

## Laboratory for Acoustics

*Determination of the sound absorption  
(reverberation room method) of Airpanel,  
manufacturer Texdecor*





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*Determination of the sound absorption (reverberation room method) of Airpanel, manufacturer Texdecor*

Principal	Texdecor Siège social 2 rue d'Hem 59780 Willems France
Report number	A 3151-7E-RA-002
Date	June 1, 2017
Reference	TS/TS/KF/A 3151-7E-RA-002
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All orders are accepted and executed according to 'De Nieuwe Regeling 2011' (The New Rules)

BTW NL004933837B01 KvK: 12028033

mook – zoetermeer – groningen – düsseldorf – dortmund – berlijn – leuven – parijs – lyon – sevilla

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## 1 Introduction

At the request of Texdecor based in Willems (France), laboratory measurements of the sound absorption (reverberation room method) were carried out on:

**Airpanel  
manufacturer Texdecor**

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 354:2003<sup>1</sup> Acoustics Measurement of sound absorption in a reverberation room  
NOTE: this international standard has been accepted within all EU-countries as European standard EN ISO 354:2003

Various other related norms:

EN ISO 11654:1997 Acoustics Sound absorbers for use in buildings Rating of sound absorption


ASTM C423-09a Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method

<sup>1</sup> According to this norm, the report should include for each measurement the mean reverberation times  $T_1$  and  $T_2$  at each frequency. Because these figures are not relevant for judging the quality of the product being tested, but merely for judging the accuracy of the calculations, they have been omitted in this report. It is possible of course to reproduce those figures at any time if the principal requests this.

### 3 Tested construction

The data presented here have been received from the principal or obtained by own observations.

#### Airpanel

dimensions w x h built-up	1200 x 1200 mm steel frame with acoustic non-woven fleece, covered with fabric at both sides	 
filling total thickness	polyester wool 50 mm	

#### Dalle

dimensions w x h built-up view side	600 x 600 mm aluminum frame with acoustic non-woven fleece, covered at the view side with fabric	 
filling total thickness	polyester wool 70 mm	

*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. The test report ahead is valid as long as the tested constructions and/or materials are unchanged.*

## 4 Measurements

The products are installed for the laboratory test in the same manner as they are typically installed in practice;

- mounted directly on the floor of the reverberation room (Airpanel)
- mounted on a support structure, height 200 mm, above the floor of the reverberation room (Airpanel)
- mounted as a discrete object (Dalle space absorber)

The results for discrete absorbers are expressed as the equivalent sound absorption area A (m<sup>2</sup>) per object.

### 4.1 Method

The tests were conducted in accordance with the provisions of the test method ISO 354 in the reverberation room of "Peutz bv" in Mook (the Netherlands) (see figure 1). The relevant data regarding the reverberation room are given in figure 3 of this report.

By means of reverberation measurements the reverberation time of the room is measured under two conditions:

- when the reverberation room is empty
- when the construction under test is inside the reverberation room

In general, once material is placed into the reverberation room a lower reverberation time will result.

The difference in reverberation times is a measure of the amount of absorption brought into the room.

Measurements and calculations were carried out in 1/3-octave bandwidth from 100 to 5000 Hz, according to the norms. Where applicable the octave values have been calculated from these 1/3-octave values.

From the reverberation measurements in the empty reverberation room the equivalent sound absorption A<sub>1</sub> is calculated (per frequency band) according to formula 1 and expressed in m<sup>2</sup>

$$A_1 = \frac{55,3V}{cT_1} - 4V m_1 \quad (1)$$

in which:

- V = the volume of the reverberation room [m<sup>3</sup>]
- T<sub>1</sub> = the reverberation time in the empty reverberation room [sec.]
- m<sub>1</sub> = "power attenuation coefficient" in the empty room, calculated according to formula [m<sup>-1</sup>]

$c$  = the speed of sound in the air, in m/s, calculated according to [m/s]

$$c = 331 + 0,6t \quad (2)$$

in which:

$t$  = the temperature; this formula is valid for temperatures between 15 and 30 °C [°C]

$$m = \frac{\alpha}{10 \log(e)} \quad (3)$$

in which:

$\alpha$  = "attenuation coefficient" according to ISO 9613-1

In the same manner the equivalent sound absorption  $A_2$  for the room with the test specimen is calculated according to formula 4, also expressed in  $m^2$

$$A_2 = \frac{55,3V}{cT_2} - 4Vm_2 \quad (4)$$

in which:

$c$  and  $V$  have the same definition as in formula 1 and

$T_2$  = the reverberation time of the reverberation room with the test specimen placed inside [sec]

$m_2$  = "power attenuation coefficient" in the room with the test specimen placed inside, calculated according to formula 3 [ $m^{-1}$ ]

The equivalent sound absorption  $A$  of the test specimen has been calculated according to formula 5 and is expressed in  $m^2$

$$A = A_2 - A_1 \quad (5)$$

When the test specimen consists of one plane with an area between 10 and 12  $m^2$  the sound absorption coefficient  $\alpha_s$  has to be calculated according to formula 6:

$$\alpha = \frac{A}{S} \quad (6)$$

in which:

$S$  = the area of the test specimen [ $m^2$ ]

#### 4.2 Accuracy

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

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 evaluate the repeatability  $r$  for the sound absorption measurements performed in the reverberation room of "Peutz bv" in Mook (the Netherlands) eight series of measurements have been carried out according to ISO 354:1985 annex C. From the results of those measurements the repeatability  $r$  has been calculated. It was found that for the frequency range from 100 to 200 Hz and at 5000 Hz the repeatability  $r$  is 0,21 as a maximum. For the frequency range 250 to 4000 Hz the repeatability  $r$  is 0,09 as a maximum.

### 4.3 Environmental conditions

t4.1 *Environmental conditions during the measurements at December 9th, 2016*

reverberation room	temperature [°C]	barometric pressure [kPa]	relative humidity [%]
empty	17,1	102,8	52
with specimen	17,1-17,5	102,8-102,9	56-57

### 4.4 Results

The results of the measurements are given in table 4.2 in table 4.3 and in figure 3 to 5. The measurements were made in 1/3-octave bands. The results presented in octave-bands are the arithmetic average of the results of the three 1/3-octave bands belonging to that octaveband.

From the sound absorption coefficient values the following one-figure ratings have been calculated and stated :

- the "weighted sound absorption coefficient  $\alpha_w$ " according to ISO 11654;
- the "Noise Reduction Coefficient NRC" according to ASTM-C423, being the average of the absorption coefficients (1/3 octave values) at the frequencies of 250, 500, 1000 and 2000 Hz, rounded to the nearest 0,05;
- the "Sound Absorption Average SAA" according to ASTM-C423, being the average of the absorption coefficients (1/3 octave values) at the frequencies of 200 Hz up to 2500 Hz, rounded to the nearest 0,01.

t4.2 Measurements results Texdecor Airpanel

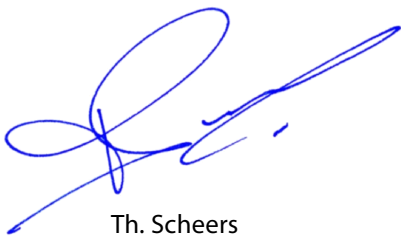
sound absorption coefficient $\alpha_s$				
mounting method	direct on the floor		mounted on a support structure, height 200 mm	
	50 mm		200 mm	
construction height	#596		#634	
record nr.	3		4	
see figure	3		4	
frequency [Hz]	1/3 oct.	1/1 oct.	1/3 oct.	1/1 oct.
100	0,12		0,20	
125	0,21	0,24	0,47	0,46
160	0,38		0,70	
200	0,52		0,84	
250	0,77	0,73	1,10	0,96
315	0,91		0,95	
400	1,00		1,03	
500	1,08	1,05	1,02	1,02
630	1,08		1,00	
800	1,08		0,94	
1000	1,10	1,08	0,98	0,99
1250	1,05		1,04	
1600	1,00		1,02	
2000	1,00	1,00	1,01	1,02
2500	0,99		1,03	
3150	0,99		1,07	
4000	1,04	1,03	1,06	1,07
5000	1,07		1,07	
$\alpha_w$	1,00		1,00	
NRC	1,00		1,05	
SAA	0,97		1,00	

The surface of the tested sample is less than the in the ISO 354 prescribed surface area (between 10 and 12,6 m<sup>2</sup>). In this case the accuracy of the sound absorption coefficient is less than the in paragraph 4.2 given values (which are based on a surface area between 10 and 12,6 m<sup>2</sup>).

