

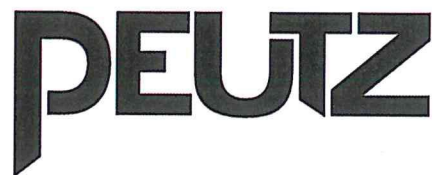
Test réalisé sur le Tramisol LVT

PEUTZ

Laboratory for Acoustics



Determination of the improvement of impact sound insulation of underlayment laminated AS, manufacturer type with a LVT topfloor



Laboratory for Acoustics

*Determination of the improvement of impact sound
insulation of underlayment type
laminated AS, manufacturer with a LVT
topfloor*

Principal

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Table of contents

1 Introduction	4
2 Standards and guidelines	5
3 Tested construction	6
4 Measurements	7
4.1 Method	7
4.2 Calculations	7
4.2.1 Normalized impact sound level	8
4.3 Reduction of transmitted impact noise	8
4.4 Accuracy	8
4.4.1 Repeatability r	9
4.4.2 Reproducibility R	9
4.5 Environmental conditions during the measurements	9
4.6 Results	9

1 Introduction

At the request _____ based in _____ sound measurements have been carried out in order to determine the reduction of transmitted impact noise of:

underlayment _____ **type** _____ **laminated AS, manufacturer** _____
with a LVT topfloor

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



For these type of measurements the Laboratory for Acoustics has been accredited by the Dutch Accreditation Council (RvA).

The RvA is member of the EA MLA (**EA MLA: European Accreditation Organisation MultiLateral Agreement**: <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 Standards and guidelines

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

ISO 10140-3:2010 Acoustics - Laboratory measurements of sound insulation of building elements – Part 3: Measurement of impact sound insulation

Note: The standard ISO 10140-3 is in all countries of the EG accepted as European standard EN ISO 10140-3:2010

Other related standards:

ISO 10140-1:2010 Acoustics - Laboratory measurements of sound insulation of building elements – Part 1: Application rules for specific products

Note: The standard ISO 10140-1 is in all countries of the EG accepted as European standard EN ISO 10140-1:2010

ISO 10140-4:2010 Acoustics - Laboratory measurements of sound insulation of building elements – Part 4: Measurement procedures and requirements

N.B. The standard ISO 10140-4 is in all countries of the EG accepted as European standard EN ISO 10140-4:2010

ISO 10140-5:2010 Acoustics - Laboratory measurements of sound insulation of building elements – Part 5: Requirements for test facilities and equipment

Note: The standard ISO 10140-5 is in all countries of the EG accepted as European standard EN ISO 10140-5:2010

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 standard is accepted by all members of the European Union as European standard EN 20140-2:1993

ISO 717-2:2013 Acoustics - Rating of sound insulation in buildings and of building elements - Part 2: Impact sound insulation

Note: This international standard is accepted by all members of the European Union as European standard EN ISO 717-2:2013

4 Measurements

4.1 Method

The tests were conducted in accordance with the provisions of the test method ISO 10140-3. A detailed description of the test set up has been given in the figures 1 and 2 of this report. For the tested material (see chapter 3) a sample with dimensions of c. 10 m² is used.

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 10140-5, Annex E (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:

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

in which:

- A = the equivalent sound absorption [m²]
- V = the volume of the receiving room [m³]
- T = the reverberation time in the receiving room [s]

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

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

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 [m²]
- A_0 = the reference sound absorption (= 10 m²)

4.3 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:

$$\Delta L = L_{n1} - L_{n2} \quad (2)$$

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

4.4 Accuracy

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

4.4.1 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 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.

4.4.2 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 3 dB.

4.5 Environmental conditions during the measurements

t4.1 *Environmental conditions during the measurements*

temperature [°C]	relative humidity [%]
15,8	55

4.6 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 t4.2 and in figure 5 and 6 of this report.

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

t4.2 measurement results

reduction of transmitted impact noise ΔL [dB]								
variant nr.	1		2		3		4	
underlayment	type		type		type		type	
topfloor	aminated AS		aminated AS		aminated AS		aminated AS	
record nr.	#399		#407		#415		#423	
figure nr.	4		5		6		7	
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.
50	2,6		2,4		3,2		2,1	
63	4,3	3,9	3,0	3,0	3,6	3,5	2,7	2,6
80	5,3		3,6		3,8		3,0	
100	4,5		1,9		4,6		1,9	
125	2,5	3,1	1,0	1,4	2,7	3,1	1,4	1,8
160	2,5		1,4		2,4		2,2	
200	4,5		3,8		4,6		4,4	
250	4,5	4,9	4,8	4,6	5,5	5,5	6,2	5,7
315	5,7		5,3		6,8		6,9	
400	9,2		8,6		10,3		10,4	
500	13,1	12,3	12,9	11,7	14,4	13,2	14,3	13,3
630	20,5		19,5		18,5		18,7	
800	21,0		20,7		21,1		22,3	
1000	26,0	24,1	24,8	23,6	24,2	23,8	24,5	24,5
1250	29,5		28,7		30,1		29,1	
1600	38,2		36,5		37,8		36,7	
2000	44,6	41,9	43,6	40,3	43,3	41,3	42,6	40,3
2500	51,4		49,1		50,5		49,6	
3150	55,1		54,1		55,4		54,8	
4000	57,6	56,7	56,5	55,7	57,9	57,0	57,6	56,6
5000	58,2		57,3		58,3		58,2	
ΔL_{in}	9 dB		8 dB		10 dB		9 dB	
ΔL_w	20 dB		19 dB		21 dB		20 dB	

