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NBN EN ISO 17025:2017  
 EA MLA signatory

## NOISE LAB

**REPORT Number A-2021LAB-123-I217-44523\_E**

**Customer :** CENTEXBEL  
 Technologiepark 70  
 9052 Zwijnaarde  
 Belgium

**Contacts :** Client : Kristina De Temmerman  
 Noise lab : Gert-Jan Loobuyck

**Tests :** Laboratory measurement of the reduction of impact noise by a floating floor system  
 on a heavyweight standard floor.  
**Product name :** Rubber tile T2123748 + underlayer T2123749

### Normative references:

NBN EN ISO 10140-3:2010 Acoustics - Laboratory measurement of sound insulation of building elements  
 - Part 3: Measurements of impact sound insulation

### Various other related norms:

NBN EN ISO 10140-3/A1:2015 Acoustics - Laboratory measurement of sound insulation of building elements  
 - Part 3: Measurements of impact sound insulation - Amendment 1 (ISO 10140-3:2010/Amd 1:2015)  
 NBN EN ISO 10140-1:2016 Acoustics - Laboratory measurement of sound insulation of building elements  
 - Part 1: Application rules for specific products  
 NBN EN ISO 10140-4:2010 Acoustics - Laboratory measurement of sound insulation of building elements  
 - Part 4: Measurement procedures and requirements  
 NBN EN ISO 10140-5:2010 Acoustics - Laboratory measurement of sound insulation of building elements  
 - Part 5: Requirements for test facilities and equipment  
 NBN EN ISO 12999-1:2014 Acoustics - Determination and application of measurement uncertainties in building acoustics  
 - Part 1: Sound insulation  
 NBN EN ISO 717-2:2013 Acoustics - Rating of sound insulation in buildings and of building elements  
 - Part 2: Impact sound insulation

To perform the above measurements, the laboratory of Daidalos Peutz is accredited by BELAC, "The Belgian Accreditation Body", under the certificate nr N°451-TEST. The activities covered by this accreditation certificate are covered by the EA MLA.

BELAC is a signatory of all existing multilateral agreements and recognition agreements of International Laboratory Accreditation Cooperation (ILAC).

In this way, reports issued by BELAC accredited bodies are internationally accredited.

<b>Date and reference of the request:</b>	4/11/2021	2021LAB-123
<b>Date of receipt of the specimen (s):</b>	22/11/2021	SONI217
<b>Date of tests:</b>	23/11/2021	
<b>Date of preparation of the report:</b>	27/12/2021	

This test report together with its annexes contains : 13 pages and must be multiplied only in its entirety.

Technical Manager,

Paul Mees

Laboratory Worker,

Gert-Jan Loobuyck

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### MEASURING EQUIPMENT

#### Source signal

Brüel & Kjaer - 4292 : Omni Power Sound Source  
 Brüel & Kjaer - 2716 : Power amplifier  
 Norsonic Nor277 : Tapping machine conform ISO 10140-5 Annex E

#### Microphone and data acquisition system:

Brüel & Kjaer - 4189 : 1/2" free field microphone, 6Hz to 20kHz, prepolarized  
 Brüel & Kjaer - ZC-0032 : 1/2" microphone preamplifier  
 Brüel & Kjaer - 4231 : Sound calibrator 94&114dB SPL-1000Hz, Fulfil IEC 60942(2003)Class1  
 Brüel & Kjaer - JP 1041 : dual 10-pole adaptor JP-1041  
 Brüel & Kjaer - 2270 : Sound level meter - dual channel instrument (measuring both channels simultaneously)  
 Conforms with IEC 61672-1 (2002-05) Class 1  
 Brüel & Kjaer - 3923 : rotating microphone boom

#### *One rotating microphone system in the receiving room*

Number of tapping machine positions:	3
Minimum 0,7m between the different source positions	
Distances to the board of the floor at least 0.5 m	
Random positions and orientation of the tapping machine.	
Number of microphone positions for each tapping machine position:	3
Microphone position with a rotating microphone	
Number of rotations:	3
Rotation speed:	16 s/tr
Minimum rotation time:	30 s
Just not a rotation angle <math><10^\circ</math> to the chamber surfaces	

