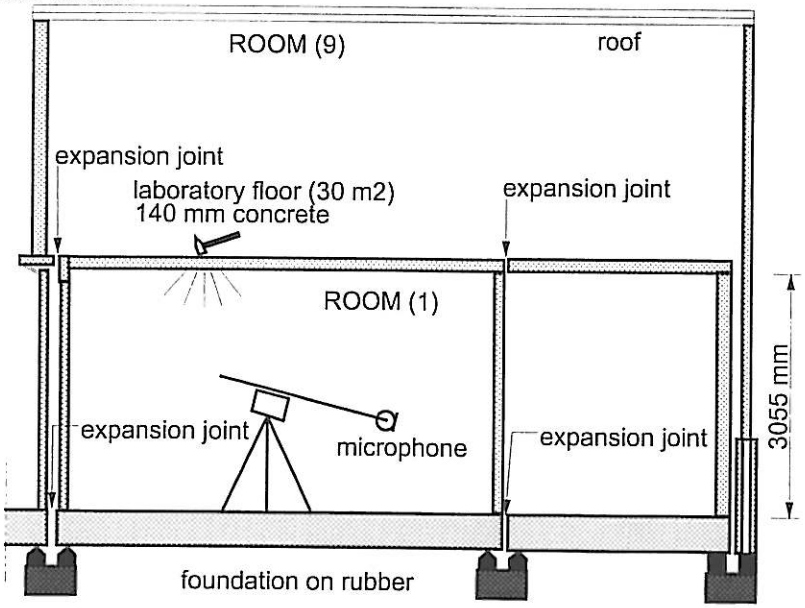
DETERMINATION OF THE REDUCTION OF TRANSMITTED IMPACT NOISE

the testrooms meet the requirements ISO 140
additional data:
- volume of room (1): 94 m3

vertical section



plan of room (1)