reduction of transmitted impact noise ΔL [dB]				
variant nr.	5		6	
underlayment	type		type	
topfloor	laminated AS LVT topfloor 4 mm with load (ca. 20 kg/m ²)		laminated AS LVT topfloor 4 mm without load	
record nr.	#539		#547	
figure nr.	8		9	
frequency [Hz]	1/3 oct.	1/1 oct.	1/3 oct.	1/1 oct.
50	1,1		0,7	
63	-0,1	1,4	-1,1	0,1
80	4,1		1,0	
100	2,7		0,9	
125	1,5	2,1	1,3	1,3
160	2,1		1,7	
200	4,7		4,7	
250	5,5	5,7	6,1	5,9
315	7,2		7,1	
400	11,5		10,8	
500	15,7	14,4	15,7	13,9
630	19,4		19,5	
800	23,3		23,1	
1000	26,5	26,1	26,2	25,8
1250	33,0		32,3	
1600	40,3		40,1	
2000	47,6	44,1	47,5	44,0
2500	53,0		53,7	
3150	57,0		57,3	
4000	57,9	57,4	58,4	57,8
5000	57,4		57,9	
ΔL_{in}	9 dB		9 dB	
ΔL_w	20 dB		20 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.



Th. Scheers
Laboratory Supervisor



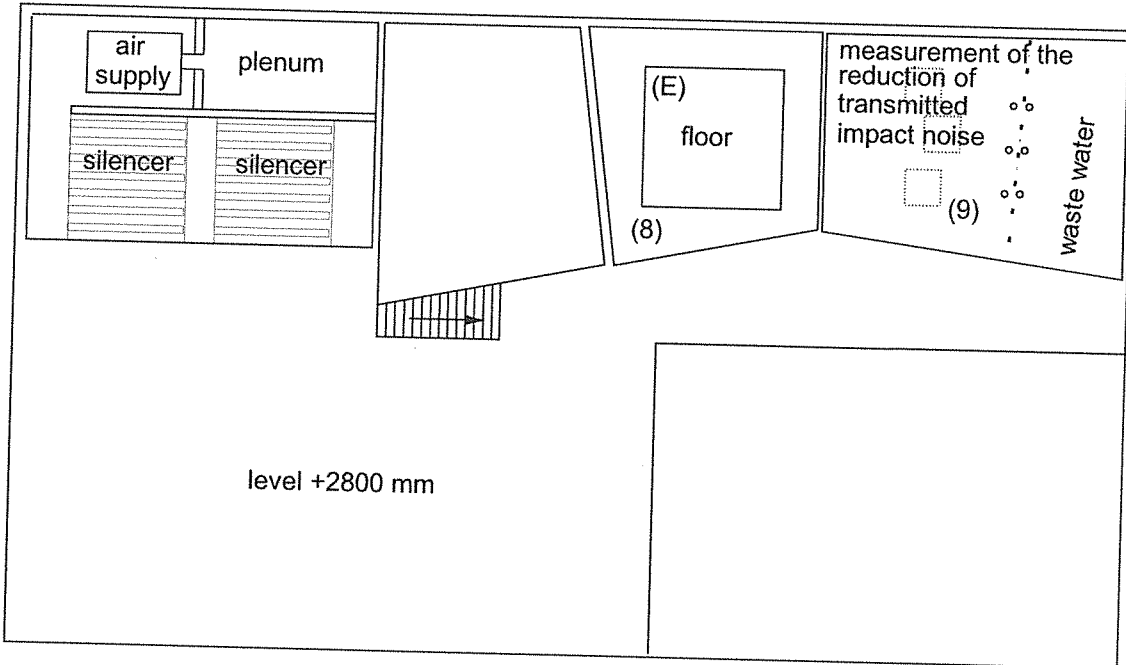
Mook,
dr. ir. M.L.S Vercammen
Manager

This report contains 12 pages and 9 figures.