#### Data processing

Brüel & Kjaer - BZ-5503 : utility software for hand-held analyzers  
 Brüel & Kjaer - BZ-7229 : dual-channel building acoustics software  
 Brüel & Kjaer - 7830 :Qualifier Software for reporting results  
 A computer with proprietary software

Averaging Time per measurement:	48 s
Number of reverberation time measurements (with graphic control):	27

#### Test chambers

Volume receiving room:	52,6 m <sup>3</sup>
Reference floor area:	12,00 m <sup>2</sup>
Surface test floor :	3,00 m <sup>2</sup>

There are diffusers and absorption material applied in the receiving room.

#### Standard floor

The base floor used is a 140 mm thick solid reinforced concrete slab.  
 According to ISO 10140-5 Annex C this is the "heavyweight standard floor".

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### STANDARD METHOD

The normalised impact sound pressure level  $L_n$  and the reduction of sound pressure level (improvement of impact sound insulation)  $\Delta L$  were measured according to the standard NBN EN ISO 10140-3:2010. A detailed description of the test set up has been given in the figures of annex 1 of this report.

The tests were measured as follows:

- The test sample is mounted onto a heavyweight standard floor, in accordance with the descriptions in the standard NBN EN ISO 10140-1 and 10140-3.
- The standardized (see NBN EN ISO 10140-5:2010 Annex E) tapping machine is positioned in 3 or 4 positions on the test floor (depending on the sample). The impact sound pressure levels are measured in the receiving room below the test floor using a moving microphone. A one-third octave band analyser measured the averaged sound levels in the third octave bands from 100 to 5000 Hz. If required, the levels are corrected to account for the background noise. The individual measurements are then averaged energetically for each one-third octave band and converted with the reverberation time measurements to the normalized impact sound pressure level  $L_n$  for a receiving room having 10m<sup>2</sup> of equivalent sound absorption area.
- The normalized impact sound pressure level of the heavyweight standard floor  $L_{n,0}$  is measured using the identical procedure.
- The normalized impact sound pressure level is calculated according to the following equation:

$$L_n = L_i + 10 \log (A/A_0) \quad [\text{dB}]$$

- met
- $L_n$  = The normalized impact sound pressure level, expressed in dB (ref 20μPa)
  - $L_i$  = the energy average sound pressure level in a one-third octave band in the receiving room when the floor under test is excited by the standardized tapping machine
  - $A_0$  = the reference equivalent absorption area (= 10m<sup>2</sup>)
  - $A$  = the measured equivalent absorption area

- The temperature, relative humidity and static pressure is also measured in the test rooms.
- The improvement  $\Delta L$  of the impact sound insulation is calculated from the difference between the weighted impact sound levels of the bare floor without and with the floor covering:

$$\Delta L = L_{n,0} - L_n \quad [\text{dB}]$$

- met
- $\Delta L$  = The improvement of the impact sound insulation
  - $L_{n,0}$  = normalized impact sound pressure level of the bare floor
  - $L_n$  = normalized impact sound pressure level of the bare floor with floor covering

## NOISE LAB

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### STANDARD METHOD

#### Single rating numbers

Evaluation according to EN ISO 717-2 defines single-number quantities,  $L_{n,w}(C_i)$  for the impact sound insulation of floors and  $\Delta L_w(C_{i,\Delta})$  for the impact sound reduction of floor coverings and floating floors from the results of measurements carried out in accordance with NBN EN ISO 10140-3. The values obtained in accordance with ISO 10140-3 are compared with reference values at the frequencies of measurement within the range 100Hz to 3150 Hz for measurements in one-third octave bands. The calculation of the single-value indicator can not be summarised in a few lines. See standard NBN EN ISO 717-2 for details.