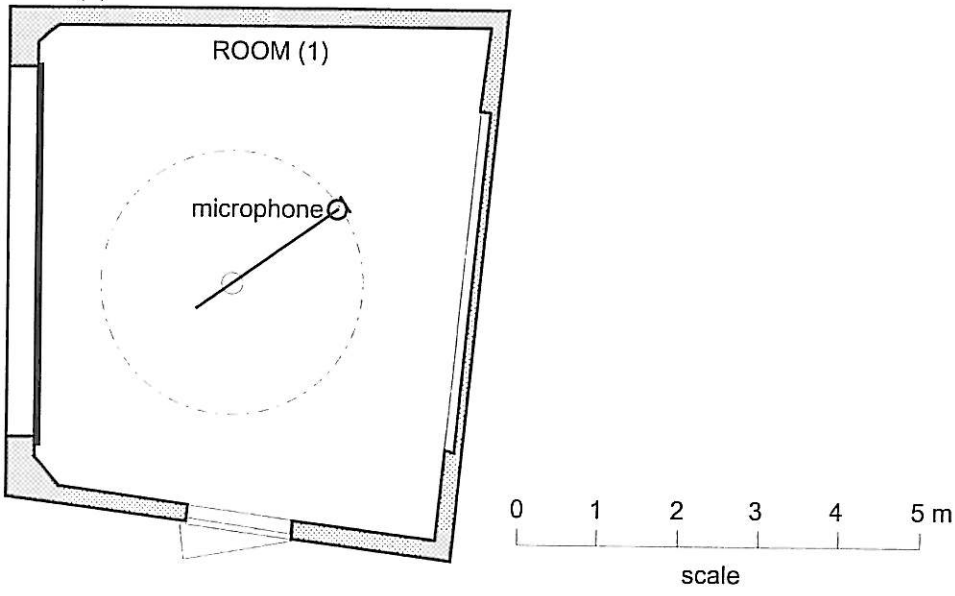


figure 3a Construction

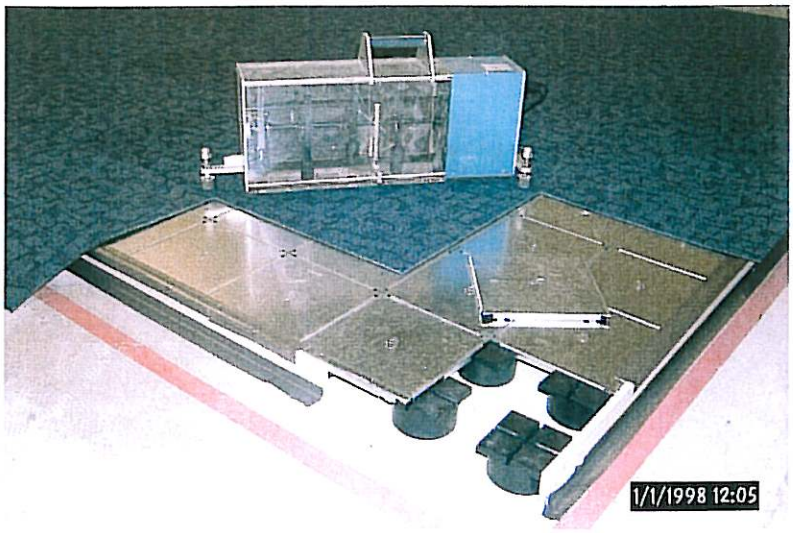


figure 3b tile

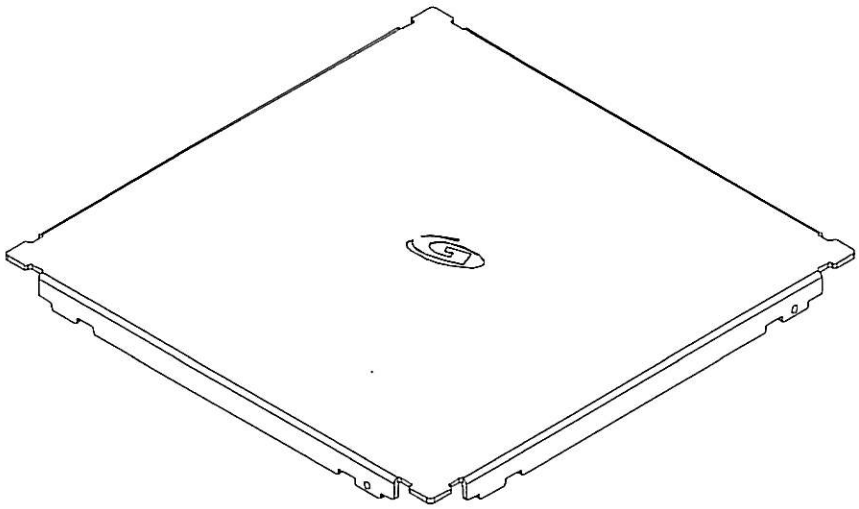
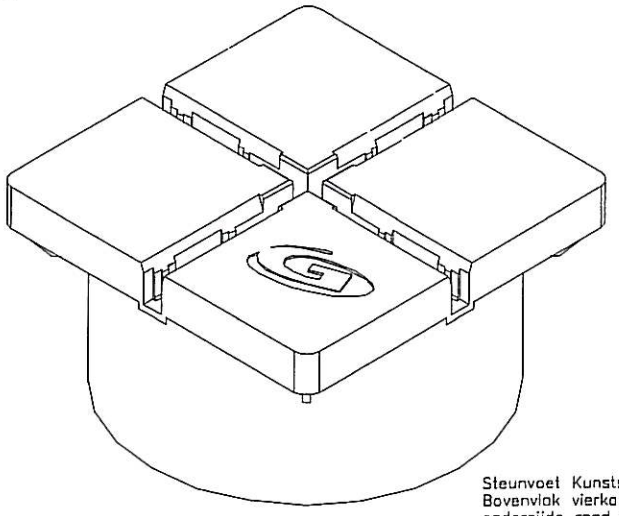


figure 3c floorsupport



LABORATORY FOR ACOUSTICS

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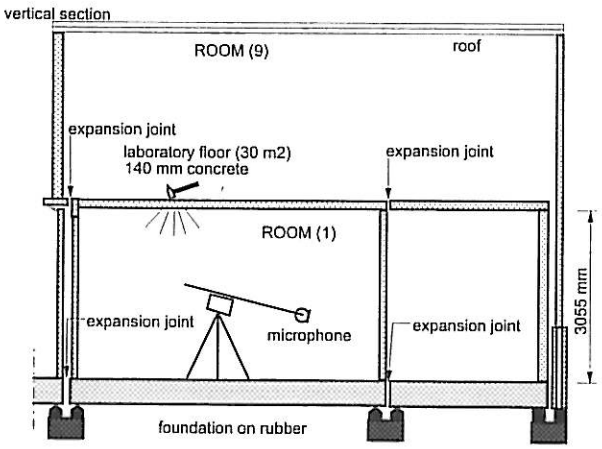
THE NORMALIZED IMPACT SOUND PRESSURE LEVEL L_n OF A FLOOR ACCORDING TO ISO 140-6:1998

principal: Van Geel Legrand B.V.