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

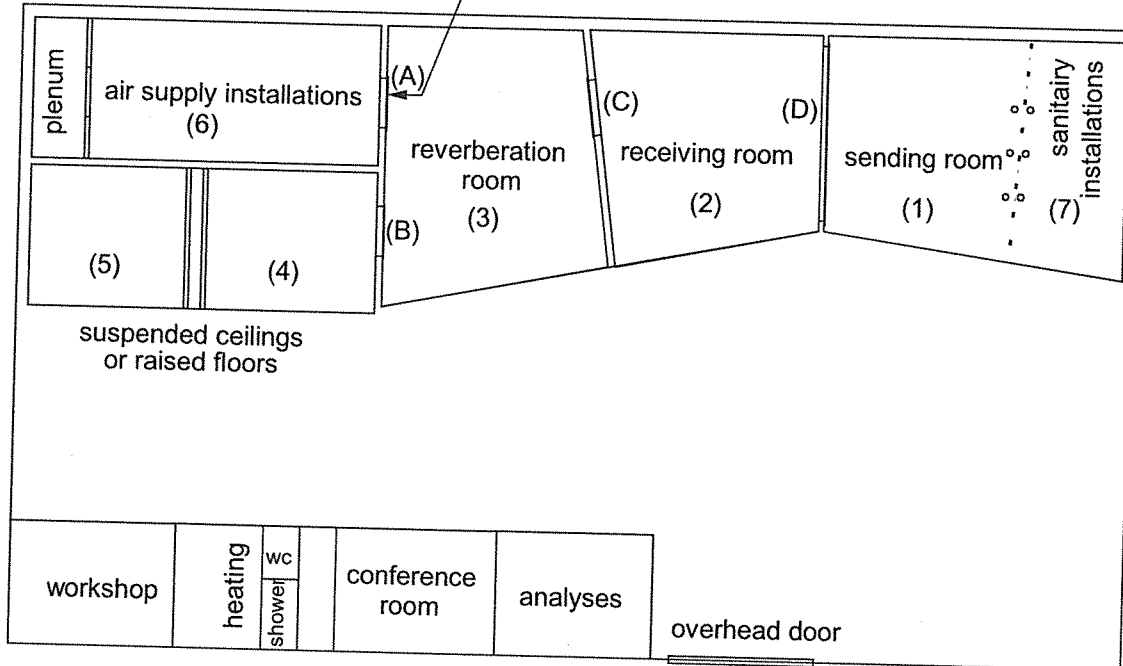
Story

OVERVIEW



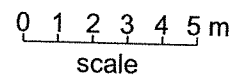
Ground level

opening (A) (closed)
w x h = 1300 x 1905 mm



TEST OPENINGS (w x h in mm)

- (B) 1000 x 2200
- (C) 1500 x 1250
- (D) 4300 x 2800
- (E) 4000 x 4000



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DETERMINATION OF THE REDUCTION OF TRANSMITTED IMPACT NOISE

the test room meet the requirements of the standard ISO 10140-3:2011

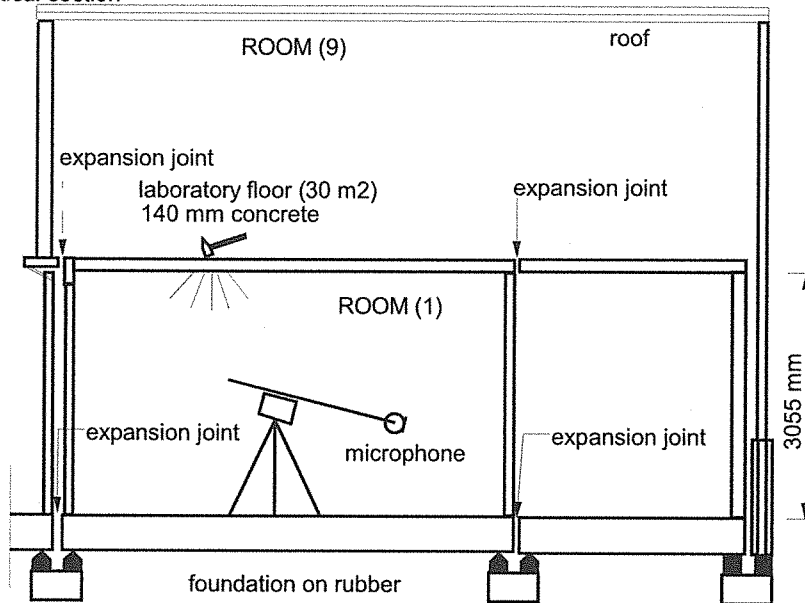
additional data:

volume of room (1): 94 m³

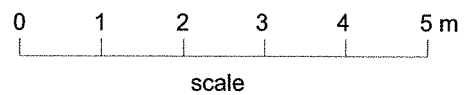
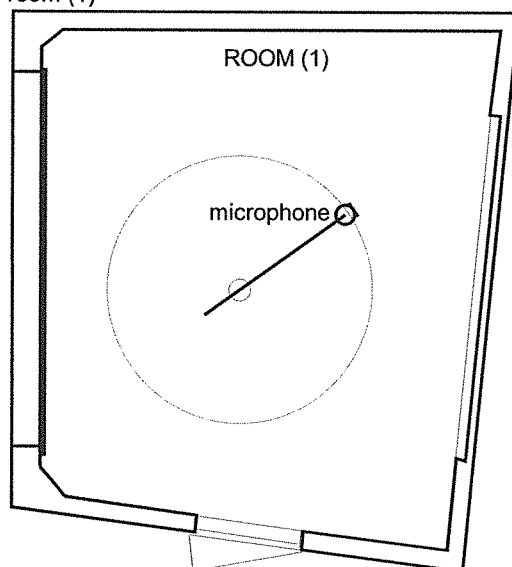
reverberation time of room (1)

frequency	125	250	500	1000	2000	4000	Hz
reverberation time	2,26	1,96	2,25	2,11	1,81	1,43	s

vertical section



plan of room (1)