$L_{n,w}$  = weighted normalized impact sound pressure level

$L_{n,w}+C_i$  = weighted normalized impact sound pressure level corrected with the adaptation term  $C_i$

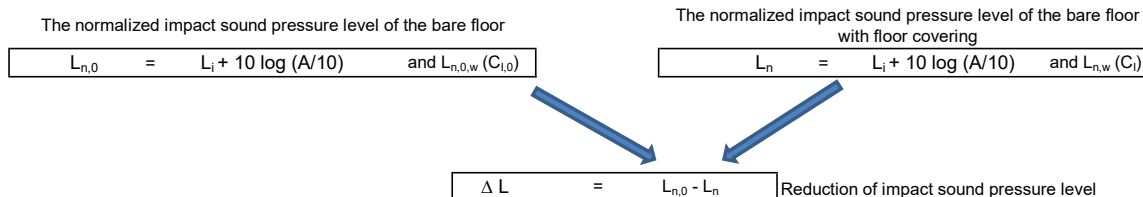
$C_i$  =  $L_{n,sum} - 15 - L_{n,w}$  With  $L_{n,sum}$  the summation on an energetic basis for the one-third octave bands in the frequency range 100Hz to 2,5kHz

$$L_{n,sum} = 10 \log \sum_{i=1}^n 10^{\frac{L_i}{10}}$$

Calculations of the spectrum adaptation term may additionally be carried out for an enlarged frequency range.

The single-number quantities of impact sound insulation properties of floors, presented as  $L_{n,w}(C_i)$

The single-number quantities of the weighted reduction in impact sound pressure level for floorcoverings, is presented as  $\Delta L_w(C_{i,\Delta})$  and  $\Delta L_{in}$



To compare the measurement results obtained in different test laboratories, the normalized impact sound level  $L_n$ , is referred to the reference floor defined in ISO 717-2 in the following way. The quantity is designated by the index "r" ("reference floor"):  $L_{n,r}$

$$L_{n,r} = L_{n,r,0} - \Delta L \quad \text{and} \quad L_{n,r,w}(C_{i,r})$$

with  $L_{n,r,0}$  is the defined normalized impact sound pressure level of the reference floor (see ISO 717-2 point 5.2)

$$\Delta L_w = L_{n,r,0,w} - L_{n,r,w} = 78 - L_{n,r,w} \quad \text{with} \quad C_{i,\Delta} = C_{i,r,0} - C_{i,r} = -11 - C_{i,r}$$

$$\Delta L_{in} = \Delta L_w + C_{i,\Delta}$$

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### SPECIAL MEASUREMENT CONDITIONS

/

### ACCURACY

The accuracy of the impact sound insulation as calculated can be expressed in terms of repeatability (tests within one laboratory) and reproducibility (between various laboratories)

#### 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

#### 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

The standard ISO 12999-1:2014 contains a statement on the expected reproducibility R, based on the results of various interlaboratory tests.

The standard deviation for the reduction in impact sound pressure level,  $\Delta L_{w,i}$ , obtained under reproducibility conditions,  $\sigma_R$ , for the single number value, in accordance with ISO 717-2, from table 7 of standard ISO 12999-1:2014 is 1,1dB.

At present, there are no results available for impact sound insulation at reproducibility conditions. Indicated values are estimates.

The standard deviation for impact sound insulation,  $L_{n,w}$ , obtained under reproducibility conditions,  $\sigma_R$ , for the single number value, in accordance with ISO 717-2, from table 5 of standard ISO 12999-1:2014 is 1,5dB.

For  $L_{n,w}$  is  $\sigma_R$ , from table 5 of standard ISO 12999-1:2014 estimated as 1,5dB

### ENVIRONMENTAL CONDITIONS during the tests

	Source room	Receiving room
Temperature :	T = 18,0 °C	18,4 °C
Atmospheric pressure :	p = 1026,2 hPa	1026,5 hPa
Relative humidity :	$h_r$ = 66,3 %	58,8 %

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### MEASUREMENT AND CALCULATION DETAILS

The results as presented here relate only to the tested items and laboratory conditions as described in this report.

The results of the measurements are presented on the next pages (6 till 9)

- on page 7 : the measurement results for the normalized impact sound level for the bare floor (the naked laboratory floor)
- on page 8 : the measurement results for the normalized impact sound level for the bare floor with floor covering, composition of the test element in annex 2
- on page 9 : the calculation of the reduction of impact sound pressure

The results are given at all frequencies of measurement, both in tabular form and in the form of a graph.