construction tested: laboratory concrete floor 140 mm



volume receiving room: 94 m^3

surface area floor: 30 m^2

measured at: laboratory conditions

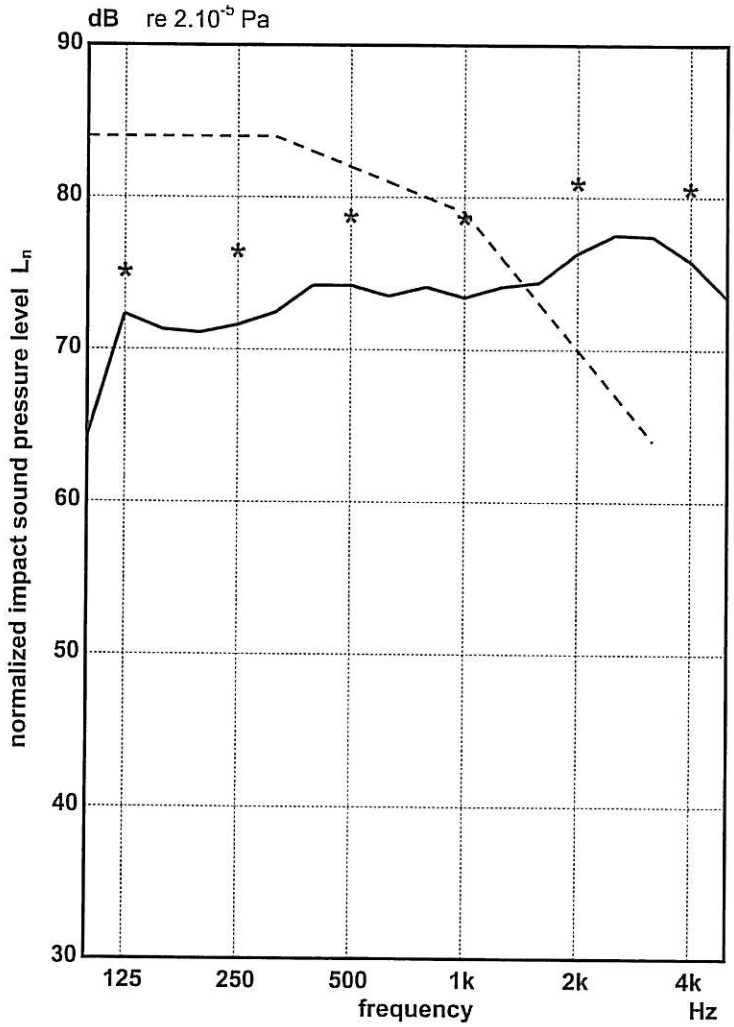
signal: tapping machine

bandwidth: 1/3 octave

A_0 = 10.0 m^2

ISO 717-2:1996

$L_{n,w}(C_I)$ = 82(-11) dB



	125	250	500	1k	2k	4k	
	64.3	71.1	74.2	74.1	74.4	77.4	
1/3 oct.	72.3	71.6	74.2	73.4	76.3	75.8	dB
	71.3	72.4	73.5	74.1	77.5	73.4	
1/1 oct.	75.2	76.5	78.8	78.7	81.0	80.6	dB

* 1/1 oct.

——— 1/3 oct.

- - - - ref. curve (ISO 717)

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Mook, 14-03-2001

report nr. A1038-1E

figure 4

Insulat versie 1.2.5, mode 8 file: a1038 C#:1 ##:36

LABORATORY FOR ACOUSTICS

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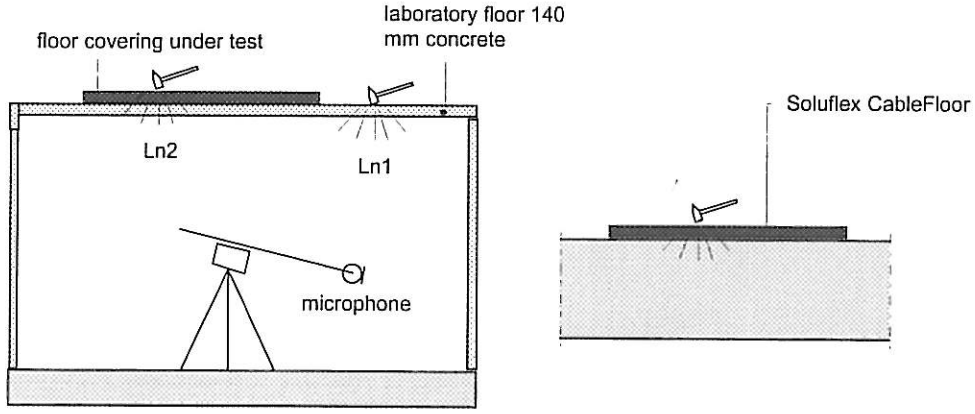
DETERMINING THE REDUCTION OF TRANSMITTED IMPACT NOISE BY FLOOR COVERINGS ACCORDING TO ISO 140-8:1997
principal: Van Geel Legrand B.V.