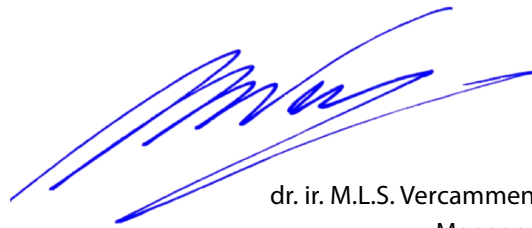
t4.3 Measurements results Dalle panels

sound absorption A [m <sup>2</sup> ] per element (0,6 x 0,6 m)		
panel thickness	70 mm	
mounting height	200 mm	
record nr.	#673	
figure	5	
frequency [Hz]	1/3 oct.	1/1 oct.
100	0,04	
125	0,12	0,12
160	0,21	
200	0,33	
250	0,53	0,49
315	0,61	
400	0,72	
500	0,77	0,74
630	0,73	
800	0,70	
1000	0,72	0,70
1250	0,68	
1600	0,66	
2000	0,67	0,66
2500	0,65	
3150	0,72	
4000	0,75	0,75
5000	0,77	

The sound absorption coefficient of a material is not a material property. It should be taken into account that the sound absorption of a construction depends on the dimensions, the way of mounting of the material and its position in the room.



Th. Scheers  
Laboratory Supervisor



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

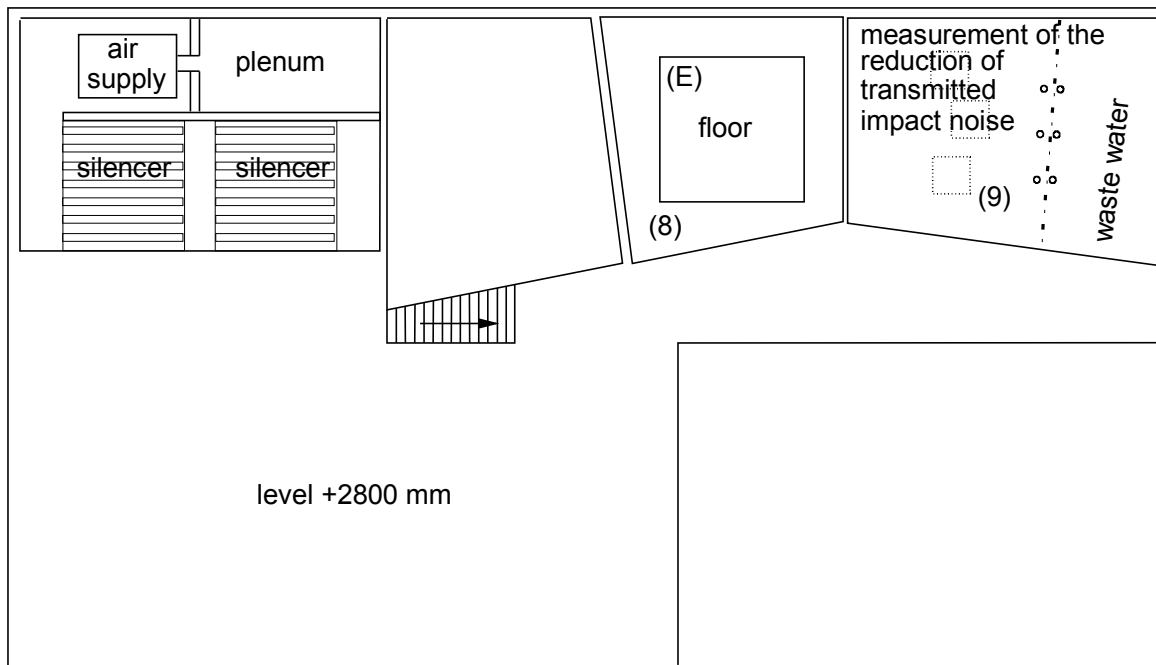
Mook,

This report contains 12 pages and 5 figures.

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

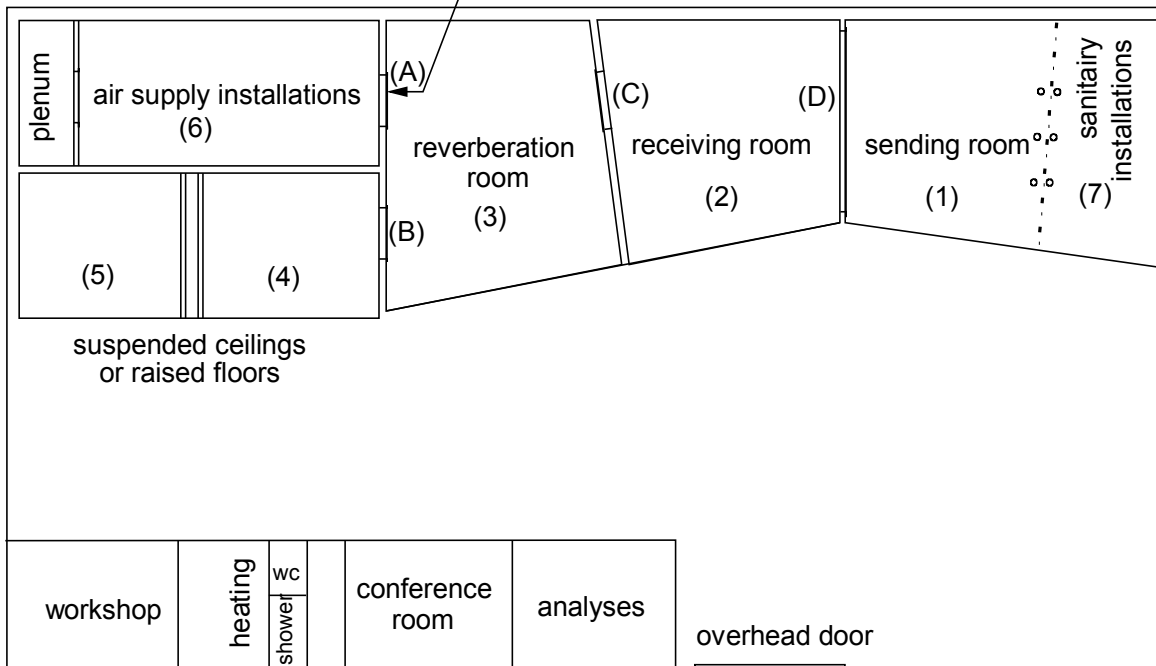
OVERVIEW

Story



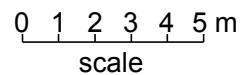
Ground level

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



PEUTZ bv  
Lindenlaan 41, 6584 AC MOLENHOEK (LB)

**REVERBERATION ROOM**

The reverberation room meets the requirements of ISO 354:2003.

additional data:

volume : 214 m<sup>3</sup>

total area S<sub>t</sub> (walls, floor and ceiling) : 219 m<sup>2</sup>

diffusion: by the shape of the room and by adding 6 curved and 2 flat reflecting elements with a total area of approx. 13 m<sup>2</sup> a sufficient diffusion has been gained.