The next table present an overview of the measurements and calculations

f	$L_{n,0}$ bare floor	$L_n$ bare floor + floor covering	$\Delta L$ $L_{n,0} - L_n$	$L_{n,r,0}$ reference floor according ISO 717-2 / 5.2	$L_{n,r}$ reference floor + floor covering $L_{n,r,0} - \Delta L$	
(Hz)	(dB)	(dB)	(dB)	(dB)	(dB)	
50	44,3	41,3	3,0			
<b>63</b>	<b>59,0</b>	<b>56,3</b>	2,7			
80	67,6	65,5	2,1			
100	63,1	61,3	1,8	67,0	<b>65,2</b>	
<b>125</b>	<b>64,0</b>	<b>60,9</b>	3,1	67,5	<b>64,4</b>	
160	66,6	55,9	10,7	68,0	<b>57,3</b>	
200	67,0	49,2	17,8	68,5	<b>50,7</b>	
<b>250</b>	<b>67,3</b>	<b>42,1</b>	25,2	69,0	<b>43,8</b>	
315	66,5	34,5	32,0	69,5	<b>37,5</b>	
400	66,9	28,8	38,1	70,0	<b>31,9</b>	
<b>500</b>	<b>67,4</b>	<b>24,5</b>	42,9	70,5	<b>27,6</b>	
630	68,5	22,5	46,0	71,0	<b>25,0</b>	
800	69,7	23,0	46,7	71,5	<b>24,8</b>	
<b>1000</b>	<b>71,2</b>	<b>23,3</b>	47,9	72,0	<b>24,1</b>	
1250	71,3	18,0	53,3	72,0	<b>18,7</b>	
1600	70,3	13,4	56,9	72,0	<b>15,1</b>	
<b>2000</b>	<b>70,0</b>	<b>8,2</b>	61,8	72,0	<b>10,2</b>	
2500	70,0	5,7	64,3	72,0	<b>7,7</b>	
3150	68,0	5,6	62,4	72,0	<b>9,6</b>	
<b>4000</b>	<b>65,2</b>	<b>4,9</b>	60,3	/	/	
5000	61,9	5,2	56,7	/	/	
<b>ISO 717-2</b>	$L_{n,0,w}$	$L_{n,w}$		$L_{n,r,0,w}$	$L_{n,r,w}$	$\Delta L_w = 78 - L_{n,r,w}$
	<b>76</b>	<b>47</b>		78	50	<b>28 dB</b>
	$C_{l,0}$	$C_l$		$C_{l,r,0}$	$C_{l,r}$	$C_{l,\Delta} = C_{l,r,0} - C_{l,r}$
	<b>-10</b>	<b>3</b>		-11	<b>3</b>	<b>-14 dB</b>
						$\Delta L_{lin} = \Delta L_w + C_{l,\Delta}$
						<b>14 dB</b>

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**L<sub>n,0</sub>**

**NORMALIZED IMPACT SOUND PRESSURE LEVEL (of standard floor) in accordance with ISO 10140-3:2010**

**Client: CENTEXBEL**

Date of test: 23/11/2021

**Description of the test setup:**

The base floor used is a 140 mm thick solid reinforced concrete slab.  
 According to ISO 10140-5 Annex C this is the "heavyweight standard floor".

Receiving room volume V: 52,6 m<sup>3</sup>  
 Reference floor area : 12,0 m<sup>2</sup>  
 Tested floor area : 3,0 m<sup>2</sup>

Signal : Standard tapping machine with steel-headed hammers.