construction tested: **bare Soluflex Cablefloor**



volume receiving room: 94 m^3

surface area floor: 10 m^2

measured at: laboratory conditions

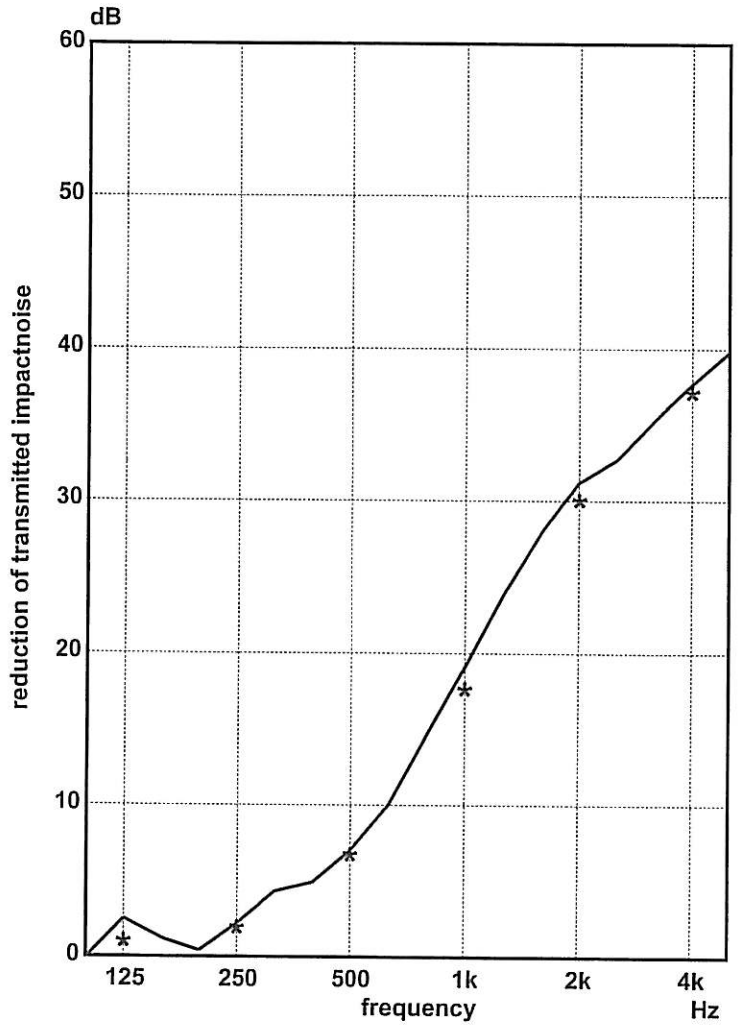
signal: tapping machine

bandwidth: 1/3 octave

ISO 717-2:1996

ΔL_w = 17 dB

ΔL_{lin} = 7 dB



	-0.1	0.4	4.9	14.6	27.9	35.3
1/3 oct.	2.5	2.2	7.0	19.1	31.2	37.7 dB
	1.2	4.3	10.0	23.8	32.7	39.8
1/1 oct.	1.1	2.0	6.8	17.7	30.1	37.2 dB

* 1/1 oct.
—— 1/3 oct.

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LABORATORY FOR ACOUSTICS

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DETERMINING THE REDUCTION OF TRANSMITTED IMPACT NOISE BY FLOOR COVERINGS ACCORDING TO ISO 140-8:1997
principal: Van Geel Legrand B.V.