THE NORMALIZED IMPACT SOUND PRESSURE LEVEL L_n OF A FLOOR
 ACCORDING TO ISO 10140-3:2010

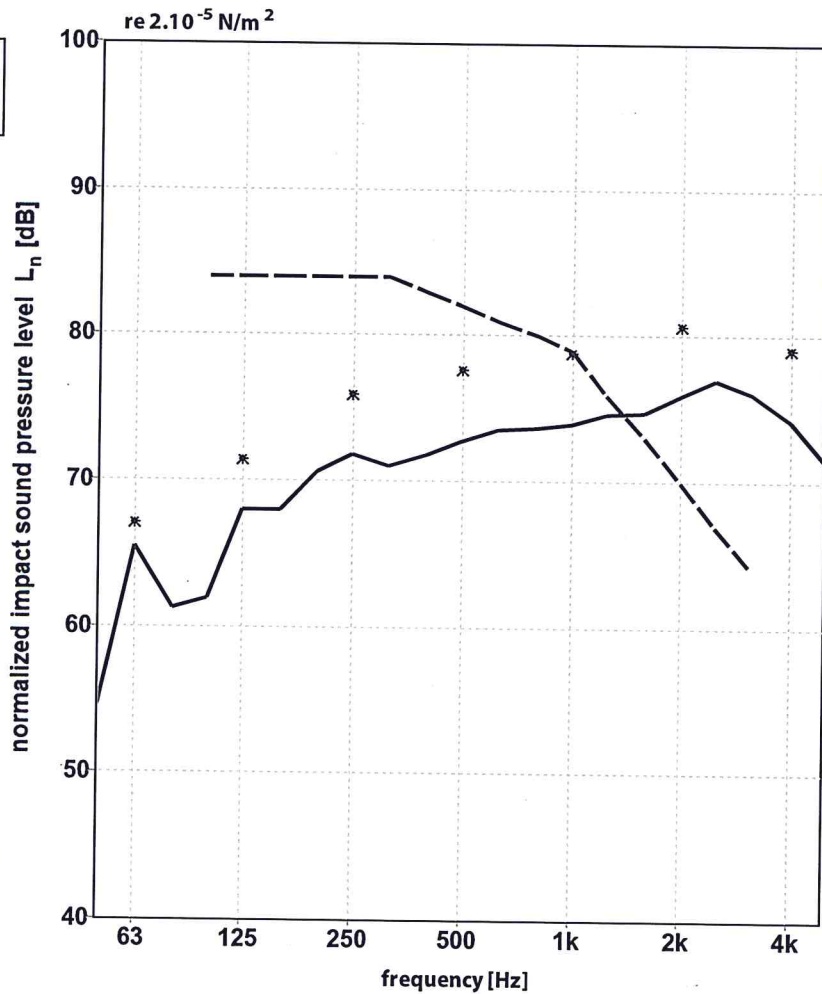


principal:
 construction tested: Bare floor

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

volume measuring room: 94 m³
 surface area floor: 30 m²
 measured at:
 Peutz Laboratory for Acoustics
 signal: tapping machine
 bandwidth: 1/3 octave
 $A_0 = 10,0 \text{ m}^2$

ISO 717-2:2013
 $L_{n,w}(C_i) = 82(-12) \text{ dB}$



	63	125	250	500	1k	2k	4k
1/3 oct.	54,5 65,5 61,3	61,9 68,0 68,0	70,6 71,8 71,1	71,9 72,8 73,6	73,7 73,9 74,6	74,7 75,9 77,0	76,1 74,2 71,4
1/1 oct.	67,1	71,5	76,0	77,6	78,9	80,7	79,1

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DETERMINING THE REDUCTION OF TRANSMITTED IMPACT NOISE BY FLOOR COVERINGS ACCORDING TO ISO 10140-3:2010



principal: f

Variant 1: **type 5 laminated AS underlayment with LVT topfloor 5 mm with load (ca. 20 kg/m²).**



— 1/3 oct.
* 1/1 oct.