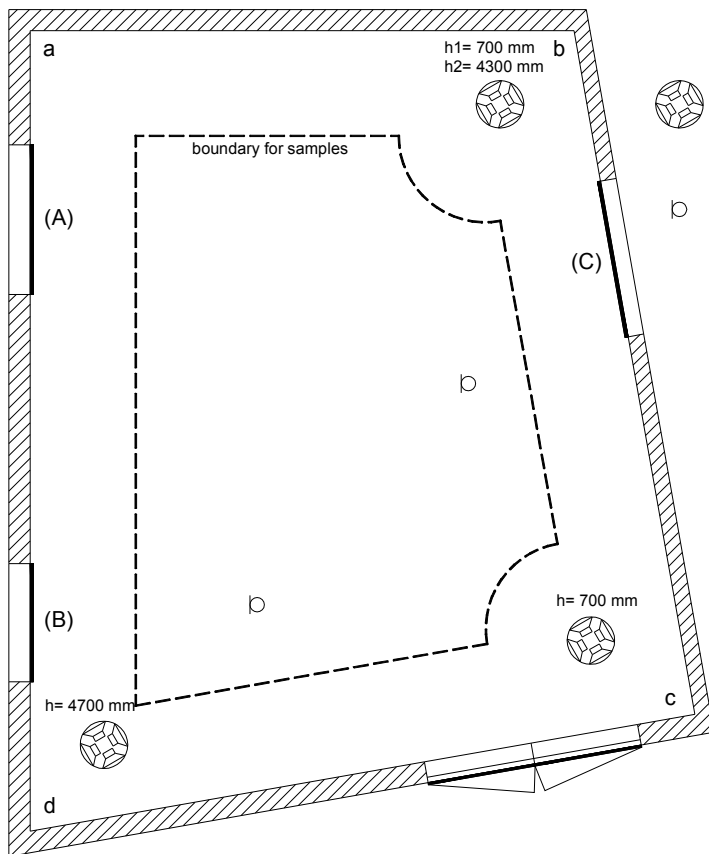
reverberation time of the empty reverberation room during measurements of 09-12-2016

frequency (1/1 oct.)	125	250	500	1000	2000	4000	Hz
reverberationtime	7,87	6,29	6,09	5,43	4,15	2,71	sec.

repeatability r (1/1 oct.) c.f. ISO 354:1985 annex C (see chapter 4.2 of this report).

r bij hoge α	0,13	0,04	0,04	0,02	0,02	0,08	-
r bij lage α	0,09	0,02	0,01	0,02	0,02	0,04	-

plan

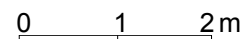


loudspeaker (4x)

microphone (3x)

(closed) testopenings  
(width x height in mm)  
(A): 1300 x 1800  
(B): 1000 x 2200  
(C): 1500 x 1250

height at:  
a: 5573 mm  
b: 5102 mm  
c: 5000 mm  
d: 5580 mm



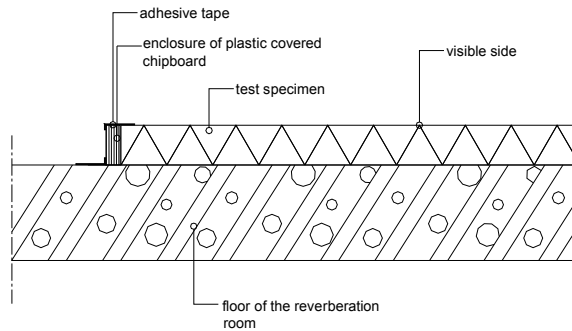
Absorb, versie 5.8.4 mode 7, PM: TS, file: a3151\_E#:488-523 T<sub>1</sub> = 17,1 °C p<sub>1</sub> = 102,8 kPa h<sub>1</sub> = 52,4 %

## MEASUREMENT OF SOUND ABSORPTION IN A REVERBERATION ROOM ACCORDING TO ISO 354:2003



principal: Texdecor

Texdecor Air panel mounted directly at the concrete floor



volume reverberation room: 214 m<sup>3</sup>

surface area sample: 8,64 m<sup>2</sup>

height of the construction: 0,05 m

measured at: Peutz Laboratory for Acoustics

signal: broad-band noise

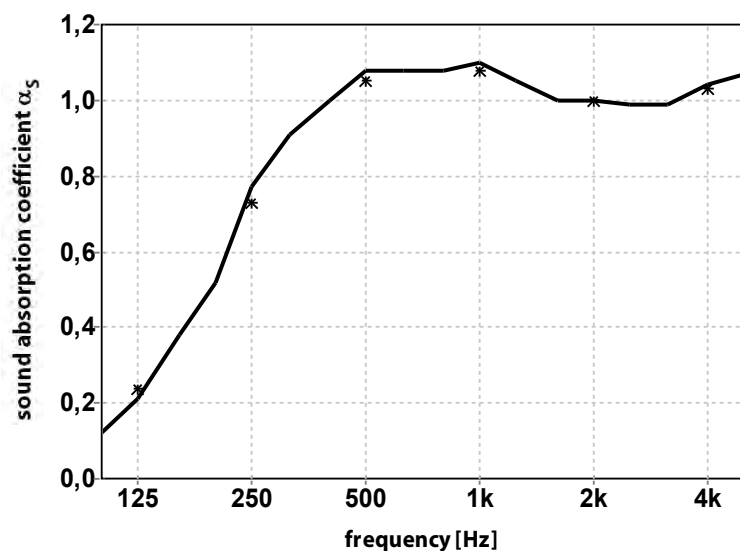
bandwidth: 1/3 octave

$\alpha_w$  (ISO 11654) = 1,00

NRC (ASTM - C423) = 1,00

SAA (ASTM - C423) = 0,97

— 1/3 oct.  
\* 1/1 oct.



	0,12	0,52	1,00	1,08	1,00	0,99
1/3 oct.	0,21	0,77	1,08	1,10	1,00	1,04
	0,38	0,91	1,08	1,05	0,99	1,07
1/1 oct.	<b>0,24</b>	<b>0,73</b>	<b>1,05</b>	<b>1,08</b>	<b>1,00</b>	<b>1,03</b>

publication is permitted for the entire page only

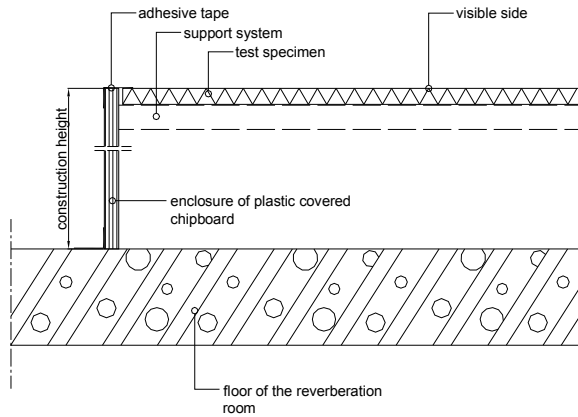
Mook, measured at  
09-12-2016

## MEASUREMENT OF SOUND ABSORPTION IN A REVERBERATION ROOM ACCORDING TO ISO 354:2003



principal: Texdecor

Texdecor Air panel mounted at a construction height of 200 mm



Absorb, versie 5.8.4 mode 7, PM: TS, file: a3151 E#:488-523 F#:598-633 A#:634 T<sub>1</sub> = 17,1 °C T<sub>2</sub> = 17,4 °C p<sub>1</sub> = 102,8 kPa p<sub>2</sub> = 102,9 kPa h<sub>1</sub> = 52,4 % h<sub>2</sub> = 56,6 %

