

**Laboratory measurements**  
**For Sonacoustic International BV**  
Power Acoustics absorption measurements

Commissioning party  
Sonacoustic International b.v

Contact  
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## 1 Introduction

Measurements were performed with regard to the acoustic absorption of the Power Acoustics material in March and April 2017 at the instructions of Sonacoustic International b.v. The measurements were performed in the Kees van Dorsser laboratory reverberation room located at Neherkade 1, The Hague, the Netherlands.

The aim of the measurements was to determine the acoustic absorption coefficient of Power Acoustics used on Sonaboard boards of different thicknesses.

The performed measurements and the measurement results are elaborated in this report.

## 2 Product description

Power Acoustics is an acoustic spray plaster that can be applied on load-bearing backgrounds such as walls and ceilings. In this case, the Power Acoustics material has been applied in accordance with the instructions of the manufacturer on what is commonly known as Sonaboard boards.

The spray plaster was applied on to the Sonaboard board well in advance of the test. It was applied on boards that measured 1 m by 1 m. The reason being that the material must dry out sufficiently before the measurements are performed so that a good comparison can be made if used in practice.

The composition of the Sonaboard board and the content information about the Power Acoustics spray plasters are described in confidential letter B058906ab.00001.go that is part of this document.

This confidential letter ensures that there is a record of which materials with regard to content the manufacturer has had used to perform the test. The commissioning party and LBP|SIGHT are aware of this letter.

An overview of the LBP|SIGHT tested variants is given in table 2.1.

**Table 2.1**

Spray plaster type	Spray plaster thickness	Load-bearing background thickness
Power Acoustics	Between 3 mm and 5 mm	30 mm Sonaboard
		40 mm Sonaboard
		50 mm Sonaboard
		60 mm Sonaboard

## 3 Measuring set-up

A set-up was created for each variant with a total area of 12 m<sup>2</sup>. The 5 mm Power Acoustics spray plaster was applied prior to the measurements of the acoustic absorption on 12 Sonaboard boards measuring 1 m by 1 m. Variants of the Sonaboard board were measured with a thickness of 30, 40, 50 and 60 mm.

The boards were positioned one next to each other in a rectangle basically diagonally flat on the concrete floor of the reverberation room and provided with a framework. This timber framework that protected all of the sides was structured using a timber frame with a thickness of 32 mm and a height of 65 mm. Photos are included in figures I.1 to I.6 of appendix I of the structure of the measuring set-up.

Please refer to appendix II for a description of the reverberation room and the used measuring equipment.

## 4 Measurement results

The measurements of the acoustic absorption were performed in accordance with NEN-EN-ISO 354:2003(E) of 1 July 2003. Please refer to appendix III for a description of the measuring method.

Appendix IV includes the results of the measurements including a graphic representation thereof. Table 4.1 summarises the results of the measurements.

**Table 4.1**  
Results of the measurements of the acoustic absorption

5 mm EC Power Acoustics	Acoustic absorption coefficient [-] per octave band [Hz]						$\alpha_w$ [-]	NRC [-]
	125	250	500	1,000	2,000	4,000		
30mm Sonaboard	0.24	0.71	1.04	1.07	1.00	0.93	1	0.95
40mm Sonaboard	0.39	0.88	1.13	1.06	1.01	0.97	1	1.00
50mm Sonaboard	0.55	0.95	1.09	1.05	0.99	0.95	1	1.00
60mm Sonaboard	0.67	1.03	1.03	1.02	0.97	0.92	1	1.00

The presented results of the measurements of the acoustic absorption apply to the tested samples as described in relation to the measuring set-up.

Acoustic absorption in practice is also influenced by the background on which the material is applied.