volume measuring room: 94 m³

measured at:
Peutz Laboratory for Acoustics

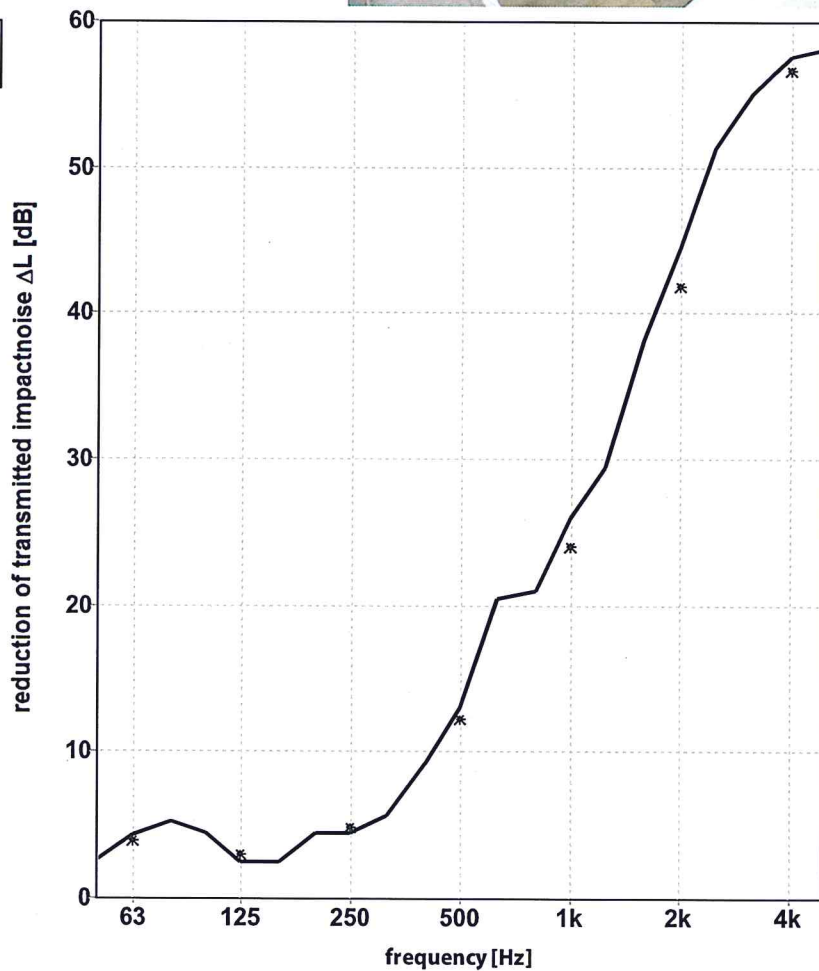
signal: tapping machine

bandwidth: 1/3 octave

ISO 717-2:2013

$\Delta L_{in} = 9 \text{ dB}$

$\Delta L_w = 20 \text{ dB}$



	2,6	4,5	4,5	9,2	21,0	38,2	55,1	
1/3 oct.	4,3	2,5	4,5	13,1	26,0	44,6	57,6	dB
	5,3	2,5	5,7	20,5	29,5	51,4	58,2	
1/1 oct.	3,9	3,1	4,9	12,3	24,1	41,9	56,7	dB

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DETERMINING THE REDUCTION OF TRANSMITTED IMPACT NOISE BY FLOOR COVERINGS ACCORDING TO ISO 10140-3:2010



principal: F...

Variant 2: type 1 laminated AS underlayment with LVT topfloor 5 mm without load



— 1/3 oct.
* 1/1 oct.