volume reverberation room: 214 m<sup>3</sup>

surface area sample: 8,64 m<sup>2</sup>

height of the construction: 0,2 m

measured at: Peutz Laboratory for Acoustics

signal: broad-band noise

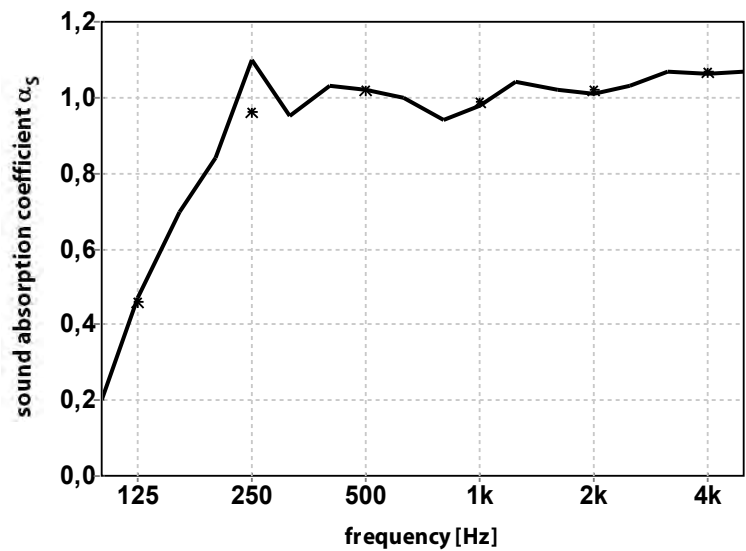
bandwidth: 1/3 octave

$\alpha_w$  (ISO 11654) = 1,00

NRC (ASTM - C423) = 1,05

SAA (ASTM - C423) = 1,00

— 1/3 oct.  
\* 1/1 oct.



	125	250	500	1k	2k	4k
1/3 oct.	0,20	0,84	1,03	0,94	1,02	1,07
1/1 oct.	0,47	1,10	1,02	0,98	1,01	1,06
1/1 oct.	0,70	0,95	1,00	1,04	1,03	1,07
<b>1/1 oct.</b>	<b>0,46</b>	<b>0,96</b>	<b>1,02</b>	<b>0,99</b>	<b>1,02</b>	<b>1,07</b>

publication is permitted for the entire page only

Mook, measured at  
09-12-2016



EQUIVALENT SOUNDABSORPTION AREA PER OBJECT conform ISO 354:2003

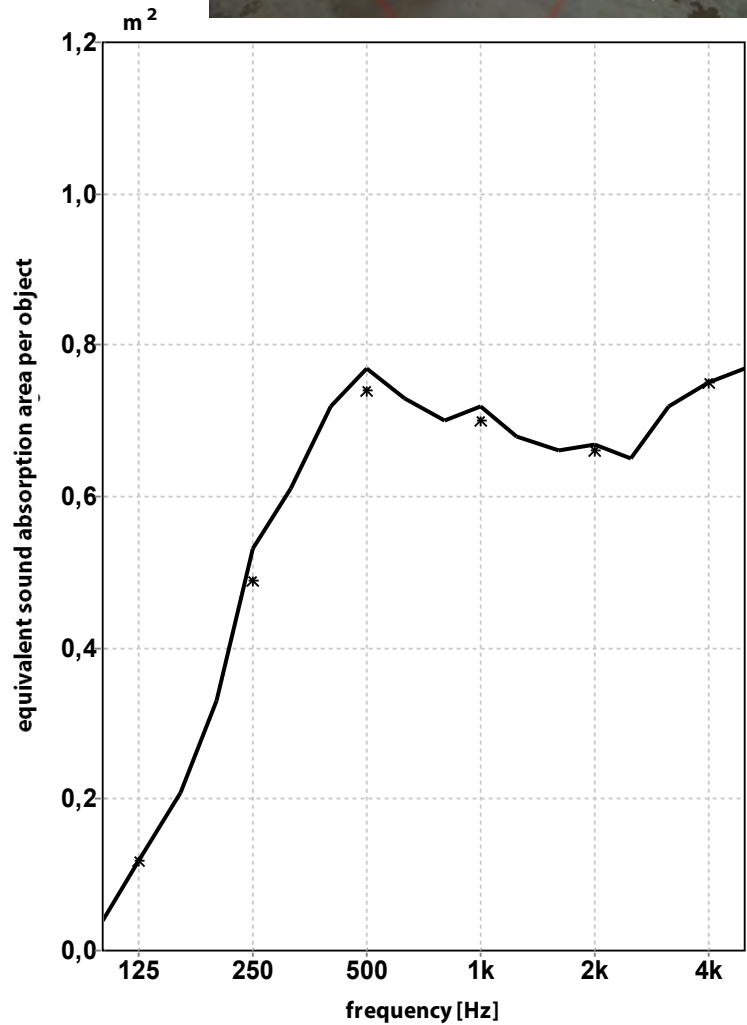


principal: Texdecor

Texdecor DALLE elements (random) mounted at 200 mm distance to the floor  
Absorption (A) per element of 600 mm x 600 mm



— 1/3 oct.  
\* 1/1 oct.



volume reverberation room: 214 m<sup>3</sup>

number of elements: 4

measured at: Peutz Laboratory for Acoustics

signal: broad-band noise

bandwidth: 1/3 octave

	0,04	0,33	0,72	0,70	0,66	0,72
1/3 oct.	0,12	0,53	0,77	0,72	0,67	0,75
	0,21	0,61	0,73	0,68	0,65	0,77
<b>1/1 oct.</b>	<b>0,12</b>	<b>0,49</b>	<b>0,74</b>	<b>0,70</b>	<b>0,66</b>	<b>0,75</b>

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Mook, measured at  
09-12-2016

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Principal	Texdecor Siège social 2 rue d'Hem 59780 Willems France
Report number	A 3151-2E-RA-001
Date	June 1, 2017
Reference	TS/RA/HT/A 3151-2E-RA-001
Representative	Th.W. Scheers
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BTW NL004933837B01 KvK: 12028033

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4.3 Environmental conditions during the measurements	9
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## 1 Introduction

At the request of Texdecor based in Willems (France), laboratory measurements of the sound absorption (reverberation room method) were carried out on:

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manufacturer Texdecor**

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).

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NOTE: this international standard has been accepted within all EU-countries as European standard EN ISO 354:2003

Various other related norms:

EN ISO 11654:1997 Acoustics Sound absorbers for use in buildings Rating of sound absorption

ASTM C423-09a Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method


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<sup>1</sup> According to this norm, the report should include for each measurement the mean reverberation times  $T_1$  and  $T_2$  at each frequency. Because these figures are not relevant for judging the quality of the product being tested, but merely for judging the accuracy of the calculations, they have been omitted in this report. It is possible of course to reproduce those figures at any time if the principal requests this.


## 3 Tested construction

The data presented here have been received from the principal or obtained by own observations.

### Airpanel 1

dimensions w x h built-up	1200 x 1200 mm steel frame with acoustic non-woven fleece, covered with fabric at the view side	
filling	polyester wool	
total thickness	50 mm	

### Airpanel 2

dimensions w x h built-up	1200 x 1200 mm steel frame with acoustic non-woven fleece, covered with fabric at both sides	
filling	polyester wool	
total thickness	50 mm	

*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. The test report ahead is valid as long as the tested constructions and/or materials are unchanged.*

## 4 Measurements

The products are installed for the laboratory test in the same manner as they are typically installed in practice;

- lying on the floor of the reverberation room (Airpanel 1)
- lying on a support structure, height 50, 200 and 300 mm, above the floor of the reverberation room (Airpanel 1)
- free-standing on the floor of the reverberation room (Airpanel 2)

For discrete absorbers like this particular case, the results are expressed as the equivalent sound absorption area  $A$  ( $\text{m}^2$ ) per object.



### 4.1 Method

The tests were conducted in accordance with the provisions of the test method ISO 354 in the reverberation room of "Peutz bv" in Mook (the Netherlands) (see figure 1). The relevant data regarding the reverberation room are given in figure 3 of this report.

By means of reverberation measurements the reverberation time of the room is measured under two conditions:

- when the reverberation room is empty
- when the construction under test is inside the reverberation room

In general, once material is placed into the reverberation room a lower reverberation time will result.

The difference in reverberation times is a measure of the amount of absorption brought into the room.

Measurements and calculations were carried out in 1/3-octave bandwidth from 100 to 5000 Hz, according to the norms. Where applicable the octave values have been calculated from these 1/3-octave values.