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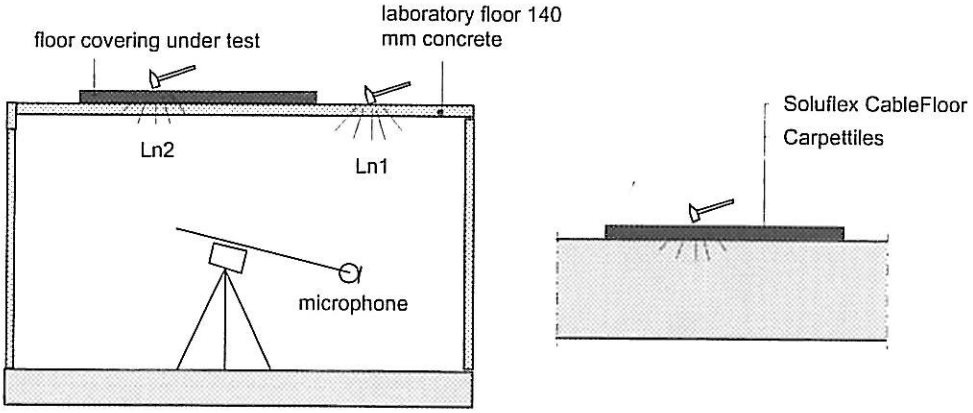
construction tested: **Soluflex Cablefloor covered with Carpet**



volume receiving room: 94 m^3

surface area floor: 10 m^2

measured at: laboratory conditions

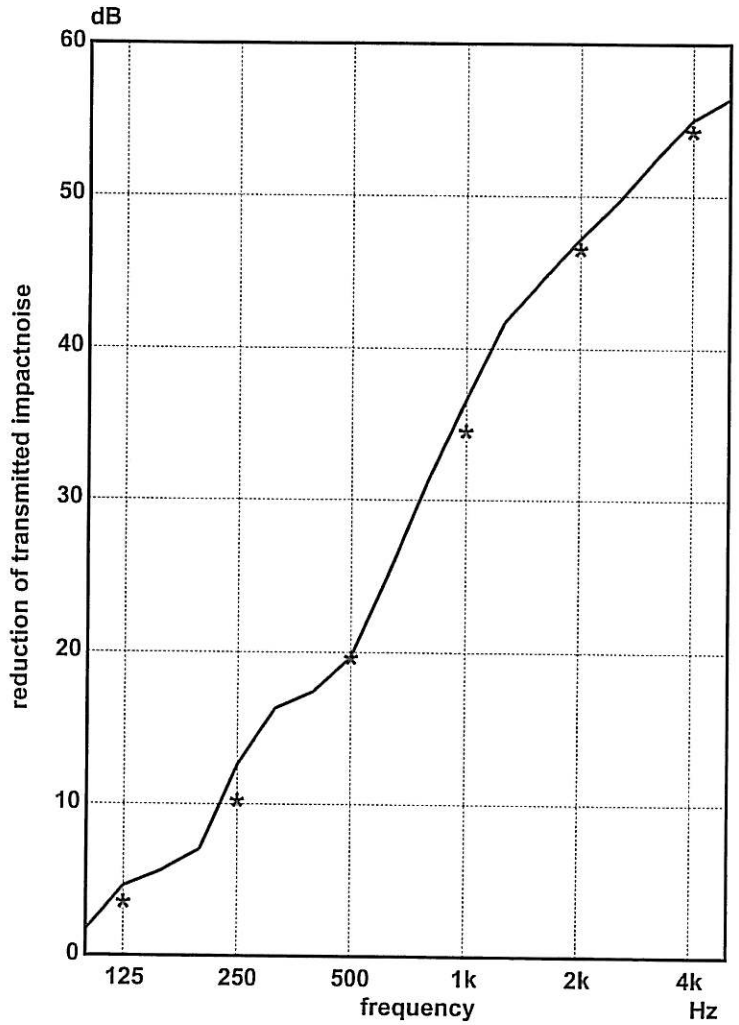
signal: tapping machine

bandwidth: 1/3 octave

ISO 717-2:1996

ΔL_w = 24 dB

ΔL_{lin} = 12 dB



	1.7	7.0	17.4	31.2	44.5	52.4
1/3 oct.	4.6	12.6	19.7	36.6	47.2	55.0 dB
	5.6	16.3	25.2	41.7	49.6	56.4
1/1 oct.	3.6	10.3	19.7	34.6	46.6	54.3 dB

* 1/1 oct.
—— 1/3 oct.