volume measuring room: 94 m³

measured at:
Peutz Laboratory for Acoustics

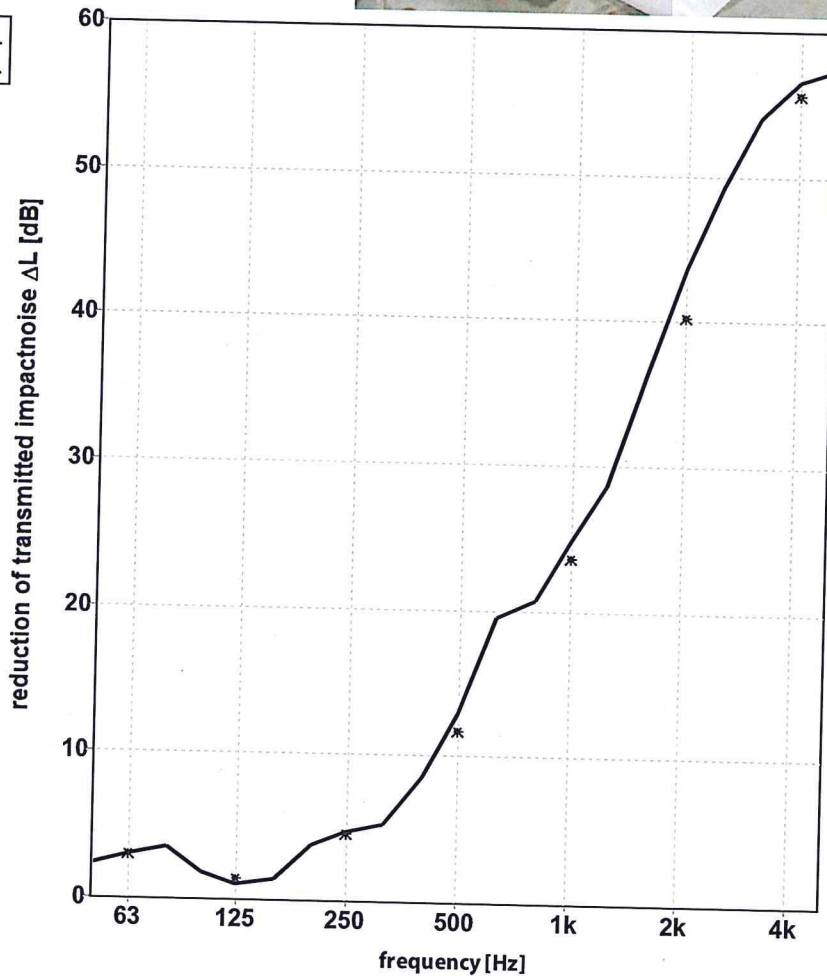
signal: tapping machine

bandwidth: 1/3 octave

ISO 717-2:2013

$\Delta L_{in} = 8 \text{ dB}$

$\Delta L_w = 19 \text{ dB}$



	2,4	1,9	3,8	8,6	20,7	36,5	54,1	
1/3 oct.	3,0	1,0	4,8	12,9	24,8	43,6	56,5	dB
	3,6	1,4	5,3	19,5	28,7	49,1	57,3	
1/1 oct.	3,0	1,4	4,6	11,7	23,6	40,3	55,7	dB

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DETERMINING THE REDUCTION OF TRANSMITTED IMPACT NOISE BY FLOOR COVERINGS ACCORDING TO ISO 10140-3:2010



principal: *[illegible]*

Variant 3: *[illegible]*, type laminated AS underlayment with LVT topfloor 4,5 mm with load (ca. 20 kg/m²).



— 1/3 oct.
* 1/1 oct.

volume measuring room: 94 m³

measured at:
Peutz Laboratory for Acoustics

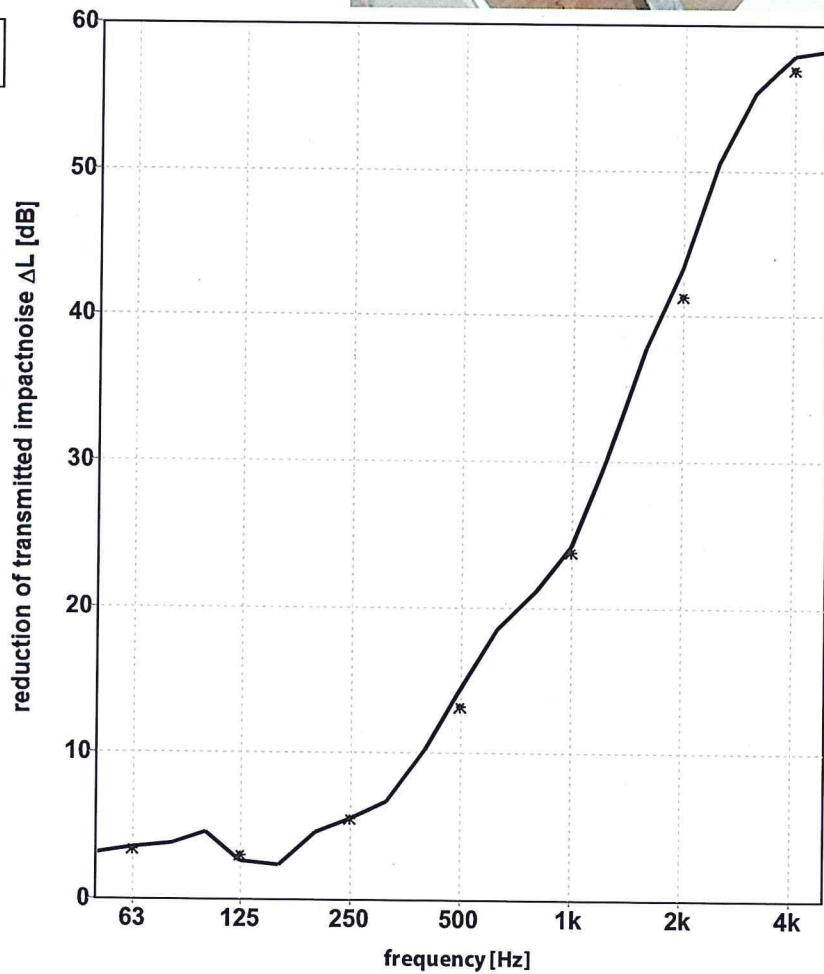
signal: tapping machine

bandwidth: 1/3 octave

ISO 717-2:2013

$\Delta L_{in} = 10 \text{ dB}$

$\Delta L_w = 21 \text{ dB}$



	3,2	4,6	4,6	10,3	21,1	37,8	55,4
1/3 oct.	3,6	2,7	5,5	14,4	24,2	43,3	57,9 dB
	3,8	2,4	6,8	18,5	30,1	50,5	58,3
1/1 oct.	3,5	3,1	5,5	13,2	23,8	41,3	57,0 dB

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DETERMINING THE REDUCTION OF TRANSMITTED IMPACT NOISE BY FLOOR COVERINGS ACCORDING TO ISO 10140-3:2010



principal:

Variant 4: type 4.1.1.1 laminated AS underlayment with LVT topfloor 4,5 mm without load



— 1/3 oct.
* 1/1 oct.