From the reverberation measurements in the empty reverberation room the equivalent sound absorption  $A_1$  is calculated (per frequency band) according to formula 1 and expressed in  $\text{m}^2$



$$A_1 = \frac{55,3V}{cT_1} - 4Vm_1 \quad (1)$$

in which:

$V$  = the volume of the reverberation room [m<sup>3</sup>]

$T_1$  = the reverberation time in the empty reverberation room [sec.]

$m_1$  = "power attenuation coefficient" in the empty room,  
calculated according to formula [m<sup>-1</sup>]

$c$  = the speed of sound in the air, in m/s, calculated according to [m/s]

$$c = 331 + 0,6t \quad (2)$$

in which:

$t$  = the temperature; this formula is valid for temperatures between 15 and 30 °C [°C]

$$m = \frac{\alpha}{10\log(e)} \quad (3)$$

in which:

$\alpha$  = "attenuation coefficient" according to ISO 9613-1

In the same manner the equivalent sound absorption  $A_2$  for the room with the test specimen is calculated according to formula 4, also expressed in m<sup>2</sup>

$$A_2 = \frac{55,3V}{cT_2} - 4Vm_2 \quad (4)$$

in which:

$c$  and  $V$  have the same definition as in formula 1 and

$T_2$  = the reverberation time of the reverberation room with the test specimen placed inside [sec]

$m_2$  = "power attenuation coefficient" in the room with the test specimen placed inside, calculated according to formula 3 [m<sup>-1</sup>]

The equivalent sound absorption  $A$  of the test specimen has been calculated according to formula 5 and is expressed in m<sup>2</sup>

$$A = A_2 - A_1 \quad (5)$$

## 4.2 Accuracy

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

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 evaluate the repeatability  $r$  for the sound absorption measurements performed in the reverberation room of "Peutz bv" in Mook (the Netherlands) eight series of measurements have been carried out according to ISO 354:1985 annex C. From the results of those measurements the repeatability  $r$  has been calculated. It was found that for the frequency range from 100 to 200 Hz and at 5000 Hz the repeatability  $r$  is 0,21 as a maximum. For the frequency range 250 to 4000 Hz the repeatability  $r$  is 0,09 as a maximum.

#### 4.3 Environmental conditions during the measurements

t4.1

reverberation room	temperature [°C]	barometric pressure [kPa]	relative humidity [%]
empty	18	101,3	53
with specimens	18	101,3	55 - 56

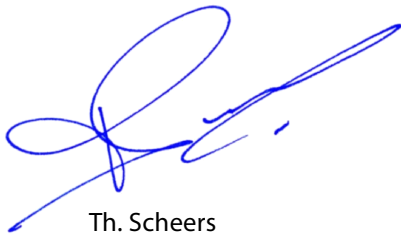
#### 4.4 Results

The results of the measurements are given in table 4.2 and in the figures 3 up till and including 7. The measurements were made in 1/3-octave bands. The results presented in octave-bands are the arithmetic average of the results of the three 1/3-octave bands belonging to that octaveband.

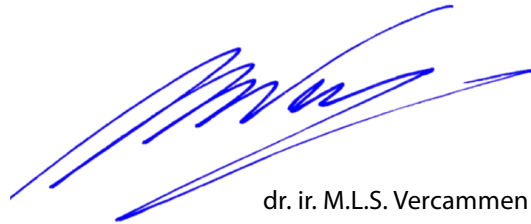
t4.2 Measurements results

type height Cavity + panel record nr. figure nr.	sound absorption [m <sup>2</sup> ] per element (1,2 x 1,2 m)									
	Airpanel 1 0 + 50 mm #335 3		Airpanel 1 50 + 50 mm #372 4		Airpanel 1 200 + 50 mm #409 5		Airpanel 1 300 + 50 mm #446 6		Airpanel 2 -- #485 7	
	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	0,2		0,1		0,2		0,2		0,6	
125	0,4	0,3	0,4	0,4	0,4	0,5	0,4	0,5	0,5	0,7
160	0,5		0,6		0,8		0,9		0,9	
200	0,8		0,8		1,2		1,2		1,1	
250	1,2	1,2	1,3	1,2	1,5	1,5	1,5	1,5	1,5	1,4
315	1,6		1,6		1,9		1,8		1,6	
400	1,7		1,9		2,0		1,9		1,9	
500	1,8	1,8	2,1	2,0	2,0	2,0	1,9	1,9	2,2	2,1
630	1,9		2,1		2,0		2,0		2,2	
800	1,8		2,1		2,0		2,2		2,3	
1000	1,6	1,7	2,0	2,0	2,2	2,1	2,2	2,2	2,4	2,4
1250	1,6		1,9		2,1		2,2		2,4	
1600	1,5		1,8		2,0		2,2		2,3	
2000	1,5	1,5	1,8	1,8	2,0	2,0	2,3	2,2	2,4	2,3
2500	1,5		1,7		2,0		2,2		2,4	
3150	1,6		1,7		2,0		2,3		2,3	
4000	1,6	1,6	1,6	1,7	2,1	2,1	2,2	2,3	2,4	2,4
5000	1,6		1,7		2,1		2,3		2,5	

The sound absorption coefficient of a material is not a material property. It should be taken into account that the sound absorption of a construction depends on the dimensions, the way of mounting of the material and its position in the room.



Th. Scheers  
Laboratory Supervisor



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

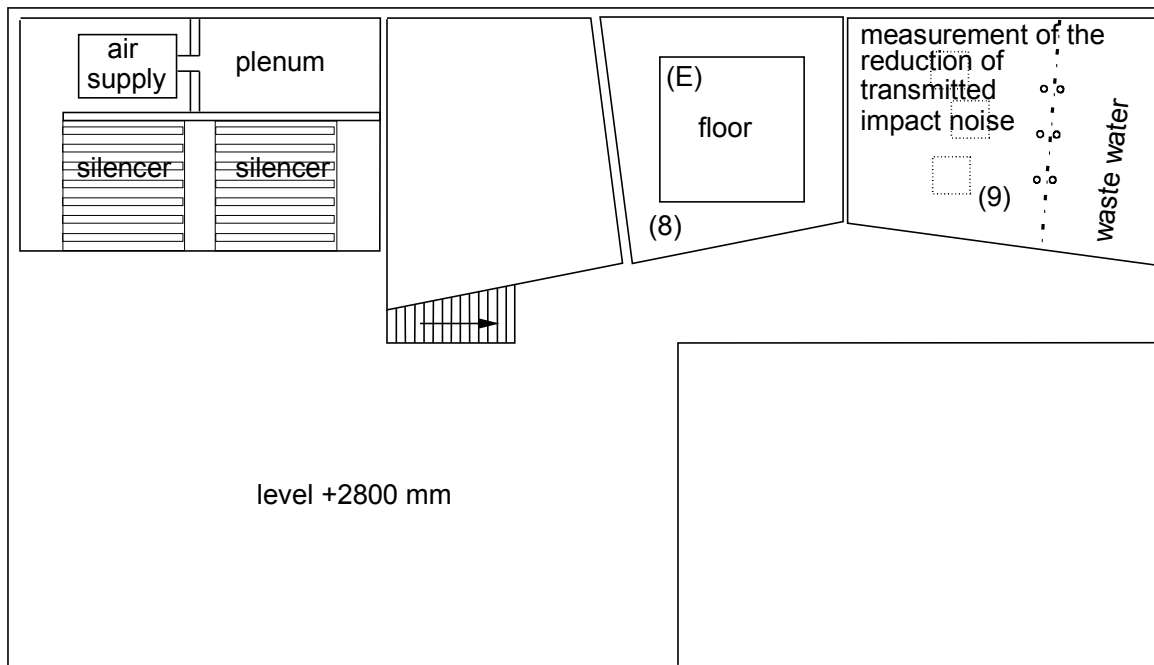
Mook,

This report contains 11 pages and 7 figures.