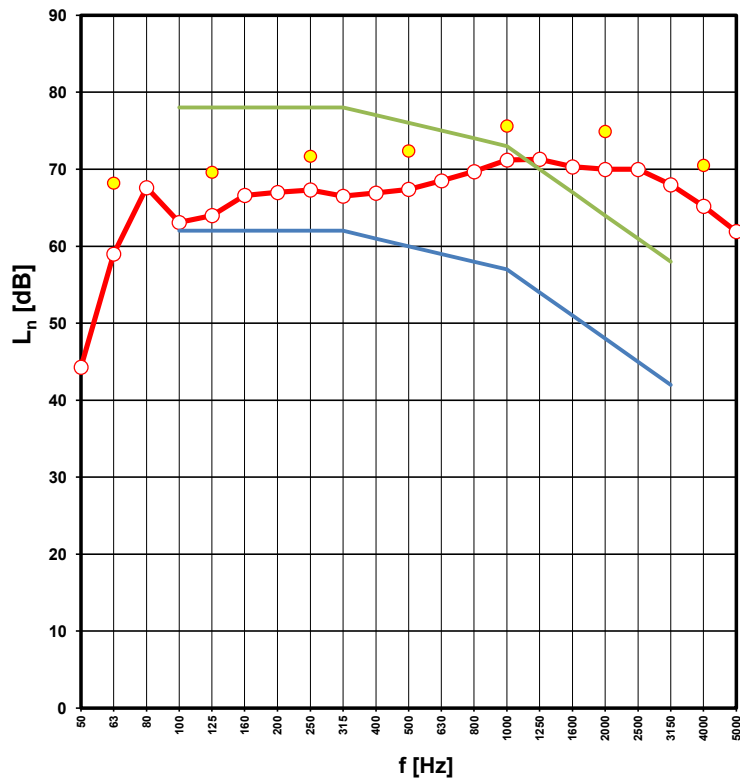
— reference values (according ISO 717-2)  
 — shifted reference values (according ISO 717-2)

f	L <sub>n,0</sub>	(*)
(Hz)	(dB)	
<b>1/3 octave bands :</b>		
50	44,3	
<b>63</b>	<b>59,0</b>	
80	67,6	
100	63,1	
<b>125</b>	<b>64,0</b>	
160	66,6	
200	67,0	
<b>250</b>	<b>67,3</b>	
315	66,5	
400	66,9	
<b>500</b>	<b>67,4</b>	
630	68,5	
800	69,7	
<b>1000</b>	<b>71,2</b>	
1250	71,3	
1600	70,3	
<b>2000</b>	<b>70,0</b>	
2500	70,0	
3150	68,0	
<b>4000</b>	<b>65,2</b>	
5000	61,9	

<b>octave bands :</b>	
<b>63</b>	<b>68,2</b>
<b>125</b>	<b>69,6</b>
<b>250</b>	<b>71,7</b>
<b>500</b>	<b>72,4</b>
<b>1000</b>	<b>75,6</b>
<b>2000</b>	<b>74,9</b>
<b>4000</b>	<b>70,5</b>

B: L<sub>n</sub>=< value shown

(\*) b : background noise correction used  
 B : Maximum background noise correction used



Rating according to ISO 717-2

**L<sub>n,0,w</sub> (C<sub>i,0</sub>) = 76 ( -10 ) dB**

Evaluation based on laboratory measurement results obtained in one-third-octave bands by an engineering method

No. of test report: SONI215  
 Date: 23/11/2021

Name of test institute: Daidalos Peutz  
 Signature: Gert-Jan Loobuyck

**NOISE LAB**  
**REPORT Number A-2021LAB-123-I217-44523\_E**

**$L_n$**

**NORMALIZED IMPACT SOUND PRESSURE LEVEL** in accordance with ISO 10140-3:2010

**Client: CENTEXBEL**

**Date of test: 23/11/2021**

**Description of the test setup:**

20 mm Rubber tile T2123748  
 20 mm underlayer T2123749  
 140 mm heavyweight standard floor = solid reinforced concrete slab

Receiving room volume V: 52,6 m<sup>3</sup>

Reference floor area : 12,0 m<sup>2</sup>

Tested floor area : 3,0 m<sup>2</sup>

Signal : Standard tapping machine with steel-headed hammers.

— reference values (according ISO 717-2)  
 — shifted reference values (according ISO 717-2)