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report nr. A1038-1E

figure 6

Insulat versie 1.2.5, mode 11 file: a1038 L0#:36 L1#:61

LABORATORY FOR ACOUSTICS

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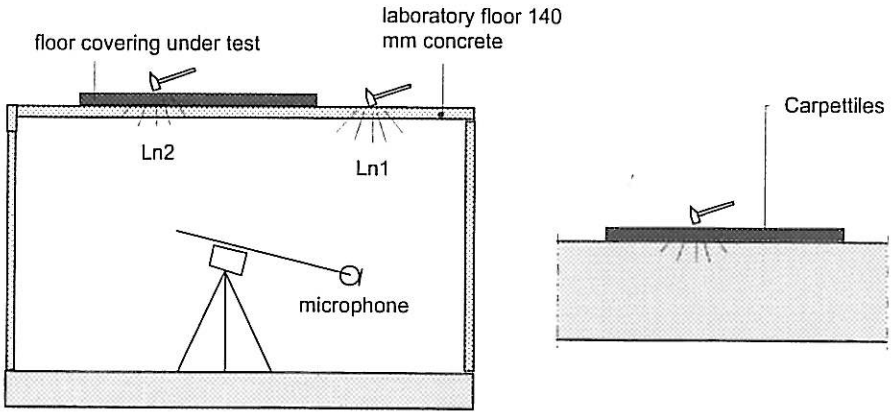
DETERMINING THE REDUCTION OF TRANSMITTED IMPACT NOISE BY FLOOR COVERINGS ACCORDING TO ISO 140-8:1997
principal: Van Geel Legrand B.V.

construction tested: **carpet alone**



volume receiving room: 94 m^3

surface area floor: 10 m^2

measured at: laboratory conditions

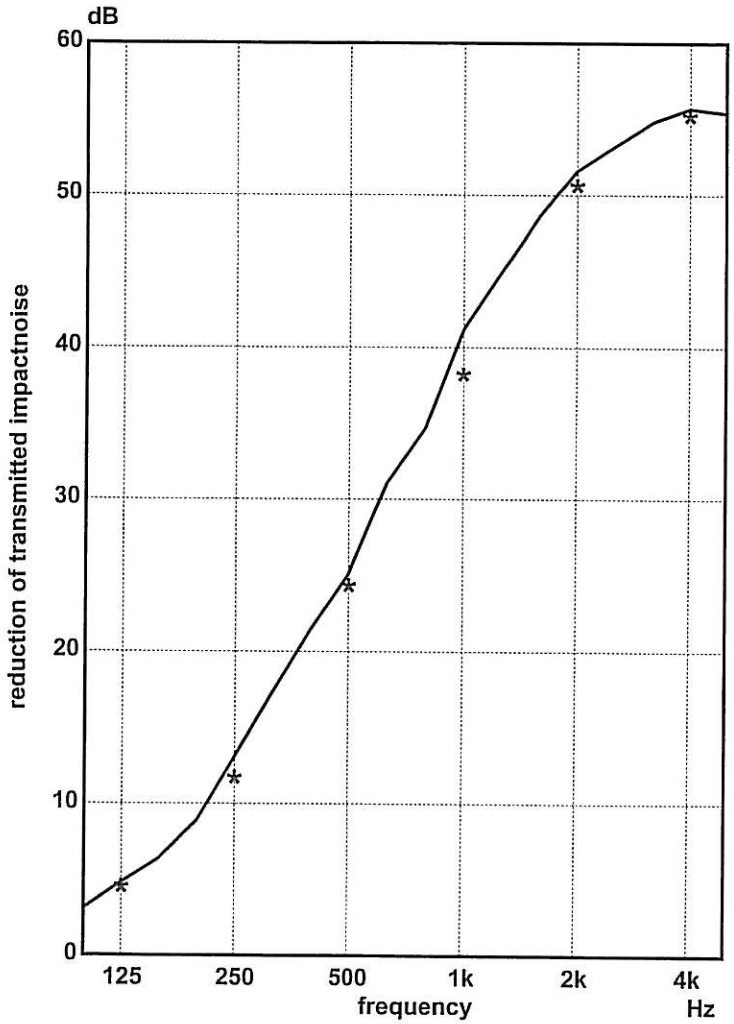
signal: tapping machine

bandwidth: 1/3 octave

ISO 717-2:1996

ΔL_w = 25 dB

ΔL_{lin} = 13 dB



	3.1	8.9	21.5	34.7	48.6	54.8
1/3 oct.	4.8	13.1	25.1	41.2	51.6	55.7 dB
	6.4	17.4	31.1	44.9	53.2	55.4
1/1 oct.	4.6	11.8	24.4	38.3	50.7	55.3 dB

* 1/1 oct.
——— 1/3 oct.

Mook, 14-03-2001