volume measuring room: 94 m³

measured at:
Peutz Laboratory for Acoustics

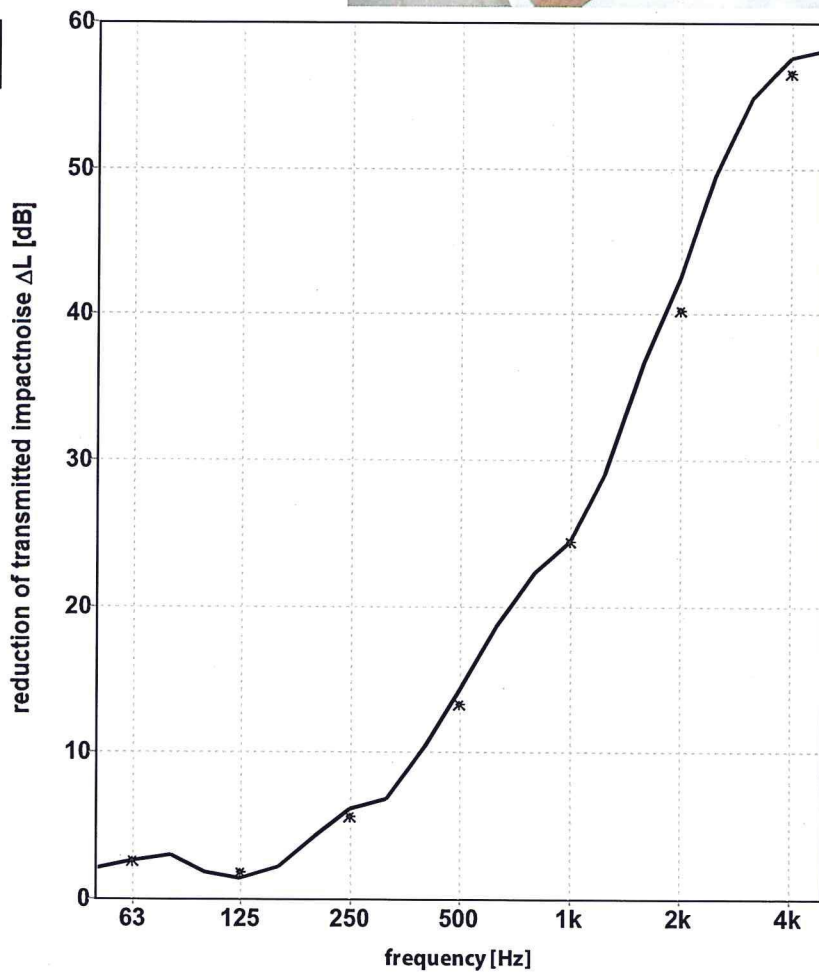
signal: tapping machine

bandwidth: 1/3 octave

ISO 717-2:2013

$\Delta L_{in} = 9 \text{ dB}$

$\Delta L_w = 20 \text{ dB}$



	2,1	1,9	4,4	10,4	22,3	36,7	54,8	
1/3 oct.	2,7	1,4	6,2	14,3	24,5	42,6	57,6	dB
	3,0	2,2	6,9	18,7	29,1	49,6	58,2	
1/1 oct.	2,6	1,8	5,7	13,3	24,5	40,3	56,6	dB

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DETERMINING THE REDUCTION OF TRANSMITTED IMPACT NOISE BY FLOOR COVERINGS ACCORDING TO ISO 10140-3:2010



principal: P

Variant 5: type laminated AS underlayment with LVT topfloor 4 mm with load (ca. 20 kg/m²).



— 1/3 oct.
* 1/1 oct.