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**Appendix I.**  
Measuring set-up photos

**Figure I.1**



Measuring set-up in the reverberation room

**Figure I.2**



Detail

**Figure I.3**



Set-up: 5 mm Power Acoustics  
30 mm thick Sonaboard

**Figure I.4**



Set-up: 5 mm Power Acoustics  
40 mm thick Sonaboard



Figure I.5



Set-up: 5 mm Power Acoustics  
50 mm thick Sonaboard

Figure I.6



Set-up: 5 mm Power Acoustics  
60 mm thick Sonaboard

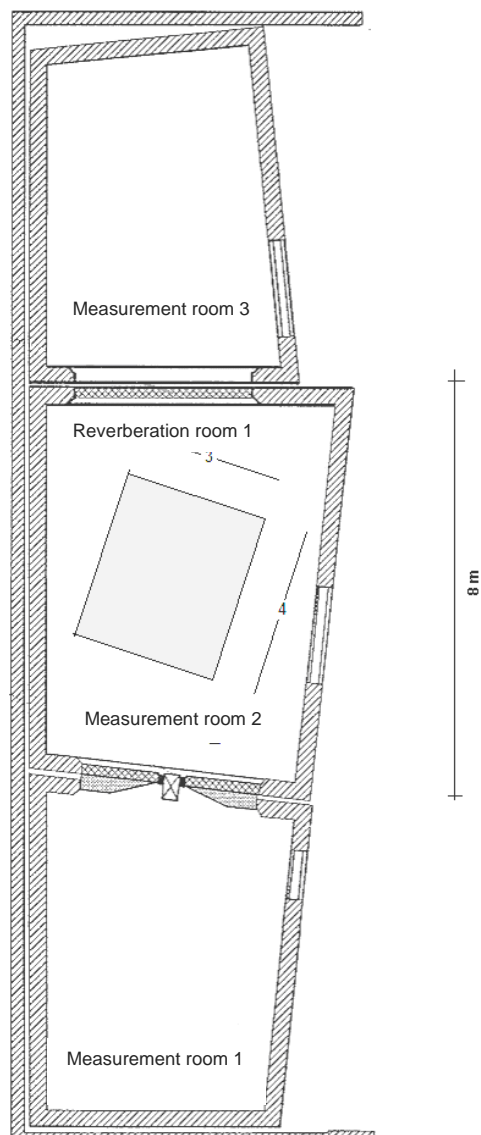
**Appendix II.**

Reverberation room and measuring equipment

## Reverberation room

Figure II.1 includes a floor plan of the measurement rooms in the Kees van Dorsser laboratory in The Hague. Measurement room 2, the reverberation room, was used for measuring the acoustic absorption using the reverberation method. The specifications of measuring room 2 are:

- Height: 5.60 - 6.05 m;
- Floor area: 42 m<sup>2</sup>;
- Enclosing area: 240 m<sup>2</sup>;
- Empty room volume: 216 m<sup>3</sup>.



**Figure 0.1**

Floor plan of the measurement rooms in the Kees van Dorsser laboratory with measuring set-up.

## Measuring equipment

The following measuring equipment was used for the measurements:

- Brüel & Kjær 1/2" microphones, type 4165.
- Brüel & Kjær real time analyser, type 2131.
- Quad amplifier, type 405.
- Bose speakers, type 802.

**Appendix III.**  
Measuring method

## Measurement and calculation results

The acoustic absorption coefficient is determined based on:

$$\alpha_s = \frac{\frac{V_2}{6T_2} - \frac{V_1}{6T_1}}{S}$$

Where:

- $\alpha_s$  = the acoustic absorption coefficient of the structure to be tested per third-octave band;
- $V_1$  = the volume of the empty reverberation room in m<sup>3</sup>;
- $V_2$  = the volume of the empty reverberation room with the structure to be tested in m<sup>3</sup>;
- $S$  = the area of the structure to be tested (in this case, 10.5 m<sup>2</sup>);
- $T_1$  = the reverberation time of the empty reverberation room;
- $T_2$  = the reverberation time of the reverberation room with the structure to be tested.

The empty reverberation room has a volume of 216 m<sup>3</sup>. The reverberation room including the structure has a minimum volume of approximately 215 m<sup>3</sup>.

In addition to the acoustic absorption coefficient per third octave band, it is the norm to also indicate the one-figure values such as the  $\alpha_w$  and NRC.

### Acoustic absorption coefficient $\alpha_w$

The  $\alpha_w$  term is one method for expressing the average absorption coefficient of a material. The weighted acoustic absorption  $\alpha_w$  is determined in accordance with the NEN-EN-ISO 11654 standard based on the measurements in accordance with the NEN-EN-ISO 354 standard.