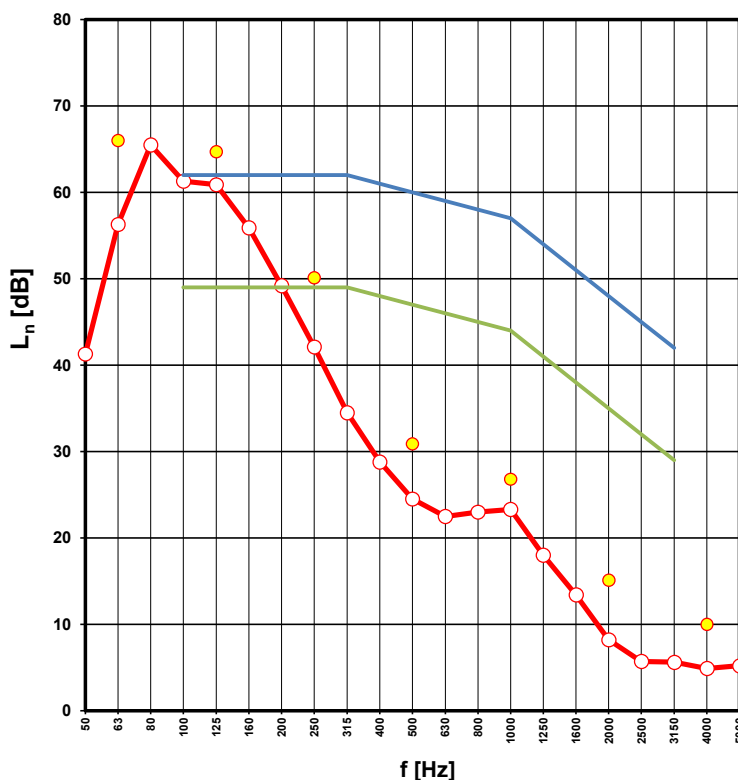
f	$L_n$	(*)
(Hz)	(dB)	
<b>1/3 octave bands :</b>		
50	41,3	
63	56,3	
80	65,5	
100	61,3	
125	60,9	
160	55,9	
200	49,2	
250	42,1	
315	34,5	
400	28,8	
500	24,5	
630	22,5	
800	23,0	B
1000	23,3	b
1250	18,0	b
1600	13,4	b
2000	8,2	B
2500	5,7	B
3150	5,6	B
4000	4,9	B
5000	5,2	B

<b>octave bands :</b>	
63	66,0
125	64,7
250	50,1
500	30,9
1000	26,8
2000	15,1
4000	10,0

B:  $L_n$  < value shown

(\*) b : background noise correction used

B : Maximum background noise correction used



Rating according to ISO 717-2

**$L_{n,w}(C_i) = 47 (3) \text{ dB}$**

Evaluation based on laboratory measurement results obtained in one-third-octave bands by an engineering method

No. of test report: SONI217  
 Date: 23/11/2021

Name of test institute: Daidalos Peutz  
 Signature: Gert-Jan Loobuyck

**NOISE LAB**  
**REPORT Number A-2021LAB-123-I217-44523\_E**



**REDUCTION OF IMPACT SOUND PRESSURE LEVEL BY FLOOR COVERINGS in accordance with ISO 10140-3**

**Client: CENTEXBEL**

Date of test: 23/11/2021

**Description of the test setup:**

20 mm Rubber tile T2123748  
 20 mm underlayer T2123749  
 140 mm heavyweight standard floor = solid reinforced concrete slab

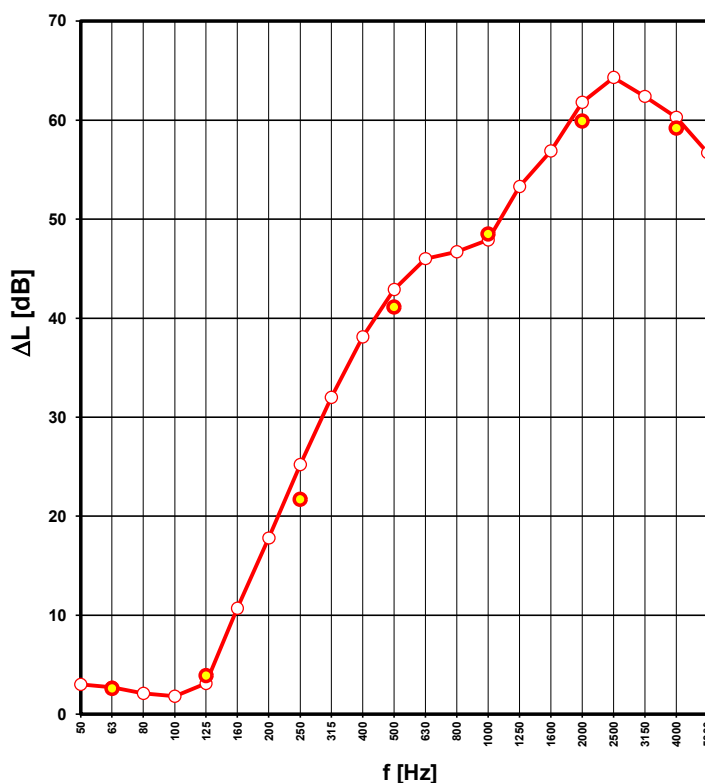
Receiving room volume V: 52,6 m<sup>3</sup>