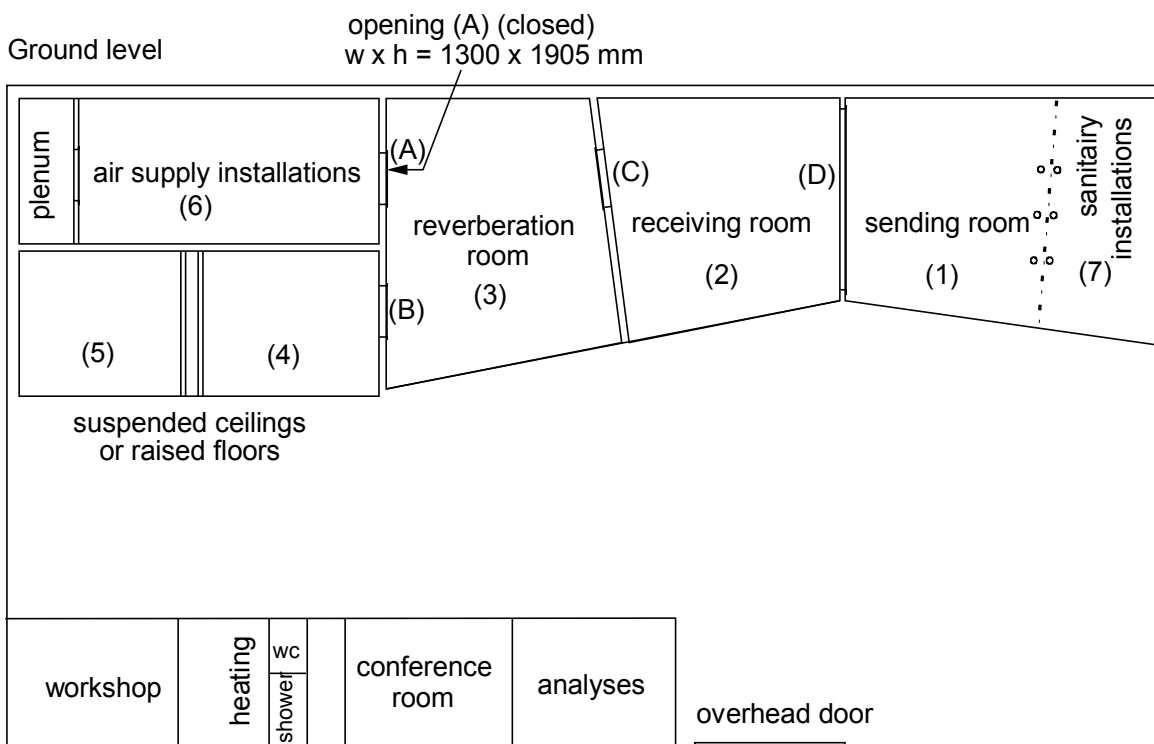
PEUTZ bv  
 Lindenlaan 41, NL-6584 AC MOLENHOEK (LB), THE NETHERLANDS

OVERVIEW

Story

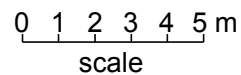


Ground level



TEST OPENINGS (w x h in mm)

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



PEUTZ bv  
Lindenlaan 41, 6584 AC MOLENHOEK (LB)

**REVERBERATION ROOM**

The reverberation room meets the requirements of ISO 354:2003.

additional data:

volume : 214 m<sup>3</sup>  
total area S<sub>t</sub> (walls, floor and ceiling) : 219 m<sup>2</sup>

diffusion: by the shape of the room and by adding 6 curved and 2 flat reflecting elements with a total area of approx. 13 m<sup>2</sup> a sufficient diffusion has been gained.

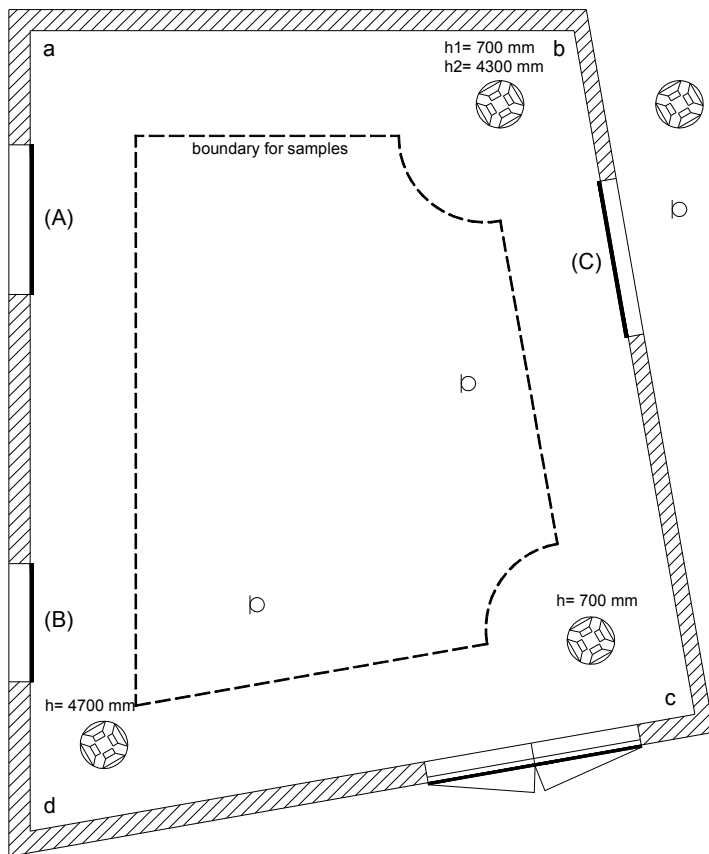
reverberation time of the empty reverberation room during measurements of 24-10-2016

frequency (1/1 oct.)	125	250	500	1000	2000	4000	Hz
reverberationtime	7,60	6,21	5,95	5,37	4,15	2,69	sec.

repeatability r (1/1 oct.) c.f. ISO 354:1985 annex C (see chapter 4.2 of this report).

r bij hoge α	0,13	0,04	0,04	0,02	0,02	0,08	-
r bij lage α	0,09	0,02	0,01	0,02	0,02	0,04	-

plan

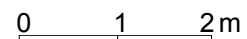


loudspeaker (4x)

microphone (3x)

(closed) testopenings  
(width x height in mm)  
(A): 1300 x 1800  
(B): 1000 x 2200  
(C): 1500 x 1250

height at:  
a: 5573 mm  
b: 5102 mm  
c: 5000 mm  
d: 5580 mm



Absorb, versie 5.8.4 mode 7, file: a3151 E#261-296 T<sub>1</sub> = 17,9 °C p<sub>1</sub> = 101,3 kPa h<sub>1</sub> = 52,8 %