The weighted acoustic absorption  $\alpha_w$  is, next, determined by the measured values in octave bands by comparing the medium frequencies 250 to 4,000 Hz with a shifted reference curve where the total of the negative deviations may not be more than 0.10. The value that the shifted reference curve indicates at 500 Hz is  $\alpha_w$  rounded off to the closest multiple of 0.05.

### Noise Reduction Coefficient

A different term that can be used to express the acoustic absorbing effect of a material is the Noise Reduction Coefficient (NRC). In accordance to the American ASTM C423-09A standard, the NRC can be established by determining the computational average of the octave bands with medium frequencies 250 to 2,000 Hz and rounding the obtained figure off to the closest multiple of 0.05.

**Appendix IV. Measurement results**

ACOUSTIC ABSORPTION IN ACCORDANCE WITH ISO 354:2003(E)

Measurement 1

Kees van Dorsser laboratory (LBP|SIGHT)

<b>Commissioning party</b>	Sonacoustic International	<b>Framing type</b>	-
<b>Project number:</b>	058906ab	<b>Area:</b>	12
<b>Measurement date:</b>	04 April 2017	<b>Measurement room volume:</b>	216 m <sup>3</sup>

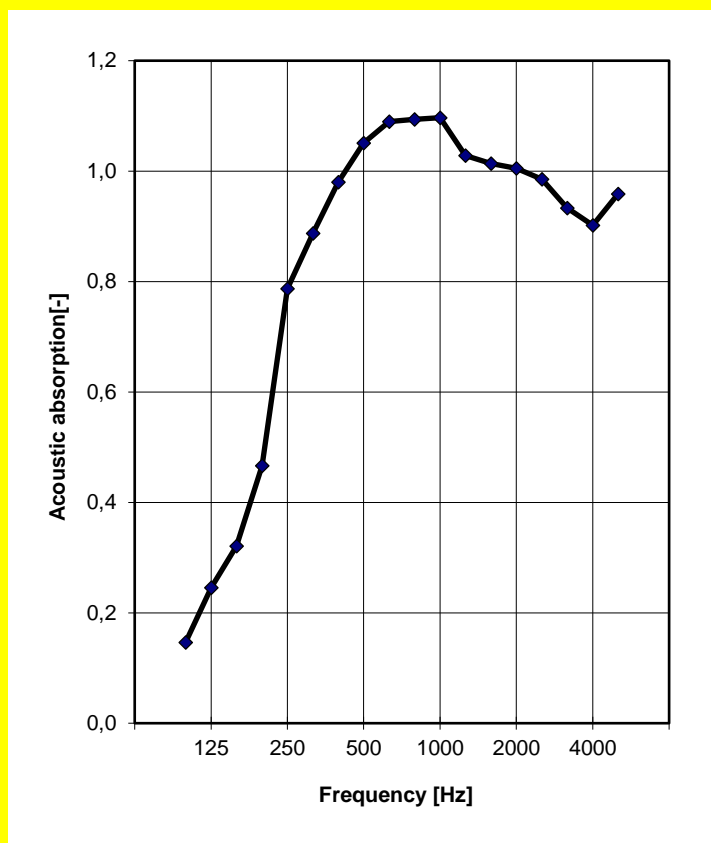
**Structure description:**  
5 mm Power Acoustics  
30 mm Sonaboard  
Average thickness of 35 mm

**Structure set-up:**  
**Total thickness:** 35 mm  
**Air gap thickness:** -  
**Absorption thickness**

**Temperature:** 16 °C  
**Relative humidity:** 63%

**Manufacturer** Sonacoustic International

Freq	T <sub>empty</sub>	T <sub>full</sub>	$\alpha_s$	$\alpha_p$
100	4.22	3.49	0.15	
<b>125</b>	4.65	3.36	0.25	0.24
160	4.26	2.92	0.32	
200	3.92	2.43	0.47	
<b>250</b>	3.93	1.93	0.79	0.71
315	4.36	1.90	0.89	
400	4.58	1.83	0.98	
<b>500</b>	4.83	1.79	1.05	1.04
630	4.76	1.74	1.09	
800	4.50	1.70	1.09	
<b>1000</b>	4.45	1.69	1.10	1.07
1250	4.40	1.75	1.03	
1600	4.13	1.72	1.01	
<b>2000</b>	3.76	1.66	1.01	1.00
2500	3.30	1.58	0.99	
3150	2.97	1.54	0.93	
<b>4000</b>	2.55	1.44	0.90	0.93
5000	2.09	1.25	0.96	