Reference floor area : 12,0 m<sup>2</sup>

Tested floor area : 3,0 m<sup>2</sup>

Signal : Standard tapping machine with steel-headed hammers.

f (Hz)	$\Delta L$ = $L_{n,0} - L_n$ (dB)
<b>1/3 octave bands : —</b>	
50	3,0
63	2,7
80	2,1
100	1,8
125	3,1
160	10,7
200	17,8
250	25,2
315	32,0
400	38,1
500	42,9
630	46,0
800	46,7
1000	47,9
1250	53,3
1600	56,9
2000	61,8
2500	64,3
3150	62,4
4000	60,3
5000	56,7
<b>octave bands : ●</b>	
63	2,6
125	3,9
250	21,7
500	41,1
1000	48,5
2000	59,9
4000	59,2



Rating according to ISO 717-2

$\Delta L_w (C_{i,\Delta}) = 28 \quad ( -14 ) \quad \text{dB}$

$\Delta L_{\text{lin}} = 14 \quad \text{dB}$

Evaluation based on laboratory measurement results obtained in one-third-octave bands by an engineering method

No. of test report: SONI217  
 Date: 23/11/2021

Name of test institute: Daidalos Peutz  
 Signature: Gert-Jan Loobuyck

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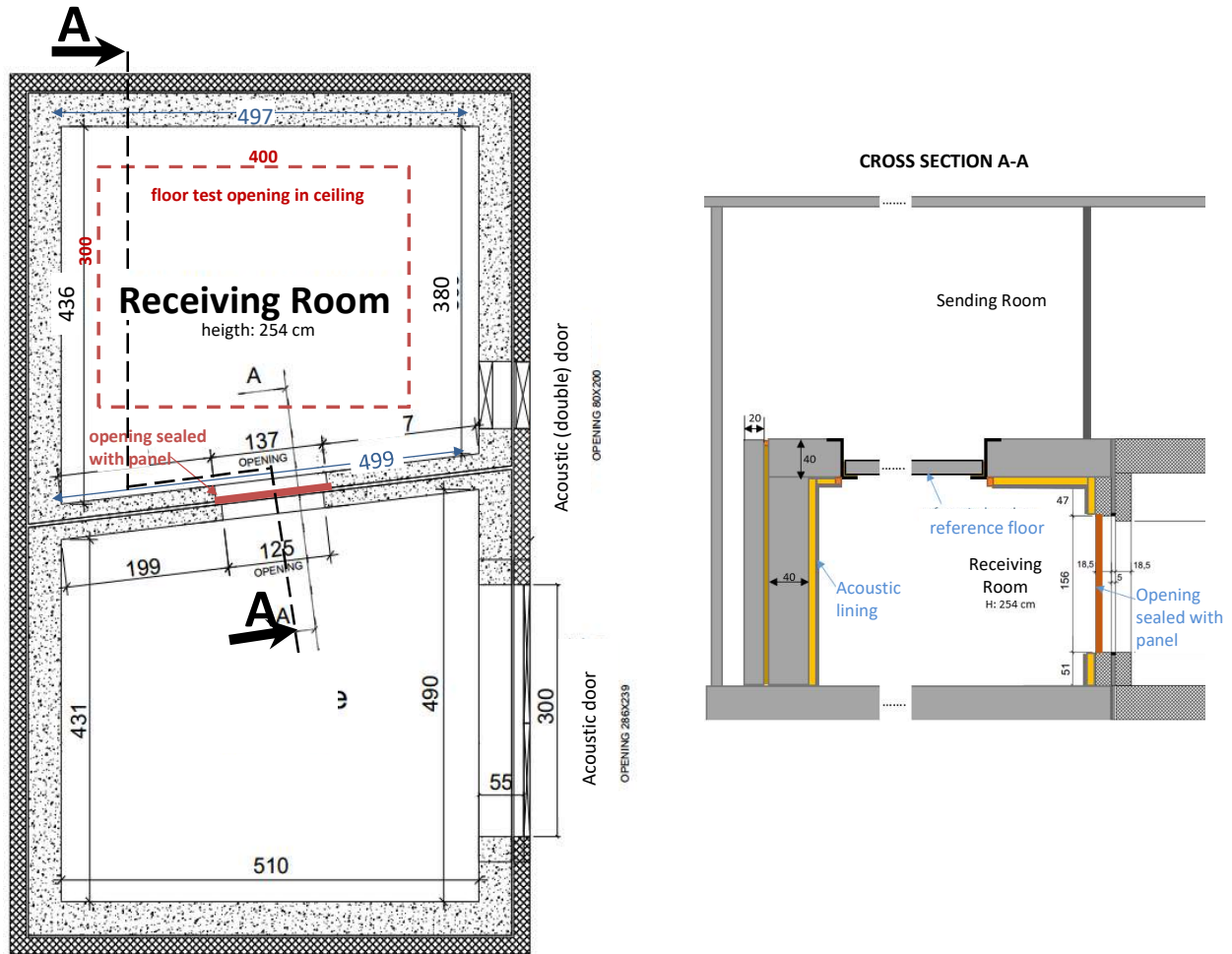