EQUIVALENT SOUNDABSORPTION AREA PER OBJECT conform ISO 354:2003

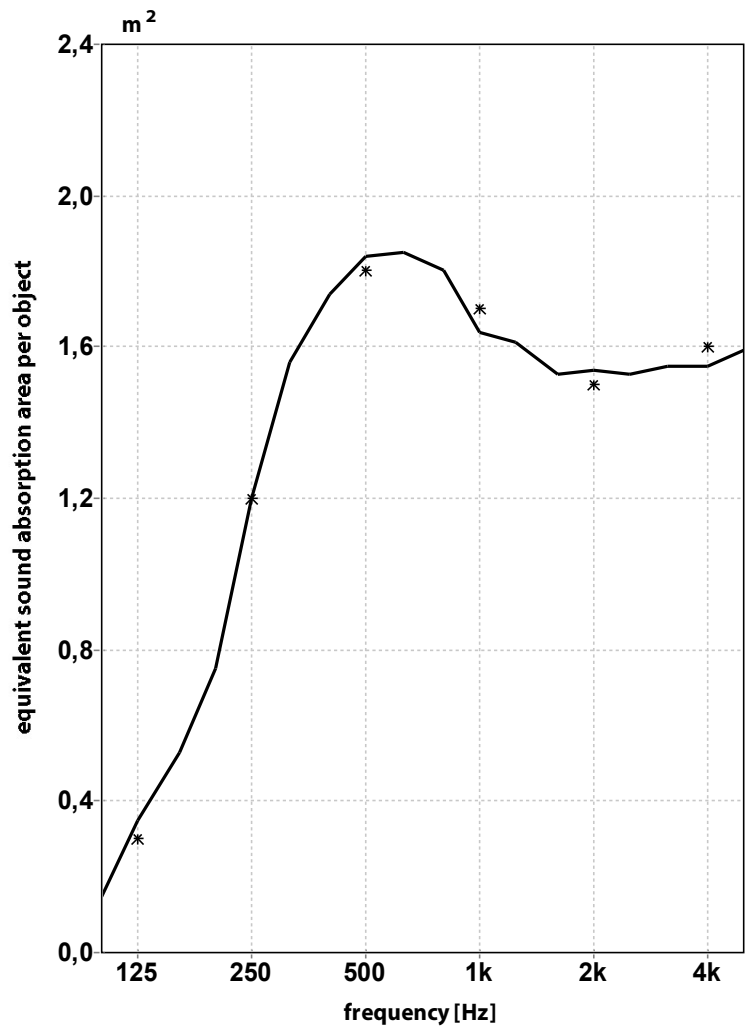


principal: Texdecor

#1 Airpanel; directly on the floor



— 1/3 oct.  
\* 1/1 oct.



volume reverberation room: 214 m<sup>3</sup>

number of elements during test: 4

measured at: Peutz Laboratory for Acoustics

signal: broad-band noise

bandwidth: 1/3 octave

	0,2	0,8	1,7	1,8	1,5	1,6
1/3 oct.	0,4	1,2	1,8	1,6	1,5	1,6 m <sup>2</sup>
	0,5	1,6	1,9	1,6	1,5	1,6
1/1 oct.	<b>0,3</b>	<b>1,2</b>	<b>1,8</b>	<b>1,7</b>	<b>1,5</b>	<b>1,6 m<sup>2</sup></b>

publication is permitted for the entire page only

Mook, measured at 24-10-2016

EQUIVALENT SOUNDABSORPTION AREA PER OBJECT conform ISO 354:2003



principal: Texdecor

#2; Airpanel; 50 mm cavity; 4 panels



Absorb, versie 5.8.4 mode 9, PM: JK, file: a3151 E#:261-296 F#:336-371 A#:372 T<sub>1</sub> = 17,9 °C T<sub>2</sub> = 18,0 °C p<sub>1</sub> = 101,3 kPa p<sub>2</sub> = 101,3 kPa h<sub>1</sub> = 52,8 % h<sub>2</sub> = 56,0 %

volume reverberation room: 214 m<sup>3</sup>

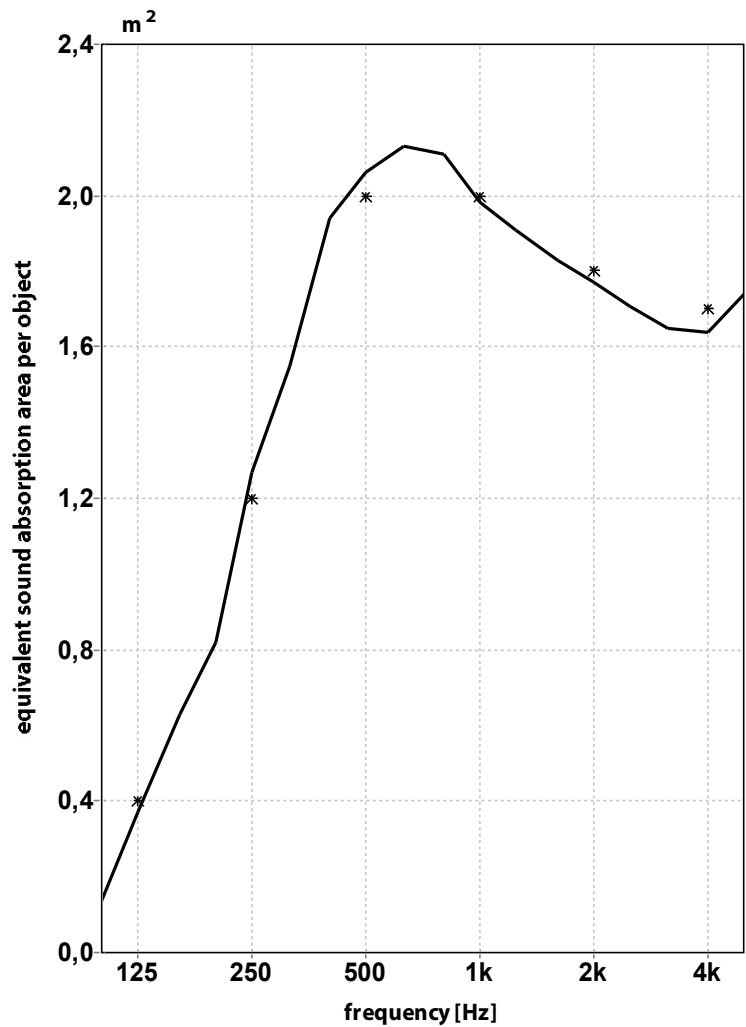
number of elements during test: 4

measured at: Peutz Laboratory for Acoustics

signal: broad-band noise

bandwidth: 1/3 octave

— 1/3 oct.  
\* 1/1 oct.



	0,1	0,8	1,9	2,1	1,8	1,7
1/3 oct.	0,4	1,3	2,1	2,0	1,8	1,6 m <sup>2</sup>
	0,6	1,6	2,1	1,9	1,7	1,7
1/1 oct.	0,4	1,2	2,0	2,0	1,8	1,7 m <sup>2</sup>

publication is permitted for the entire page only

Mook, measured at 24-10-2016



EQUIVALENT SOUNDABSORPTION AREA PER OBJECT conform ISO 354:2003

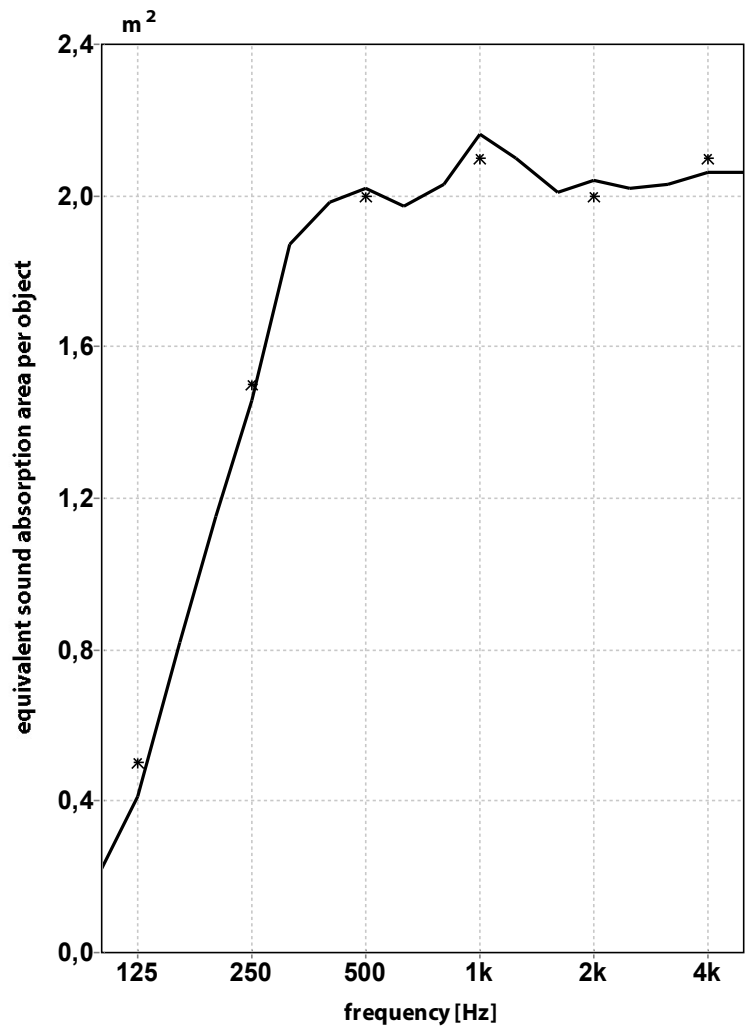


principal: Texdecor

#3; Airpanel; 200 mm cavity; 4 panels



— 1/3 oct.  
\* 1/1 oct.