Designations in accordance with ISO 11654		Designations in accordance with ASTM C423-99	
Weighted sound absorption $\alpha_w$ :	1 ( )	Noise Reduction Coefficient, NRC:	0.95
Sound Absorption Class:	A	Sound Absorption Average (SAA):	0.96



ACOUSTIC ABSORPTION IN ACCORDANCE WITH ISO 354:2003(E)

Measurement 2

Kees van Dorsser laboratory (LBP|SIGHT)

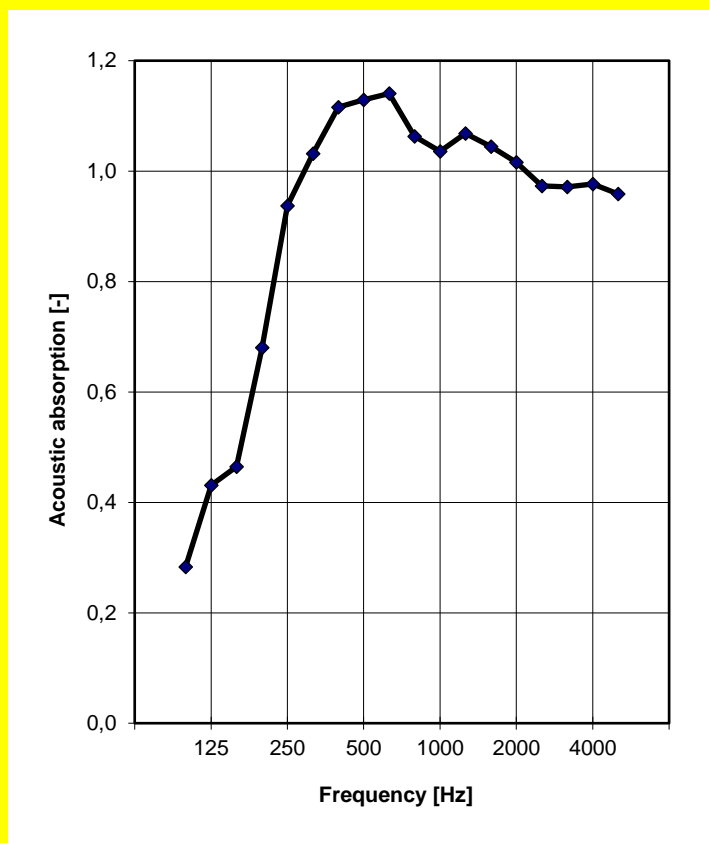
<b>Commissioning party</b>	Sonacoustic International	<b>Framing type</b>	-
<b>Project number:</b>	058906ab	<b>Area:</b>	12
<b>Measurement date:</b>	04 April 2017	<b>Measurement room volume:</b>	216 m <sup>3</sup>

**Structure description:** 5 mm Power Acoustics  
40 mm Sonaboard  
Average thickness of 45 mm

**Structure set-up:** **Temperature:** 16 °C  
**Total thickness:** 45 mm **Relative humidity:** 63%  
**Air gap thickness:** -  
**Absorption thickness**

**Manufacturer** Sonacoustic International

Freq	T <sub>empty</sub>	T <sub>full</sub>	$\alpha_s$	$\alpha_p$
100	4.22	3.01	0.28	
125	4.65	2.78	0.43	0.39
160	4.26	2.56	0.46	
200	3.92	2.07	0.68	
250	3.93	1.76	0.94	0.88
315	4.36	1.74	1.03	
400	4.58	1.69	1.12	
500	4.83	1.71	1.13	1.13
630	4.76	1.69	1.14	
800	4.50	1.73	1.06	
1000	4.45	1.75	1.04	1.06
1250	4.40	1.71	1.07	
1600	4.13	1.69	1.04	
2000	3.76	1.65	1.02	1.01
2500	3.30	1.59	0.97	
3150	2.97	1.51	0.97	
4000	2.55	1.39	0.98	0.97
5000	2.09	1.25	0.96	