volume measuring room: 94 m³

measured at:
Peutz Laboratory for Acoustics

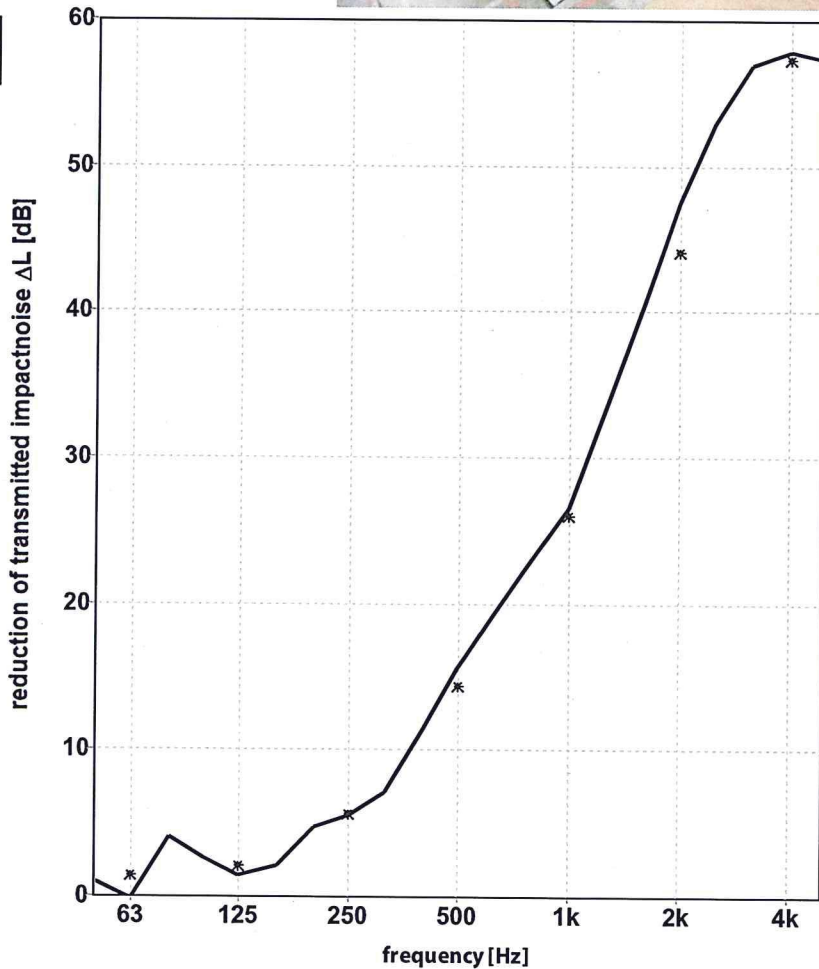
signal: tapping machine

bandwidth: 1/3 octave

ISO 717-2:2013

$\Delta L_{in} = 9 \text{ dB}$

$\Delta L_w = 20 \text{ dB}$



	1,1	2,7	4,7	11,5	23,3	40,3	57,0
1/3 oct.	-0,1	1,5	5,5	15,7	26,5	47,6	57,9 dB
	4,1	2,1	7,2	19,4	33,0	53,0	57,4
1/1 oct.	1,4	2,1	5,7	14,4	26,1	44,1	57,4 dB

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Mook, 07-03-2014

DETERMINING THE REDUCTION OF TRANSMITTED IMPACT NOISE BY FLOOR COVERINGS ACCORDING TO ISO 10140-3:2010



principal: _____

Variant 6: _____, type _____ laminated AS underlayment with LVT topfloor 4 mm without load



— 1/3 oct.
* 1/1 oct.

volume measuring room: 94 m³

measured at:
Peutz Laboratory for Acoustics

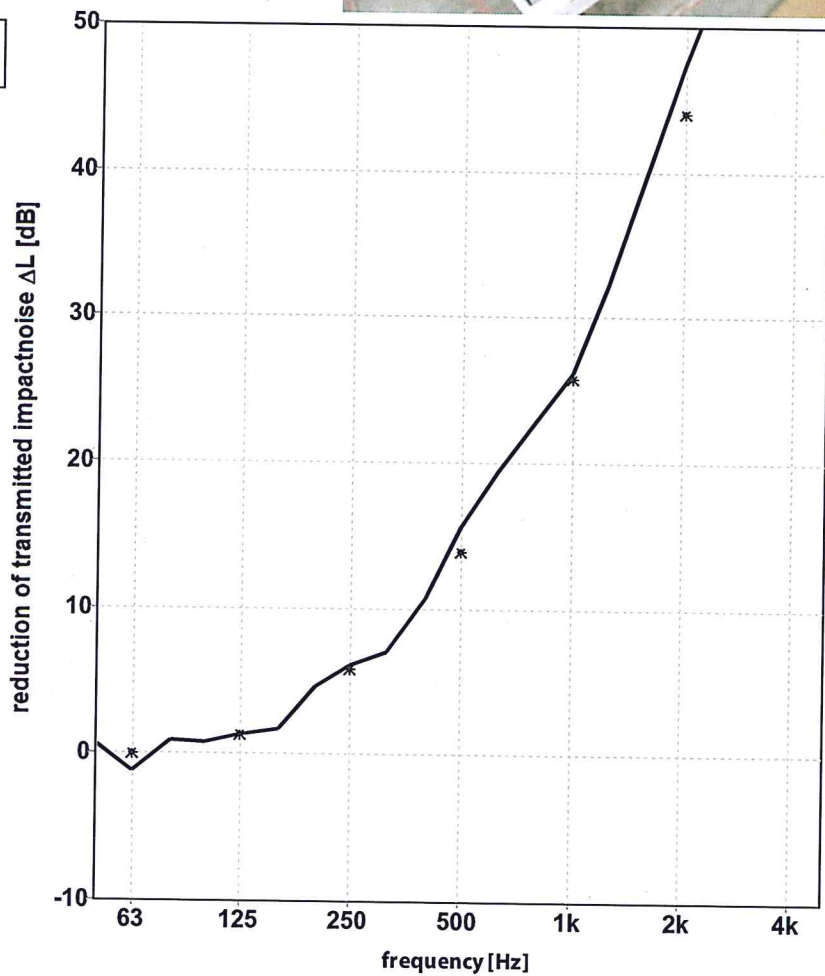
signal: tapping machine

bandwidth: 1/3 octave

ISO 717-2:2013

$\Delta L_{in} = 9 \text{ dB}$

$\Delta L_w = 20 \text{ dB}$



	0,7	0,9	4,7	10,8	23,1	40,1	57,3
1/3 oct.	-1,1	1,3	6,1	15,7	26,2	47,5	58,4 dB
	1,0	1,7	7,1	19,5	32,3	53,7	57,9
1/1 oct.	0,1	1,3	5,9	13,9	25,8	44,0	57,8 dB

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figure 9