volume reverberation room: 214 m<sup>3</sup>

number of elements during test: 4

measured at: Peutz Laboratory for Acoustics

signal: broad-band noise

bandwidth: 1/3 octave

	0,2	1,2	2,0	2,0	2,0	2,0	
1/3 oct.	0,4	1,5	2,0	2,2	2,0	2,1	m <sup>2</sup>
	0,8	1,9	2,0	2,1	2,0	2,1	
1/1 oct.	0,5	1,5	2,0	2,1	2,0	2,1	m <sup>2</sup>

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Mook, measured at 24-10-2016

EQUIVALENT SOUNDABSORPTION AREA PER OBJECT conform ISO 354:2003

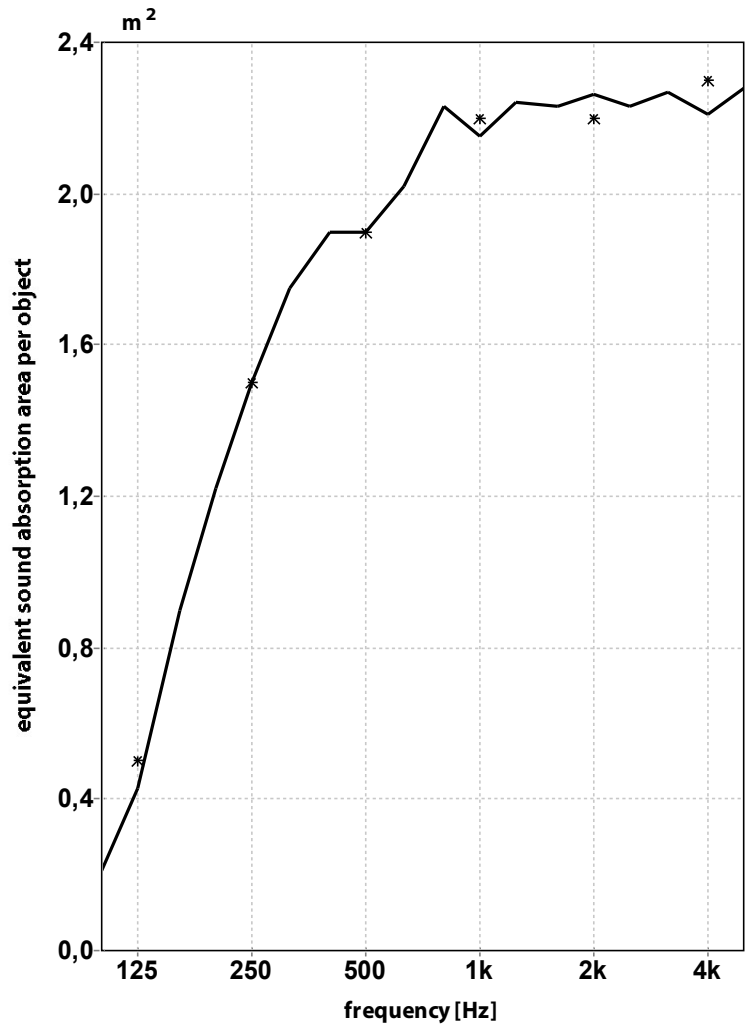


principal: Texdecor

#4; Airpanel; 300 mm cavity; 4 panels



— 1/3 oct.  
\* 1/1 oct.



volume reverberation room: 214 m<sup>3</sup>

number of elements during test: 4

measured at: Peutz Laboratory for Acoustics

signal: broad-band noise

bandwidth: 1/3 octave

	0,2	1,2	1,9	2,2	2,2	2,3	
1/3 oct.	0,4	1,5	1,9	2,2	2,3	2,2	m <sup>2</sup>
	0,9	1,8	2,0	2,2	2,2	2,3	
1/1 oct.	0,5	1,5	1,9	2,2	2,2	2,3	m <sup>2</sup>

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Mook, measured at 24-10-2016

EQUIVALENT SOUNDABSORPTION AREA PER OBJECT conform ISO 354:2003

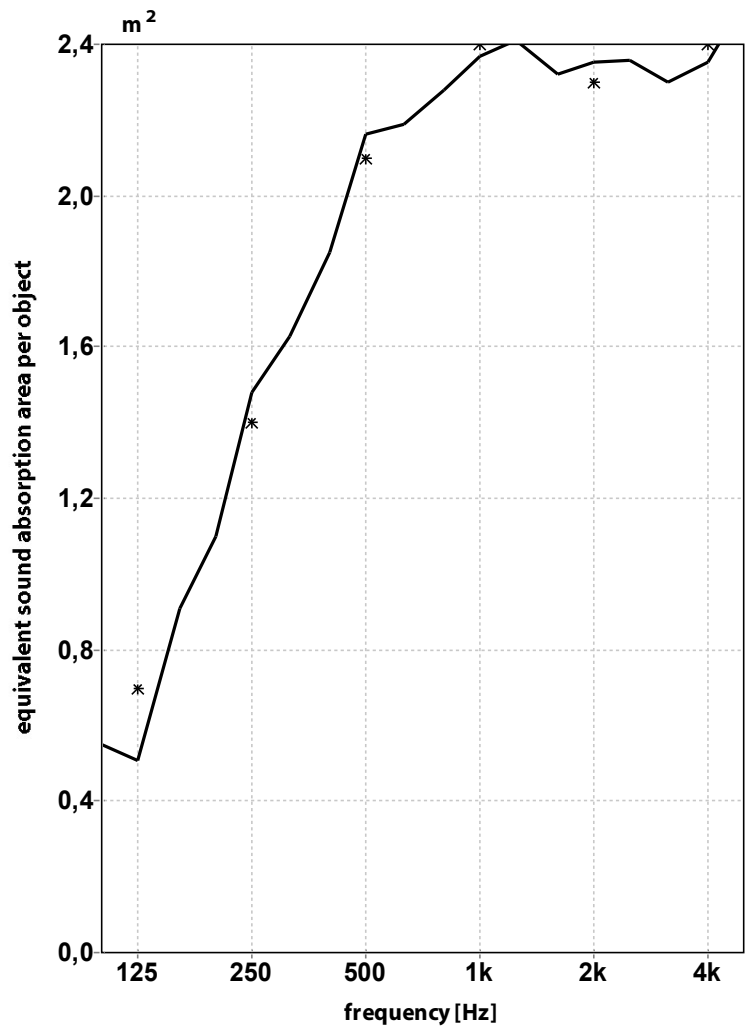


principal: Texdecor

#5; Airpanel; baffle (double sides); 4 panels



— 1/3 oct.  
\* 1/1 oct.



volume reverberation room: 214 m<sup>3</sup>

number of elements during test: 4

measured at: Peutz Laboratory for Acoustics

signal: broad-band noise

bandwidth: 1/3 octave

	0,6	1,1	1,9	2,3	2,3	2,3
1/3 oct.	0,5	1,5	2,2	2,4	2,4	2,4 m <sup>2</sup>
	0,9	1,6	2,2	2,4	2,4	2,5
1/1 oct.	0,7	1,4	2,1	2,4	2,3	2,4 m <sup>2</sup>

publication is permitted for the entire page only

Mook, measured at 24-10-2016