**Designations in accordance with ISO 11654**

**Designations in accordance with ASTM C423-99**

Weighted sound absorption $\alpha_w$ :	1 ( )	Noise Reduction Coefficient, NRC:	1.00
Sound Absorption Class:	A	Sound Absorption Average (SAA):	1.02

ACOUSTIC ABSORPTION IN ACCORDANCE WITH ISO 354:2003(E)

Measurement 3

Kees van Dorsser laboratory (LBP|SIGHT)

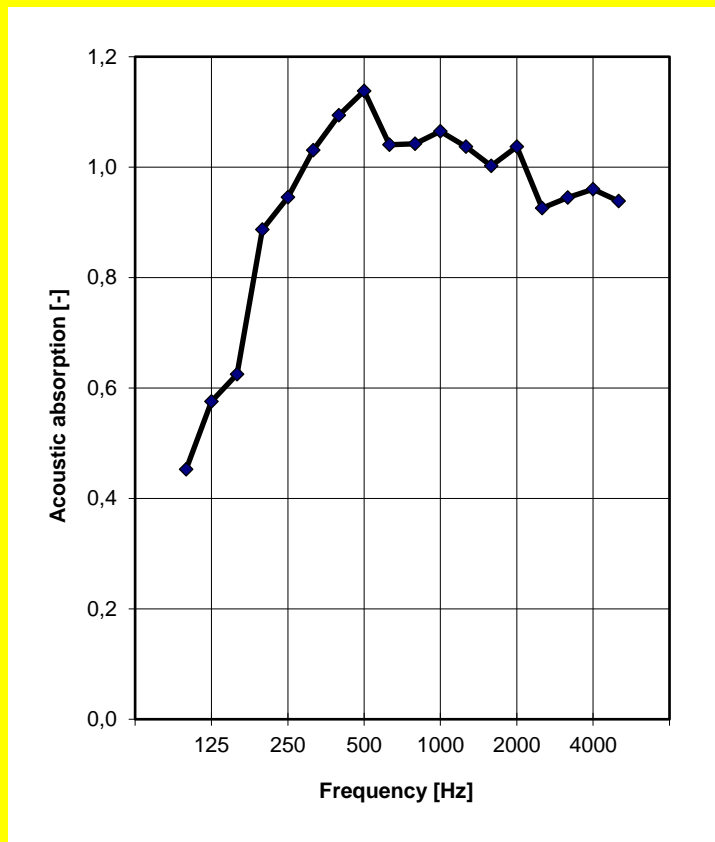
<b>Commissioning party:</b>	Sonacoustic International	<b>Framing type:</b>	-
<b>Project number:</b>	058906ab	<b>Area:</b>	12
<b>Measurement date:</b>	04 April 2017	<b>Measurement room volume:</b>	216 m <sup>3</sup>

**Structure description:**  
5 mm Power Acoustics  
50 mm Sonaboard  
Average thickness of 55 mm

**Structure set-up:**  
**Total thickness:** 55 mm  
**Air gap thickness:** -  
**Absorption thickness:** -  
**Temperature:** 16 °C  
**Relative humidity:** 63%

**Manufacturer:** Sonacoustic International

Freq	T <sub>empty</sub>	T <sub>full</sub>	$\alpha_s$	$\alpha_p$
100	4.22	2.57	0.45	
125	4.65	2.45	0.58	0.55
160	4.26	2.25	0.63	
200	3.92	1.81	0.89	
250	3.93	1.75	0.95	0.95
315	4.36	1.74	1.03	
400	4.58	1.71	1.09	
500	4.83	1.70	1.14	1.09
630	4.76	1.79	1.04	
800	4.50	1.75	1.04	
1000	4.45	1.72	1.06	1.05
1250	4.40	1.74	1.04	
1600	4.13	1.73	1.00	
2000	3.76	1.63	1.04	0.99
2500	3.30	1.63	0.93	
3150	2.97	1.53	0.94	
4000	2.55	1.40	0.96	0.95
5000	2.09	1.26	0.94	



Designations in accordance with ISO 11654

Designations in accordance with ASTM C423-99

Weighted sound absorption $\alpha_w$ :	1 ( )	Noise Reduction Coefficient, NRC:	1.00
Sound Absorption Class:	A	Sound Absorption Average (SAA):	1.02