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**ANNEX 1 : Sound insulation test facilities**

The test rooms meet the requirements of ISO 10140-5  
 Both rooms are isolated for vibrations by using a so called room-in-room construction.



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**ANNEX 2: Description test items by manufacturer**

*The test sample description given by manufacturer is checked visually as good as possible by the laboratory.  
 The correspondence between the test element and the commercialized product is the sole responsibility of the manufacturer*

Description of the test element as a layered structure

	Thickness (mm)	$\rho$ (kg/m <sup>3</sup> )	$m''$ (kg/m <sup>2</sup> )	Description of the layer
1	20	950	19	Rubber tile T2123748
2	20	200	4	underlayer T2123749
3	140	2300	322	heavyweight standard floor = solid reinforced concrete slab
4				
5				
6				
7				
8				
9				
10				

**Rubber tiles with reference number T2123748**  
 the top side is completely flat and a waffled pattern on the base  
 thickness: 20 mm (as verified on the samples)  
 dimensions: 1000mmx1000mm  
 weight of the rubber tile according to the manufacturer: 19 kg /m<sup>2</sup>

**underlayer with reference number T2123749**  
 Material: Recycled polyurethane foam  
 thickness: 20 mm (as verified on the samples)  
 dimensions: 1000mmx1000mm  
 weight of the underlayer according to the manufacturer : 4000 gr/m<sup>2</sup>

Photo of the rubber tile with reference number T2123748



Photo: Front side



Photo: Back side



Section of the the rubber tile T2123748 with underlayer T2123749



Photo: top view of the underlayer T2123749



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**ANNEX 3: Technical sheet**

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*The test sample description given by manufacturer is checked visually as good as possible by the laboratory.  
The correspondence between the test element and the commercialized product is the sole responsibility of the manufacturer*

*On request at supplier*

**NOISE LAB**

**REPORT Number A-2021LAB-123-I217-44523\_E**

**ANNEX 4: photographs of the test element or the test arrangement**

*Description of the assembly or drawing or photo*

The rubber tiles were classified as a 'category I' material, as mentioned in part H2.2.1 of the standard ISO10140-1:2016.

This category includes flexible coverings.

One sample (1m<sup>2</sup>) was large enough to support the whole tapping machine.

The samples (rubber tile on top of the polyurethane underlay) were loosely laid on three different positions on the concrete reference floor.

The same tapping machine positions were used on the uncovered floor.

*Photo test setup: Positions of the tapping machine on the testsample*



*Photo: hammers of the tapping machine, impacting the testsample*