ACOUSTIC ABSORPTION IN ACCORDANCE WITH ISO 354:2003(E)

Measurement 4

Kees van Dorsser laboratory (LBP|SIGHT)

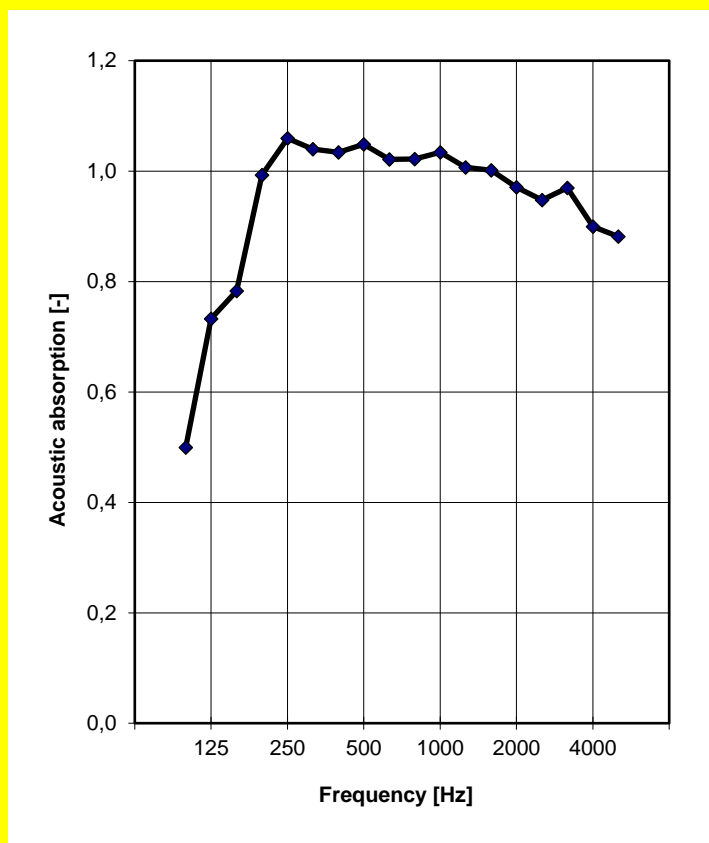
<b>Commissioning party</b>	Sonacoustic International	<b>Framing type</b>	-
<b>Project number:</b>	058906ab	<b>Area:</b>	12
<b>Measurement date:</b>	04 April 2017	<b>Measurement room volume:</b>	216 m <sup>3</sup>

**Structure description:**  
5 mm Power Acoustics  
60 mm Sonaboard  
Average thickness of 65 mm

**Structure set-up:**  
**Total thickness:** 65 mm  
**Air gap thickness:** -  
**Absorption thickness:** -  
**Temperature:** 16 °C  
**Relative humidity:** 63%

**Manufacturer** Sonacoustic International

Freq	T <sub>empty</sub>	T <sub>full</sub>	$\alpha_s$	$\alpha_p$
100	4.22	2.47	0.50	
<b>125</b>	4.65	2.17	0.73	0.67
160	4.26	2.01	0.78	
200	3.92	1.70	0.99	
<b>250</b>	3.93	1.64	1.06	1.03
315	4.36	1.73	1.04	
400	4.58	1.77	1.03	
<b>500</b>	4.83	1.79	1.05	1.03
630	4.76	1.81	1.02	
800	4.50	1.77	1.02	
<b>1000</b>	4.45	1.75	1.03	1.02
1250	4.40	1.77	1.01	
1600	4.13	1.73	1.00	
<b>2000</b>	3.76	1.69	0.97	0.97
2500	3.30	1.61	0.95	
3150	2.97	1.51	0.97	
<b>4000</b>	2.55	1.44	0.90	0.92
5000	2.09	1.29	0.88	



Designations in accordance with ISO 11654		Designations in accordance with ASTM C423-99	
Weighted sound absorption $\alpha_w$ :	1 ( )	Noise Reduction Coefficient, NRC:	1.00
Sound Absorption Class:	A	Sound Absorption Average (SAA):	1.01